



Intervention programs for entrepreneurship and
psychological capital in secondary education: Design,
implementation and longitudinal evaluation of their
effectiveness

Programas de intervención en emprendimiento y capital psicológico en
ESO: Diseño, aplicación y evaluación longitudinal de su eficacia

Doctoral Dissertation with International Doctorate Mention

Program of Personal Autonomy and Care for Dependent People

(code: 3148)

by

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València, April 2023

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Para la realización de la presente Tesis Doctoral, la investigadora Sara Martínez Gregorio ha disfrutado de:

- La Ayuda para la Formación del Profesorado Universitario (FPU) otorgada por el Ministerio de Universidades (FPU18/03710)
- Una Ayuda complementaria de movilidad destinada a beneficiarios del programa de Formación del Profesorado Universitario (FPU) para la realización de una estancia de investigación internacional en la Università degli Studi di Cagliari, de una duración de tres meses (EST22/00246)

*A mis padres,
José Luis y M^a Ángeles*

Agradecimientos

Mi abuelo dice que en esta vida hay que ser agradecida, y yo creo plenamente en lo que dice mi abuelo.

Me gustaría dedicar unas líneas a todas las personas que me han acompañado a lo largo de este proceso en la Universitat de València. En especial a mi profesora de Estadística II, mentora en el Motivem y, hoy, directora de tesis. Amparo, muchas gracias por la confianza depositada en mí durante todos estos años. Gracias por tu inquebrantable optimismo y arropo.

Gracias a todo el grupo de ARMAQoL por generar un ambiente de trabajo donde es un disfrute estar, aprender y crecer. Especialmente a José Manuel, por su generosidad y por tener la puerta del despacho siempre abierta para las interminables dudas. A las Lauras, Patri y Trini, muchas gracias por vuestra amabilidad y ejemplo. Irene dijo un día que realmente a mí me gusta hacer cualquier cosa, siempre que implique estar con gente. Puede que sea así. Quizás haya sido compartir despacho con ella y con Zaira, trabajar con Sylvia y con Sara, con todos vosotros, el motivo por el que he disfrutado tanto de esta etapa.

Special affection and gratitude to Michela Loi and Alain Fayolle for their warm welcome and inspiring work. Thanks to Luca, Giammarco, Matteo and Malek for the pokes. Grazie mille!

Gracias a Manolo García, Marta Pérez y Ana Canela por vuestra disponibilidad y esfuerzo. Sin vuestra colaboración, esta tesis no

hubiera tenido lugar. Gracias a Rosa, por despertarme el interés por las matemáticas e involucrarse conmigo para que hoy yo pueda estar aquí. Junto con vosotros, gracias a todos los docentes de educación secundaria que pelean día a día por ofrecer una educación de calidad, luchando así por la igualdad de oportunidades.

A mi madre, por apoyarme incondicionalmente en todo, siempre. A mi padre, por enseñarme que el saber no ocupa lugar. Este trabajo es el resultado de todas lecciones que me preguntasteis antes de cenar. Víctor, gracias por compartir tanto conmigo. Gracias a mis abuelos, en especial a mi yaya, por luchar por una familia donde todos tenemos hueco.

Gracias a Joaq, Mait, Rach, Ana, Suso y Tere por hacer que estudiar Psicología mereciera la pena todos los días. Por la escucha, el debate y el estímulo. Gracias a mis amigas de Sote por acompañarme y motivarme en este proyecto (y en todos los anteriores). Nai, por crecer y seguir confluyendo.

A Pedro, por darme la calma a la que siempre volver, y esperar a que lo haga.

Gracias. Gracias. Gracias.

Preface

This doctoral dissertation is based on the following studies:

Martínez-Gregorio, S., Badenes-Ribera, L., & Oliver, A. (2021). Effect of entrepreneurship education on entrepreneurship intention and related outcomes in educational contexts: a meta-analysis. *The International Journal of Management Education*, 19(3), 100545. <https://doi.org/10.1016/j.ijme.2021.100545> (Study 1)

(JCR 2021: Q1 [Education & Educational Research], impact factor: 4.56; Scopus 2021: Q1 [Education])

Martínez-Gregorio, S., & Oliver, A. (2022). Measuring entrepreneurship intention in secondary education: Validation of the Entrepreneurial Intention Questionnaire. *Journal of Psychoeducational Assessment*, 40(4), 499-513. <https://doi.org/10.1177/07342829211069222> (Study 2)

(JCR 2021: Q4 [Psychology, Educational], impact factor 1.45; Scopus 2021: Q2 [Psychology (miscellaneous)])

Tomás, J. M., **Martínez-Gregorio, S.**, & Oliver, A. (2022). Bayesian confirmatory factor analysis of the psychological capital PCQ-12 scale. *European Journal of Psychological Assessment*. Advance online publication. <https://doi.org/10.1027/1015-5759/a000738> (Study 3)

(JCR 2021: Q3 [Psychology, Multidisciplinary], impact factor 2.89; Scopus 2021: Q2 [Applied Psychology])

Martínez-Gregorio, S., Tomás, J. M., & Oliver, A. (2023). A psychometric study of the Prosocial Behavior Scale: Differential item functioning by gender. *Behavioral Sciences*, 13(3), 259. <https://doi.org/10.3390/bs13030259> **(Study 4)**

(JCR 2021: Q3 [Psychology, educational], impact factor 2.29; Scopus 2021: Q2 [Psychology (miscellaneous)])

Martínez-Gregorio, S., Oliver, A., & Revuelto-Taboada, L. Measuring gender differences in entrepreneurial self-efficacy: Validation and gender invariance of a brief scale in higher education. (Under review) **(Study 5)**

Martínez-Gregorio, S., Pérez-Jiménez, M., Torres, Z., Oliver, A., & Tomás, J. M. Psychometric properties of the Entrepreneurial Intention Questionnaire (EIQ) in Dominican Republic adolescents. *Revista Latinoamericana de Psicología*. In press. **(Study 6)**

(JCR 2021: Q4 [Psychology, multidisciplinary], impact factor 0.89; Scopus 2021: Q2 [Social Sciences (miscellaneous)])

Martínez-Gregorio, S., & Oliver, A. Generalizability of alignment and sorting effects in secondary education: Evaluation of the effectiveness of an entrepreneurship exposure activity. *Psicodidáctica*. In press. **(Study 7)**

(JCR 2021: Q1 [Psychology, Educational], impact factor 3.78; Scopus 2021: Q1 [Education])

Martínez-Gregorio, S., Loi, M., Fayolle, A., & Oliver, A. Entering the black-box of entrepreneurship education: The key role of psychological capital and outcome expectations to understand the learning process of high school students. (*Under review*)
(Study 8)

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*All the figures and tables in the doctoral dissertation are self-made, except for Figures 1, 2 and 20.

Resumen

Introducción

Aunque la investigación en el campo de la educación en emprendimiento se encuentra en un periodo de crecimiento exponencial (Aparicio et al., 2019), algunos aspectos clave relacionados con su eficacia, aproximaciones pedagógicas o su aplicación a etapas pre-universitarias requieren de más atención (Mwasalwiba, 2010; Nabi et al., 2017; Nájera-Sánchez et al., 2022).

Si realizamos un recorrido por la evolución de la literatura sobre la educación en emprendimiento podemos ver como el área de investigación ha ido creciendo tanto en términos de volumen de publicación, como en robustez de sus estudios. De la misma manera, podemos comprobar que algunos problemas identificados en etapas muy tempranas, continúan prevalentes en la literatura a día de hoy. Esta realidad ha llevado a afirmar a algunos autores que el campo de la investigación sobre educación en emprendimiento aún no ha alcanzado el mismo grado de madurez que el de la investigación sobre emprendimiento general (Liguori et al., 2019).

Por lo que respecta a qué entendemos por educación en emprendimiento, diferentes conceptualizaciones conviven en la literatura, siendo predominante una visión amplia que haría referencia a cualquier iniciativa pedagógica o proceso educativo que tenga como finalidad la promoción de actitudes o habilidades emprendedoras

(Fayolle et al., 2006; Mwasalwiba, 2010). De esta manera, queda patente la perspectiva introducida por Kuratko (2005) cuando dijo que “el emprendimiento es más que la mera creación de empresas” (p. 578).

Así mismo, esta definición de la educación en emprendimiento se muestra más en línea con la que se pretende promover desde las etapas educativas pre-universitarias. En las escuelas de educación secundaria, por ejemplo, su función principal es concienciar sobre el emprendimiento como alternativa profesional, así como fomentar las actitudes emprendedoras, que pueden repercutir positivamente en el desarrollo profesional y personal de los estudiantes (Donckels, 1991; Fillion, 1994; Gasse, 1985; Schröder & Schmitt-Rodermund, 2006). La distinción entre educación en emprendimiento “estrecha” y educación en emprendimiento “amplia” fue introducida por Lackéus (2015). Esta última podría entenderse como aquella que aborda el emprendimiento como una práctica cotidiana relacionada con una mentalidad emprendedora (Baggen et al., 2022). En consecuencia, en la tesis doctoral, el término "educación emprendedora" se entiende desde la perspectiva amplia mencionada.

En el repaso por la literatura previa, y sus lagunas, uno de los temas que ha recibido mayor atención desde sus etapas más tempranas hasta la actualidad, ha sido la evaluación de su eficacia. Las primeras revisiones en el área ya apuntaban a que era necesaria la producción de investigación empírica robusta para sostener las afirmaciones acerca de la relación de la educación en emprendimiento y el comportamiento emprendedor (Dainow, 1986; Gorman et al., 1997). Aunque este llamado fue recogido por varios autores notables (Peterman & Kennedy, 2003; Souitaris et al., 2007), la primera revisión sistemática en el área apuntaba a que aún quedaba recorrido en este sentido (Pittaway & Cope, 2007).

En la actualidad contamos con varias revisiones de la literatura y meta-análisis que se centran específicamente en este aspecto (Bae et al., 2014; Duval-Couetil, 2013; Lorz et al., 2013; Martin et al., 2013; Rideout & Gray, 2013), mostrando que aún queda margen de mejora. En concreto, estas investigaciones destacan que aunque ha aumentado la investigación empírica, la robustez metodológica de la misma es baja (Lorz et al., 2013; Rideout & Gray, 2013). Los diseños de investigación planteados tienen a ser transversales, sin mediciones pre-post intervención, y sin la presencia de un grupo control (Longva & Foss, 2018; Lorz et al., 2013; Martin et al., 2013; Rideout & Gray, 2013). A este problema se le suma la falta de instrumentos validados y protocolos de medida compartidos a través de los diferentes estudios (Duval-Couetil, 2013). Estos hechos limitan la comparabilidad de los estudios y el rigor psicométrico de las inferencias.

A pesar de la debilidad metodológica de los estudios, dos meta-análisis han sintetizado cuantitativamente la evidencia empírica respecto al impacto. Martin et al. (2013) realizaron el primer meta-análisis en este campo, que incluyó 42 muestras independientes ($n = 16.657$). Los autores también se percataron de los problemas metodológicos de los estudios y evidenciaron que esas debilidades estaban causando una sobreestimación del impacto general. Los estudios de mayor calidad metodológica informaban de efectos inferiores. Bae et al. (2014) obtuvieron resultados similares. Aunque sus resultados indican un impacto positivo de la educación emprendedora en la intención emprendedora, este efecto desapareció cuando se controló la intención emprendedora previa.

Junto con esta limitación respecto a la metodología de los estudios, algunos autores han propuesto diferentes alternativas para explicar la disparidad de los resultados de los estudios de eficacia, más

relacionadas con aspectos sustantivos y pedagógicos (Hägg & Gabrielsson, 2020; Nabi et al., 2017).

Todas estas reflexiones han girado en torno a la implementación de la educación en emprendimiento en etapas universitarias, dejando de lado la casuística particular de su aplicación en etapas educativas más tempranas (Brüne & Lutz, 2020; Longva & Foss, 2018; Lorz et al., 2013; Nájera-Sánchez et al., 2022). Este hecho resulta sorprendente si tenemos en cuenta los esfuerzos desarrollados por entidades internacionales y gobiernos nacionales para promover la formación del espíritu emprendedor desde la educación primaria (Bacigalupo et al., 2016; Donaldson, 2019). En concreto, en el contexto español, la legislación en materia educativa lleva años considerado el emprendimiento como una competencia clave a desarrollar durante la educación secundaria (LOMCE, 2013; LOMLOE, 2020). Consecuentemente, la investigación en educación en emprendimiento en la etapa secundaria no ha crecido en paralelo con su implementación real en las aulas. Por ello, todas las lagunas identificadas en la literatura general sobre educación en emprendimiento son todavía más acuciantes en muestras jóvenes.

Tras este breve repaso de la investigación en educación en emprendimiento hasta la fecha, algunos aspectos clave prevalecen como lagunas en la literatura. Entre ellos, esta tesis doctoral pretende contribuir a superar (1) las debilidades metodológicas de diseño en los estudios de impacto, (2) la falta de instrumentos de medida psicométricamente robustos, y (3) la necesidad de profundizar en el conocimiento de la disparidad de resultados de impacto desde un punto de vista metodológico y sustancial. Todos ellos, centrados específicamente en la educación en emprendimiento en la enseñanza secundaria.

Objetivos

El principal objetivo de la presente tesis doctoral es reforzar metodológica y teóricamente la investigación en el campo de la educación en emprendimiento en la enseñanza secundaria. Este amplio objetivo se concreta en tres objetivos generales:

Objetivo 1. Actualizar el conocimiento en el campo a través de un meta-análisis, integrando publicaciones recientes sobre la efectividad de la educación en emprendimiento. Concretamente, el **Estudio 1** pretende alcanzar este objetivo.

Objetivo 2. Proporcionar instrumentos psicométricos adecuados para evaluar los resultados de la educación en emprendimiento en adolescentes. La tesis doctoral se centró en la medición de cuatro variables: intención emprendedora, capital psicológico, conducta prosocial y autoeficacia emprendedora. Este destacado objetivo metodológico se desarrolla en los **Estudios 2, 3, 4, 5 y 6**.

Objetivo 3. Profundizar en el análisis de algunos procesos subyacentes que podrían explicar la disparidad en los resultados previos de los estudios de eficacia de la educación en emprendimiento, desde un punto de vista metodológico y sustancial. Para ello, se desarrolló, aplicó y evaluó una actividad de exposición al emprendimiento para estudiantes de secundaria. Este objetivo general se desarrolla a través de dos objetivos específicos: (1) Comprobar la generalizabilidad de los efectos de alineación y clasificación en la educación secundaria (**Estudio 7**; una razón metodológica para la ausencia de efectos en los estudios de eficacia); y (2) evaluar empíricamente la adecuación del Modelo de Transferencia de la Formación para comprender el proceso de aprendizaje implicado en la

participación en una actividad de exposición al emprendimiento (**Estudio 8**; una contribución sustancial a la comprensión del proceso de aprendizaje subyacente que afecta a la eficacia de la intervención).

De esta manera, los estudios que componen la presente tesis doctoral se encuentran enmarcados en los tres objetivos específicos descritos. Por ello, se presentarán agrupados en tres categorías temáticas que se corresponden con ellos: (1) Actualización del conocimiento, (2) Adaptación y estudios psicométricos de instrumentos de medida, y (3) Desarrollo y evaluación de una actividad de exposición al emprendimiento.

Estudios

Actualización del conocimiento

La producción en el campo de la educación en emprendimiento ha aumentado notablemente en los últimos años. A modo de ejemplo, una revisión reciente identificó que de las 2185 publicaciones existentes entre 2002 y 2023, más del 37% habían sido publicadas durante el año 2022 (Sreenivasan et al., 2023). Esta realidad ha convertido el campo de la educación en emprendimiento en un área compleja y fragmentada (Tiberius & Weyland, 2023), que requiere de constantes esfuerzos de reunificación para definir el estado del arte e identificar las futuras líneas de investigación.

Cuando en la introducción se han mencionado los meta-análisis realizados sobre la eficacia de la educación en emprendimiento, ambos datan de hace más de 10 años (Bae et al., 2014; Martin et al., 2013). Por ello, sus conclusiones requieren ser actualizadas a la luz de toda la evidencia posterior que ha sido publicada. En concreto, ambos meta-análisis evidenciaban como la falta de rigor metodológico en los

estudios puede sobreestimar el efecto de las intervenciones, por lo que se requiere de meta-análisis que se centren exclusivamente en esos estudios que pueden garantizar cierta calidad metodológica. La calidad metodológica se define como aquellos estudios que, como mínimo, presentan mediciones pre-post intervención y un grupo control.

En este contexto se desarrolló el **Estudio 1**. En este trabajo se plantea una revisión sistemática de la literatura y meta-análisis para identificar aquellos estudios que cumplen los estándares de calidad mencionados y habían sido desarrollados en contextos educativos, excluyendo muestras de emprendedores nacientes. Para ello, se extendieron las búsquedas de Bae et al. (2014) y Martin et al. (2013) hasta abril de 2020. Se consultaron las bases de Web of Science, Scopus, Proques y Science Direct, identificando 35 estudios empíricos que cumplieran los criterios de inclusión. De ellos, 23 incluían la información estadística suficiente para ser incluidos en el meta-análisis.

Las características de los estudios se extrajeron de forma estandarizada y sistemática aplicando a cada estudio el protocolo establecido. Las características extraídas fueron: (1) año del estudio; (2) localización geográfica; (3) tamaño de la muestra (total y por grupos); (4) edad media (total y por grupos); (5) distribución por sexos (total y por grupos); (6) nivel educativo (primario, secundario o terciario); (7) resultado; y (8) estadísticas reportadas para calcular los tamaños del efecto. Adicionalmente, se desarrolló una checklist que permitió la evaluación de la calidad metodológica de cada estudio.

Del total de estudios identificados, únicamente seis de ellos habían sido desarrollados en muestras preuniversitarias. De las variables identificadas como indicadores de eficacia, se observaron cambios estadísticamente significativos, en comparación con el grupo control, para las variables de intención emprendedora y autoeficacia.

Se estudió el efecto moderador de algunas variables como la localización geográfica del estudio, el contexto socio-económico del país de aplicación, las características sociodemográficas de los estudiantes o algunas características del programa. De entre todas ellas, solo la duración del programa mostró un efecto moderador sobre la eficacia del programa.

Adaptación y estudios psicométricos de instrumentos de medida

Aunque los llamados para el aumento de la investigación en muestras preuniversitarias han sido una constante desde hace más de dos décadas (Brüne & Lutz, 2020; Dainow, 1986; Gorman et al., 1997; Liguori et al., 2019; Lorz et al., 2013), el **Estudio 1** demuestra que continúan siendo una minoría en el volumen total de producción sobre educación en emprendimiento.

De esta manera, cuando Duval-Couetil (2013) destacó la necesidad de instrumentos con propiedades psicométricas adecuadas que puedan utilizarse en diferentes estudios para mejorar la generalizabilidad de los resultados, podríamos suponer que su comentario se basaba principalmente en estudios previos con muestras universitarias. Esta cuestión, sin embargo, es compartida por los estudios realizados con muestras preuniversitarias.

Las variables que se emplean para evaluar la eficacia de la educación en emprendimiento son muy diversas, desde habilidades no-cognitivas a cognitivas, pasando por actitudes (Brüne & Lutz, 2020). De entre ellas, destaca el empleo de la intención emprendedora como el indicador más ampliamente utilizado (Bae et al., 2014; Martin et al., 2013).

Hasta ahora, la disparidad de constructos medidos, la falta de estudios psicométricos y el escaso número de estudios empíricos hacen que aún no dispongamos de "normas de oro" para la medición

de cada variable en este campo. En consecuencia, la presente tesis doctoral explora más a fondo la medición de cuatro variables de interés con el fin de proporcionar instrumentos adecuados que puedan utilizarse en futuras investigaciones con estudiantes de secundaria.

Todos los estudios incluidos en este bloque constituyen estudios psicométricos, con métodos relativamente similares. De todas las escalas empleadas se ha explorado su fiabilidad y estructura factorial. Adicionalmente, dependiendo del constructo de interés y la escala empleada, se han obtenido otras evidencias de validez pertinentes en cada caso. La fiabilidad ha sido evaluada mediante Alfa de Cronbach y/o Omega de McDonald. La estructura factorial es puesta a prueba mediante modelos de ecuaciones estructurales en todos los casos, destacando el caso del **Estudio 3** donde se emplean métodos bayesianos. Los modelos de ecuaciones estructurales son empleados para el estudio de la validez nomológica en el caso de los **Estudios 2 y 5**. La invarianza de género de las escalas se prueba en los **Estudios 4, 5 y 6**.

Dado que la variable más utilizada para la evaluación de la eficacia de las intervenciones en emprendimiento ha sido la intención emprendedora, el primer estudio de este bloque se centra en adaptar el Cuestionario de Intención Emprendedora (CIE; Rueda et al., 2015), comúnmente utilizada para su medición en adultos, para su uso en muestras de adolescentes (**Estudio 2**). Dado el buen desempeño de la escala en la muestra española, se realizó un segundo estudio para asegurar su adaptación al contexto de República Dominicana (**Estudio 6**), obteniendo evidencias de la invarianza por género de la escala. Dado que uno de sus principales antecedentes es la autoeficacia emprendedora, se incluyó un estudio específicamente centrado en ella (**Estudio 5**). En este caso, se probó el adecuado funcionamiento de la escala de evaluación de la autoeficacia emprendedora incluida en el

Global University Spirit Students' Survey (GUESSS). Para ello, se obtuvieron evidencias en favor de la unidimensionalidad propuesta para la escala, con buenos resultados de fiabilidad. Así mismo, se obtuvieron evidencias en favor de la invarianza de género de la escala.

Como objetivo de la visión amplia de la educación en emprendimiento, se espera promover competencias positivas para los estudiantes transferibles a su vida personal y profesional. Dentro de estas competencias, esta tesis se centra en el Capital Psicológico, como variable que está recibiendo un reciente interés en el ámbito de la educación y el emprendimiento (Martínez et al., 2019; Welter & Scrimshire, 2021). En concreto, se aportó al debate acerca de la dimensionalidad del PCQ-12 (**Estudio 3**), escala ampliamente utilizada y recientemente adaptada a contextos educativos. Se probaron cuatro análisis factoriales confirmatorios competitivos, obteniendo evidencias en favor de la estructura de segundo orden.

Por último, el **Estudio 4** aporta evidencias en favor de una de las escalas de comportamiento prosocial más empleadas en el contexto español. Esta variable se considera un resultado esperado de aquellas intervenciones basadas en el trabajo en equipo y la orientación social del emprendimiento (Barba-Sánchez & Atienza-Sahuquillo, 2016; Cárcamo-Solís et al., 2017). Junto con las evidencias en favor de su estructura factorial teórica y su adecuada fiabilidad, este estudio destaca por la exploración del funcionamiento diferencial de los ítems en función del género. Aunque se vio que su impacto sobre el funcionamiento global de la escala era negligible, se identificó aquellos ítems que tienen un mayor funcionamiento diferencial, generalmente beneficiando a las chicas.

Desarrollo y evaluación de una actividad de exposición al emprendimiento

Para contribuir en la evidencia en torno a las intervenciones en educación en emprendimiento en educación secundaria, se desarrolló una actividad de exposición al emprendimiento basada en las buenas prácticas de la literatura previa. Esta actividad tenía como objetivo la promoción de las actitudes emprendedoras y la exploración por parte del alumnado del emprendimiento como una alternativa laboral.

Con la intención de que la actividad sea accesible para todo el alumnado, se diseñó para ser implementada durante el horario lectivo con el grupo clase en el aula. Basándose en programas anteriores y en los principios de diseño recomendados (e.g., Athayde, 2012; Baggen et al., 2022; Sánchez, 2013; Schröder & Schmitt-Rodermund, 2006), la actividad de exposición al emprendimiento se planteó como una actividad de aprendizaje experiencial que debía desarrollarse en equipos. A cada equipo se le pidió que ideara una propuesta emprendedora que resolviera un problema social de su comunidad. Siguiendo a Schröder y Schmitt-Rodermund (2006), cada sesión comienza con una breve introducción al contenido, continúa con una actividad autónoma en grupo y finaliza con una fase de reflexión en la que cada equipo comparte con el resto de la clase el trabajo que ha avanzado durante la sesión. Los equipos son guiados a través del proceso emprendedor durante seis sesiones de 55 minutos cada una de ellas. La última sesión concluye con una devolución en la que cada equipo presenta su idea en forma de *elevator pitch* ante su profesor, el facilitador del programa y el resto de la clase.

Se diseñó un estudio cuasi-experimental en el que, finalmente, 158 estudiantes participaron en la actividad de promoción del emprendimiento y 67 fueron evaluados como grupo control. Las escalas

estudiadas en los **Estudios 2 – 4** fueron empleadas para la evaluación de los indicadores de interés.

La eficacia del programa es puesta a prueba en el **Estudio 7**. Los resultados del estudio muestran que el impacto del programa solo se mostró estadísticamente significativo en la amortiguación de la pérdida de actitud hacia el emprendimiento. El estudio va un paso más allá probando la generalizabilidad de los efectos de alineación y clasificación en muestras de adolescentes. Estos efectos habían sido identificados previamente en muestras de universitarios (Fayolle & Gailly, 2009; Fretschner & Lampe, 2019), pero nunca se habían estudiado en muestras más jóvenes. El efecto de alineación se refiere al hecho de que, tras la participación en un programa de emprendimiento, los estudiantes con menor intención emprendedora pre-intervención, ven esta incrementada, mientras que los estudiantes con mayor intención emprendedora pre-intervención, la ven reducida. Este efecto, ocurriría simultáneamente con el efecto de clasificación, donde los estudiantes con posiciones más indecisas pre-intervención, muestran un mayor grado de decisión, a favor o en contra, una vez han participado en este programa. De esta manera, cuando la evaluación de la eficacia se basa en el estudio del cambio en la media grupal, si estos efectos ocurren, se anularían mutuamente y su estudio quedaría oculto en la ausencia de cambio en la media grupal. El **Estudio 7** evidencia que este es el caso, también en educación secundaria, donde el programa, sin provocar un cambio en la media grupal, está sirviendo como actividad de orientación vocacional.

Por último, el **Estudio 8**, trata de ahondar en el estudio de los mecanismos de aprendizaje que tienen lugar durante la participación en un programa de emprendimiento. Para ello, empleando como muestra el grupo intervención y mediante un modelo de ecuaciones estructurales, se pone a prueba el Modelo de Transferencia de la

Formación (Baldwin & Ford, 1988). Los resultados muestran que el efecto de las características previas de los estudiantes sobre su intención emprendedora tras la intervención se encuentra plenamente mediado por la adquisición de conocimiento y desarrollo de la autoeficacia emprendedora. Por otra parte, entre las variables del estudiante con más relevancia, destacan el capital psicológico y las expectativas de resultado.

Conclusiones generales

Así pues, el principal objetivo de esta tesis doctoral ha sido reforzar la investigación en el campo de la educación en emprendimiento centrándose en algunos desarrollos metodológicos recientes. Concretamente, cuando ésta tiene lugar en los centros de enseñanza secundaria. Para ello, las aportaciones se han integrado siguiendo los tres grandes objetivos o apartados temáticos que estructuran la presente tesis doctoral.

Actualización del conocimiento

Cuando sólo se tienen en cuenta los estudios metodológicamente rigurosos, la educación en emprendimiento muestra un efecto positivo (de pequeña a mediana magnitud) sobre la intención emprendedora y la autoeficacia emprendedora. Este resultado es alentador y apoya las políticas que pretenden introducir actividades de exposición al emprendimiento incluso en poblaciones que no muestran interés previo por él. Sin embargo, los estudios siguen centrándose principalmente en muestras universitarias, lo que pone en peligro la generalizabilidad a muestras preuniversitarias. En consecuencia, aún queda margen para la investigación en los niveles de educación primaria y secundaria.

La descripción de los programas aplicados en los estudios de eficacia es limitada y se formulan algunas recomendaciones para futuros estudios: (1) un muestreo representativo de los participantes (por ejemplo, muestreo probabilístico con diversos métodos de reclutamiento), (2) muestras seleccionadas en el nivel secundario y en centros de formación profesional; (3) información detallada sobre el programa de intervención (por ejemplo, duración, métodos pedagógicos, etc.); (4) pruebas de validez y fiabilidad para evaluar las medidas de resultado; (5) información detallada sobre las estadísticas descriptivas de las medidas de resultado (por ejemplo, medias y desviaciones estándar) tanto para el grupo de intervención como para el de control, por separado, en las fases de pretest y posttest, (6) información detallada sobre posibles moderadores para avanzar en la comprensión teórica (por ejemplo, características sociodemográficas de los participantes).

La duración de los programas muestra un impacto en los resultados alcanzados, siendo los programas más largos los de mayor impacto. Esta información debería tenerse en cuenta a la hora de desarrollar actividades orientadas a la educación secundaria.

Adaptación y estudios psicométricos de los instrumentos de medida

Para fortalecer la calidad metodológica de los estudios de eficacia, es necesario contar con herramientas adecuadas para la evaluación de los indicadores (Duval-Couetil, 2013). Por ello, esta tesis doctoral ofrece evidencias psicométricas a favor del uso de cuatro escalas, que además de permitir su utilización en el ámbito de la educación emprendedora, contribuye al área de conocimiento específica de cada constructo. Para ello, se han activado algunos desarrollos nuevos y/o avanzados del conocimiento metodológico en estadística, como la estimación bayesiana de modelos.

En primer lugar, se presenta una adaptación del CIE (Rueda et al., 2015) para la medición de la Intención Emprendedora, y sus antecedentes, en institutos de España y República Dominicana. La escala presenta adecuadas propiedades psicométricas y ha mostrado su invarianza de género.

Para la medida del capital psicológico en estudiantes de secundaria, la adaptación del PCQ-12 ha mostrado cierta controversia en estudios previos respecto a su estructura factorial. Nuestro estudio apoya la estructura de segundo orden como la que mejor representa su dimensionalidad. Además, los resultados ponen de manifiesto algunos problemas de fiabilidad en las dimensiones de Fiabilidad y Optimismo.

Se han reportado las propiedades psicométricas de una de las escalas más utilizadas en muestras españolas para la medición de la conducta prosocial. Nuestro estudio presenta la PBS como una escala adecuada para la evaluación en adolescentes y garantiza la ausencia de sesgo de género en sus resultados.

El interés por garantizar la ausencia de sesgo de género en las mediciones ha sido una constante a lo largo de los estudios y, en esta línea, ofrecemos instrumentos adecuados para el desarrollo de estudios con perspectiva de género. En el caso de la conducta prosocial, este aspecto es crucial a la hora de elegir los indicadores que componen la escala para evitar el uso de instrumentos que benefician sistemáticamente a hombres o mujeres.

Desarrollo y evaluación de una actividad de exposición al emprendimiento

La actividad de exposición al emprendimiento presentada se propone como una iniciativa breve susceptible de ser implementada durante el horario escolar. Aunque la actividad ha sido evaluada positivamente por los alumnos, su impacto sobre el fomento de la intención

emprendedora, el capital psicológico y el comportamiento prosocial ha sido limitado, mostrando un efecto amortiguador sobre la pérdida de actitud hacia el emprendimiento observada en el grupo de control.

Esta ausencia de efecto, en el caso de la intención emprendedora, se debe a la presencia de efectos de alineamiento y clasificación. Por lo que podríamos considerar que la actividad ha mostrado un adecuado funcionamiento como formación profesional, ayudando a los alumnos a calibrar su opinión sobre el emprendimiento como posible carrera profesional.

Desde un punto de vista metodológico, la tesis doctoral muestra cómo algunas evidencias obtenidas en muestras adultas son generalizables a adolescentes y, a su vez, cómo una evaluación de la eficacia de la intervención basada en el estudio del cambio en la media del grupo puede no captar adecuadamente la presencia de algunos efectos relevantes.

Trascendiendo el plano metodológico, para poder plantear mejores iniciativas de promoción del emprendimiento es necesario entender cómo se produce el aprendizaje a través de las mismas. En esta línea, el estudio prueba por primera vez empíricamente el ajuste del Modelo de Transferencia de la Formación en la educación emprendedora. Así, partiendo de este marco teórico, se evidencia cómo las características previas de los alumnos tienen un claro impacto en los resultados del programa. En particular, el capital psicológico y las expectativas de resultado tienen un gran impacto en el proceso de aprendizaje. Asimismo, se ha demostrado cómo la intención emprendedora que presentan los alumnos tras la realización de la actividad está muy relacionada con el grado de aprendizaje y competencia que perciben que han desarrollado. Por lo tanto, la investigación debe centrarse en comprender cómo mejorar el

aprendizaje de los alumnos a través de estas experiencias, ya que su interés depende de su percepción del aprendizaje y la competencia adquiridos.

En conclusión, no debe perderse de vista que la única forma de garantizar la igualdad de acceso a las actividades de exposición al emprendimiento es integrándolas como parte del horario escolar del alumnado. Por lo tanto, hay que tener en cuenta que la introducción de estas iniciativas no debe ir en detrimento de las horas destinadas a la adquisición de contenidos curriculares. Así, futuras investigaciones deberían profundizar en los diferentes enfoques posibles para aterrizar la competencia clave del "sentido de iniciativa y espíritu emprendedor" en el aula. Esta tesis doctoral ofrece pautas para el desarrollo de actividades de exposición al emprendimiento, instrumentos con buenas propiedades psicométricas para su evaluación y un ejemplo de actividad cuya aplicación puede ser viable como actividad breve en el aula. De este modo, se ofrecen herramientas para el desarrollo de futuros estudios, que podrían abordar tanto (1) estudios cuantitativos para comparar la eficacia comparativa de diferentes iniciativas como (2) estudios cualitativos para reflexionar con los actores relevantes sobre su materialización en el día a día de los institutos.

Introduction

Entrepreneurship education is a relatively young field, its origins dating back to the first classes at the Harvard Business School in 1945 (Katz, 2003). However, the phenomenon is widespread, with more than 3,000 institutions developing these types of initiatives (Morris & Liguori, 2016). At the same time, the research on entrepreneurship education has been growing exponentially (Aparicio et al., 2019). Nevertheless, some basic assumptions regarding its effect, pedagogical methods, or its application in early educational stages remain understudied (Mwasalwiba, 2010; Nabi et al., 2017; Nájera-Sánchez et al., 2022).

The initial stages of research on entrepreneurship education took place between 1987 and 2000 (Aparicio et al., 2019). conducted the first literature review in the field, integrating the knowledge generated in the previous 10 years. The author claimed that “there is a need for more systematic collection and analysis of data, and more varied methodologies to build a stronger empirical base” (p. 18). This work was continued by Gorman et al. (1997) who integrated the literature published in the next 10-year period, from 1987 to 1997. Gorman et al. (1997) show the diversity of the broadly named “entrepreneurship education” and point out the need to categorize education according to the target population, which could vary from secondary school students to current entrepreneurs, given that the educational objectives and pedagogical approach may vary.

Since this early research stage, some controversy has appeared regarding the term and meaning of “entrepreneurship education” (Gartner, 1990; Sexton & Bowman, 1984). Gibb (1993, 1994) clearly distinguishes between entrepreneurship, enterprise, and small business education. The differences between entrepreneurship and enterprise education at this stage may be related to the context of the intervention. The term “entrepreneurship education” has been more widely used in the American context, whereas “enterprise education” has been predominant in the UK context (Gibb, 1993). However, in the literature these three concepts have sometimes been used as synonyms and other times not (Gibb, 1993).

From the very beginning of entrepreneurship education, some authors have highlighted the interest of integrating entrepreneurship courses or activities in pre-university educational levels (Gorman et al., 1997). Gasse (1985) was one of the first authors to suggest the benefits of introducing entrepreneurship education in secondary education to take advantage of the moment when students choose their professional careers. During this educational period, the courses would aim to promote the entrepreneurial attitude of students and contribute to their vocational development (Filion, 1994). However, the research was mainly focused on higher education (Gorman et al., 1997).

From 2001 to 2007, entrepreneurship education research began its developmental stage (Aparicio et al., 2019). During this period, some classical papers were published. One of the main examples was the review published by Kuratko (2005). This review includes two statements that have been repeatedly cited during later production: (1) “the question of whether entrepreneurship can be taught is obsolete” (p. 580), and (2) “entrepreneurship is more than the mere creation of business” (p. 578). The former statement strengthens the reason underlying the relevance and pertinence of entrepreneurship education,

and the latter introduces a wide conception of entrepreneurship education in which different approaches, contents, and objectives could fit.

Additionally, the need to empirically assess the effectiveness of entrepreneurship education emerged during this period. Previous reviews claimed that some studies assumed the relationship between entrepreneurship education and entrepreneurial behavior, without methodologically strong empirical tests (Dainow, 1986; Gorman et al., 1997). To attend to this concern, Peterman and Kennedy (2003) developed a quasi-experimental study with a sample of secondary students who were enrolled in Young Achievement Australia, defined as an “enterprise program”. The results highlighted that some variables such as perceived entrepreneurial desirability or feasibility would increase after attending the program. Another impactful study, in this case in higher education, reported a positive impact on entrepreneurial intention (Souitaris et al., 2007).

Although the robustness of the field was growing through the years, the developmental stage ends with a critical paper that pointed out some concerns and future research lines. We are referring to the first systematic literature review about entrepreneurship education, which was published by Pittaway and Cope (2007). The authors concluded that, although entrepreneurship education seemed to have a positive impact on entrepreneurship, more empirical studies were required. Additionally, other aspects, such as the links between methods and approaches remained understudied.

The beginning of the expansive stage dates back to 2008, and accounts for more than 60% of the total publication output (Aparicio et al., 2019). During this period, some authors made a considerable effort to unify the literature and produce a comprehensive pool of knowledge

that directs future research and avoids circular discussions. This objective is evidenced by the multiplicity of reviews and meta-analyses that started emerging in 2010 (Aparicio et al., 2019; Bae et al., 2014; Brüne & Lutz, 2020; Duval-Couetil, 2013; Gabrielsson et al., 2020; Hägg & Gabrielsson, 2020; Landström et al., 2022; Liguori et al., 2019; Loi et al., 2022; Longva & Foss, 2018; Lorz et al., 2013; Martin et al., 2013; Mwasalwiba, 2010; Nabi et al., 2017; Nájera-Sánchez et al., 2022; Rideout & Gray, 2013; Thomassen et al., 2020). However, some authors consider that the research on entrepreneurship education “has not advanced at the same level of scholarship when compared to general entrepreneurship research” (Liguori et al., 2019, p. 4).

Nowadays, the literature still deals with some problems that were enounced in the initial stage, while others have been partially or totally closed. Regarding the conceptualization of the phenomenon, Mwasalwiba (2010) highlighted a lack of consensus regarding what is entrepreneurship education and its differences, if they exist, compared to enterprise education and entrepreneurial education. However, later research has evidenced that they have been used interchangeably with a predominance of “entrepreneurship education” as the generic nomenclature. The main manifestation of this is the fact that systematic literature reviews in the field used “enterprise education” or “entrepreneurship education” as keywords in their searches, no matter what nomenclature they choose in their manuscript (e.g., Brüne & Lutz, 2020; Gabrielsson et al., 2020; Longva & Foss, 2018), with a lower prevalence of “entrepreneurial education”.

Leaving aside the specific term, its definition and content have not been without controversy either (Duval-Couetil, 2013; Mwasalwiba, 2010). Following the idea of Kuratko (2005) of a broad understanding of entrepreneurship education, Fayolle et al. (2006) defined it as “any pedagogical (program) or process of education for entrepreneurial

attitudes or skills” (p. 702). Mwasalwiba (2010) described that the widest consensus among the objectives of entrepreneurship education was the promotion of entrepreneurial attitudes, spirit, and culture among individuals, more than the creation of a new business.

The need of expanding the narrow understanding of entrepreneurship education is highly required to integrate the different approaches that different target populations require. In primary and secondary schools, for instance, its main role should be to raise awareness about entrepreneurship as a career option as well as to encourage entrepreneurial attitudes, which can positively impact students' professional and personal development (Donckels, 1991). The distinction between narrow entrepreneurship education and wide entrepreneurship education was introduced by Lackéus (2015). The last one could be understood as the one that approaches entrepreneurship as an everyday practice related to an entrepreneurial mindset (Baggen et al., 2022). Consequently, in the doctoral dissertation, the term “entrepreneurship education” is understood from the aforementioned broad perspective. Additionally, it could include exposure activities for the promotion of entrepreneurship outside standardized intervention programs. These types of activities are frequently developed in the school contexts and have also been named “entrepreneurship experiences” (Brüne & Lutz, 2020).

A wide perspective of entrepreneurship education allows researchers to consider different variables as the main desirable outcomes after the intervention. Traditionally, the entrepreneurial intention has been the most studied construct in relation to entrepreneurship education (Nájera-Sánchez et al., 2022), and has been used to assess the effectiveness of the interventions (Bae et al., 2014; Martin et al., 2013). Apart from entrepreneurial intention, a broad range of variables have been considered. Martin et al. (2013) classified

them into two categories: (1) Entrepreneurship-related human capital assets, including knowledge, skills attitudes, and intention; and (2) Entrepreneurship outcomes, referring to entrepreneurial behaviors. However, the consideration of entrepreneurial behavior in empirical studies of the effectiveness of entrepreneurship education has been less frequent. The broad conceptualization of “entrepreneurship-related human capital assets” has been split by other authors into more categories. For example, Brüne and Lutz (2020) differentiate between non-cognitive, cognitive, beliefs and attitudes, and intention. Given that two intention models have predominated in the literature, the Theory of Planned Behavior (TPB; Ajzen, 1991) and the Entrepreneurial Event Model (EEM; Shapero & Sokol, 1982), those variables that theoretically precede intention have been commonly considered outcome variables. Attitudes toward entrepreneurship, subjective norm, and perceived behavioral control in relation to the TPB; and perceived desirability and feasibility coming from the EEM. Recently, psychological capital has emerged as a relevant construct to be promoted during entrepreneurship education (Santana-Domínguez et al., 2022; Welter & Scrimshire, 2021). Consequently, it is also receiving attention from the empirical studies that assess entrepreneurship education effectiveness.

In addition to the debate about the definition, contents, and outcomes, the concerns about methodological weakness and the lack of empirical research that have been claimed in the past (Gorman et al., 1997; Pittaway & Cope, 2007) have received attention during the last 10 years. At the beginning of the expansive stage, three literature reviews focused specifically on this aspect (Duval-Couetil, 2013; Lorz et al., 2013; Rideout & Gray, 2013). All of them evidenced that there was room for improvement in this field. The conclusion was that, although the empirical research on effectiveness assessment has increased, the methodological robustness of the studies was weak (Rideout & Gray,

2013; Lorz et al., 2013). Lorz et al. (2013) reviewed the design of the empirical studies and concluded that just 31% included pre-post-intervention measurement, and 67% did not use an equivalent control group. Both requirements are characteristics of a quasi-experimental design and are considered a minimum to guarantee the validity of inferences in terms of intervention effectiveness (Lorz et al., 2013; Rideout & Gray, 2013). Additionally, Duval-Couetil (2013) pointed out that there is also a lack of validated instruments or assessment protocols being widely used across empirical studies. This fact attempts against the comparability of the results and the psychometric rigor of the inferences.

Despite the methodological weakness of the studies, in those years, two meta-analyses aimed to quantitatively synthesize the empirical evidence regarding the impact. Martin et al. (2013) conducted the first meta-analysis in the field, which included 42 independent samples ($n = 16,657$). The authors also noticed the methodological problems in the studies and evidenced that those weaknesses were causing an overestimation of the general impact. Those studies with higher methodological quality had been reporting lower effects. Similar results were found by Bae et al. (2014). Although their results indicate a positive impact of entrepreneurship education on entrepreneurial intention, this effect disappeared when the previous entrepreneurial intention was controlled. Consequently, once again, evidence points out that researchers developing empirical impact studies should attend to the recommendation of Lorz et al., (2013): the effectiveness of entrepreneurial education must be studied through “quasi-experiments with an ex-ante/ex-post/control group design” (p. 139). Recently, Longva and Foss (2018) aimed to explore if academics have attended to the previous calls for strengthening the experimental design. Through a systematic literature review, they concluded that just 12% of the

entrepreneurship education impact studies met the recommendation of Lorz et al. (2013).

It seems that controversy regarding entrepreneurship impact could be related to methodological and statistical aspects. However, some authors have recently claimed that the literature is ignoring possible substantial reasons for the disparity (Nabi et al., 2017). Systematic literature reviews evidence that researchers have not been paying enough attention to crucial aspects related to pedagogy and teaching methods (Hägg & Gabrielsson, 2020; Nabi et al., 2017). Nabi et al. (2017) proposed a framework to understand the differential effect of different pedagogical approaches on diverse outcomes. The authors call for more research including emotional impact indicators, considering contextual moderator effects and the role of the pedagogical method on the results.

The focus on pedagogical methods is especially relevant while considering that the variety of teaching methods in entrepreneurship education has been constant throughout its development (Pittaway & Cope, 2007). Some authors have proposed different categorizations to systematize the broad range of pedagogical approaches and techniques. For example, the dichotomy between passive-active and traditional-innovative teaching methods (Mwasalwiba, 2010) or the supply-demand-competence framework (Bécharde & Grégoire, 2005). Recently, entrepreneurship education is emphasizing those approaches based on constructivist perspectives in which the student plays an active role in their learning process (Hägg & Gabrielsson, 2020). According to Lorz et al. (2013), “continuous improvement of entrepreneurship education can only take place if educators understand the implications of entrepreneurship training and the effects of different pedagogical practices” (p. 124). Nevertheless, the interaction between methods-

results should also consider the course objectives and audiences (Biggs, 1999).

It is surprising that, although the claim for more research on the secondary education level, and pre-university level in general, was present in the very initial literature reviews in the field of entrepreneurship education (Dainow, 1986; Gorman et al., 1997), attention is still focused on higher education (Brüne & Lutz, 2020; Longva & Foss, 2018; Lorz et al., 2013; Nájera-Sánchez et al., 2022). All the methodological and substantial aspects that remain controversial about general entrepreneurship education have been even less studied in primary and secondary education. For example, Brüne and Lutz (2020) carried out a systematic literature review specifically about entrepreneurship experiences during this educational stage. They concluded that, although long-term effects are difficult to study, general findings are positive. However, they highlighted the relevance of the further study of some aspects such as the impact of pre-intervention students' characteristics on entrepreneurship education outcomes.

At present, the lack of research on pre-university samples is surprising if we consider the efforts that international authorities and national governments are developing to promote entrepreneurship education among these students (Donaldson, 2019). The European Commission developed the Entrepreneurship Competence Framework in 2016 (Bacigalupo et al., 2016). They identified a set of components related to entrepreneurship as competence to be developed through education. The entrepreneurial mindset, also named "sense of initiative", would help citizens in their personal, social, and professional development. This claim has been integrated into national government policies. For example, in the Spanish context, in the educational law for secondary education, entrepreneurship is considered a key competence to be developed in high schools (LOMCE, 2013). Similarly, 90% of

secondary schools in Norway provide some kind of entrepreneurial experience for their students (Johansen & Schanke, 2013).

Consequently, previous research evidences that the growth of research on entrepreneurship education at pre-university stages has not increased alongside to the implementation of the courses in schools. All the concerns that remain alive in general entrepreneurship education are highly ignored while studying younger audiences.

After this brief overview of the research in entrepreneurship education to date, some key aspects prevail as gaps in the literature. Among them, this doctoral dissertation aims to contribute to overcoming (1) design methodological weaknesses in impact studies, (2) the lack of psychometrically robust instruments for measurement, and (3) the need for a deeper understanding of the disparity of impact results from a methodological and substantial point of view. All of them, specifically focused on entrepreneurship education in secondary education.

The following sections aim to introduce the reader to the general aim, specific objectives, and structure of the doctoral dissertation. The "Studies" section includes articles that have been published or are currently under review in scientific journals. Each study constitutes independent research with its introduction, method, results, and discussion section. All the references are included in the general "References" section at the end of the dissertation. Given that each study could be read independently, some of them repeat general explanations about entrepreneurship education and/or its relevance in high schools. The dissertation finishes with a general conclusion that synthesizes the main contributions of the whole work.

General aim

The brief overview of previous literature about entrepreneurship education, presented in the introduction section, highlights some aspects that remain understudied in the field. One of the main gaps has traditionally been the study of entrepreneurship exposure activities that take place as vocational training during secondary education. Although this was noticed in the first literature reviews, attention was still focused on higher education. Consequently, those gaps present in general entrepreneurship education are larger when considering younger participants.

The main objective of the present doctoral dissertation is to methodologically and theoretically strengthen the research in the field of high school entrepreneurship education. This broad aim is specified into three general objectives:

Objective 1. To update the knowledge in the field through a meta-analysis, integrating recent publications about the effectiveness of entrepreneurship education. Concretely, **Study 1** aim to achieve this objective.

Objective 2. To provide adequate psychometric instruments to evaluate outcomes of entrepreneurship education in adolescents. The doctoral dissertation focused on the measurement of four variables: entrepreneurial intention, psychological capital, prosocial behavior, and

entrepreneurship self-efficacy. This outstanding methodological objective is developed in **Study 2, Study 3, Study 4, Study 5, and Study 6.**

Objective 3. To further analyze some underlying processes that could explain the disparity in previous results of effectiveness studies in entrepreneurship education, from a methodological and substantial point of view. In doing so, an entrepreneurial exposure activity for high school students was developed, applied, and evaluated. This general objective is developed through two specific objectives: (1) To test the generalizability of the alignment and sorting effects in secondary education (**Study 7**; a methodological reason for non-effects in effectiveness studies); and (2) to empirically evaluated the adequacy of the Transfer of Training Model to understand the learning process implied in the participation in an entrepreneurship exposure activity (**Study 8**; a substantial contribution to understanding the underlying learning process which affects intervention effectiveness).

The next section will present the objectives of each study in detail and integrated into three thematic categories that correspond to the three general objectives: (1) Updating knowledge, (2) Adaptation and psychometric studies of measurement instruments, and (3) Development and assessment of an entrepreneurship exposure activity.

Studies

In this section, there are summarized the eight studies that composited the doctoral dissertation. Each study constitutes an article that has been published in a scientific journal (or is currently under review for its publication).

The studies are classified into three thematic categories: (1) Updating knowledge, (2) Adaptation and psychometric studies of measurement instruments, and (3) Development and assessment of an entrepreneurship exposure activity.

1. Updating the knowledge

Considering the quick growth in entrepreneurship education research (Aparicio et al., 2019), the knowledge generated is constantly increasing, with many scholars around the globe aiming to fill gaps identified in previous literature reviews.

There is one study included under the title of “Updating knowledge”. It provides an updated meta-analysis to synthesize previous evidence and redefine gaps and future research lines for the doctoral dissertation development, and the general audience. The doctoral dissertation aims to develop some of these in the next sections.

Study 1 presents a systematic literature review and meta-analysis of entrepreneurship education effectiveness. Two main reasons justified the need for a new meta-analysis in the field. First, almost ten years have passed since the previous ones, and more than 60% of the literature in the field was published after them (Aparicio et al., 2019). Second, Martin et al. (2013) and Bae et al. (2014) showed evidence that the inclusion of primary studies with low methodological quality overestimate the intervention's impact. Consequently, the methodological weakness was considered an exclusion criterion.

2. Adaptation and psychometric studies of measurement instruments

As Duval-Couetil (2013) acknowledges, one of the methodological problems in the effectiveness studies of entrepreneurship education is the lack of standardized instruments for outcome measurements. When the author made her claim, her review was mainly focused on studies developed in adult samples. If those studies lack evaluated assessment instruments, what about the instruments employed to assess the entrepreneurial outcomes in adolescent samples?

This section pools the effort made to provide adequate scales with studied psychometric properties. In this line, four outcomes have been selected: entrepreneurial intention, psychological capital, prosocial behavior, and entrepreneurial self-efficacy. Each of them presents its particularities.

Study 2 adapts the Entrepreneurial Intention Questionnaire (EIQ; Rueda et al., 2015), for its use in secondary education. The measurement of entrepreneurial intention has received attention for assessing adult samples and different scales co-exist in the literature.

However, when they have been applied in secondary education, they have not been adapted and their psychometric properties are not reported. Once its adequate psychometric properties for Spanish secondary education were studied, a second study (**Study 6**) was carried out to test them with a sample of students from the Dominican Republic.

The emergence of psychological capital as a relevant construct in entrepreneurship education requires the instruments to evaluate it while developing educative initiatives with adolescents. Additionally, some concerns have been previously claimed about its most popular measurement instruments. Especially, some authors dissent about their factor structure. **Study 3** adapts the 12-item Psychological Capital Questionnaire (PCQ-12; Avey et al., 2011) for its use with adolescents. Through Bayesian competitive models, its factor structure is analyzed and some caution notes are provided.

Study 4 studies the psychometric properties of one of the most frequently used questionnaires to assess prosocial behavior in adolescents, the Prosocial Behavior Scale (Caprara & Pastorelli, 1993). This study explores the gender-related differential item functioning of the scale, providing evidence for its use in future studies which aim to analyze gender differences in the variable.

The wiliness to guarantee the psychometric properties of the scales that allow their use for gender studies is also present in **Study 5**. Although this study is the only one that has not been developed with high school studies, it aims to study the psychometric properties of the scale that measures entrepreneurial self-efficacy in the Global University Entrepreneurial Spirit Students' Survey (GUESSS).

3. Development and assessment of an entrepreneurship exposure activity

Effectiveness studies in the field of entrepreneurship education have shown contradictory results (Bae et al., 2014; Brüne & Lutz, 2020; Martin et al., 2013). Although the trend is positive, some studies reported non-statistically significant results (e.g. Volery et al., 2013) or negative impacts (e.g. Huber et al., 2014). The disparity has been related to methodological and substantial aspects (Martin et al., 2013; Nabi et al., 2017). In this section, the doctoral dissertation aims to enhance research considering both.

The studies in this section are based on the data that has been generated after the development, application, and evaluation of an entrepreneurial exposure activity. Consequently, the section begins with an explanation of the activity that has been developed, justifying the approach and methodologies employed.

Consecutively, **Study 7** explores the effectiveness of the activity with a quasi-experimental study with pre-post-intervention measurements and a control group. Additionally, the study tests the generalizability of the alignment and sorting effects in adolescents' samples. These effects have been studied in adult samples as hidden effects that masked the effect of the intervention (Fretschner & Lampe, 2019).

The last study, **Study 8**, aims to shed light on the learning mechanisms that underlie participation in an entrepreneurship exposure activity. In doing so, it empirically tests the adequacy of the Transfer of Training Model (Baldwin & Ford, 1988) as a theoretical framework to substantially strengthen future research on the field.

Updating knowledge

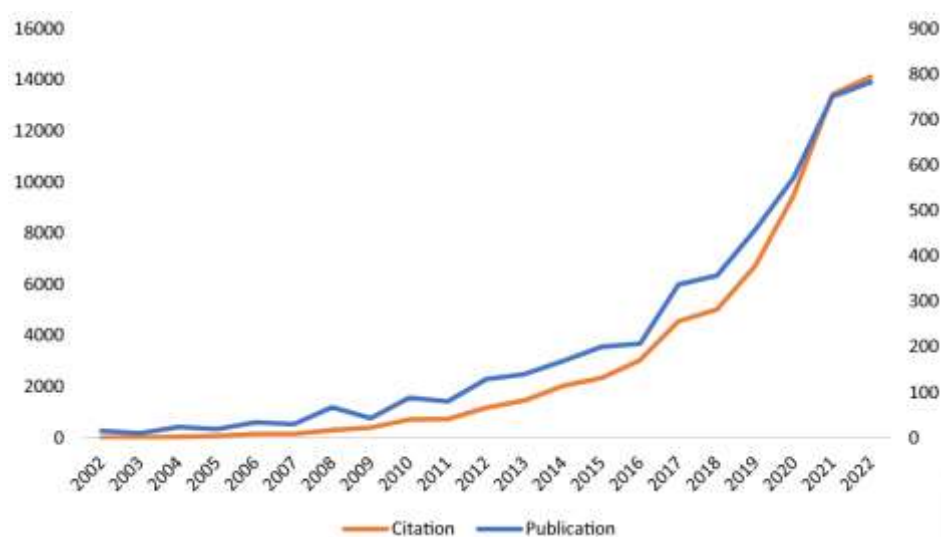
“As a consequence of this rapid growth, entrepreneurship education has become a broad, complex, and fragmented research field, which is increasingly difficult to grasp” (Tiberius & Weyland, 2023, p. 134). As has been previously commented, the volume of production in entrepreneurship education research has grown with its increased implementation at different educational levels (Kuratko, 2005). The growth of publications has increased exponentially over time, and more than 60% have currently been published in the last 10 years (Aparicio et al., 2019; Sreenivasan et al., 2023; Tiberius & Weyland, 2023). As an illustrative example, in their bibliometric analysis of the field, Sreenivasan et al. (2023) identified a total of 2185 publications about entrepreneurship education between 2002 and 2023, of which 782 were published in 2022 (see Figure 1).

As a result of this fact, the regular release of systematic literature reviews and meta-analyses that pool the amount of data available and steer future research in light of newly obtained knowledge is critical. Consequently, in order to be able to offer a relevant contribution to the field of entrepreneurship education, it is essential to update the knowledge generated in recent years, which is subsequent to the publication of the most relevant reviews and meta-analyses in the area (Bae et al., 2014; Martin et al., 2013; Mwasalwiba, 2010; Nabi et al.,

2017). Similarly, those topics that have burst into the entrepreneurship education literature, or entrepreneurship in general, more recently have generated a large volume of publication in very few years.

Figure 1

Growth in entrepreneurship education research (from Sreenivasan et al., 2023)

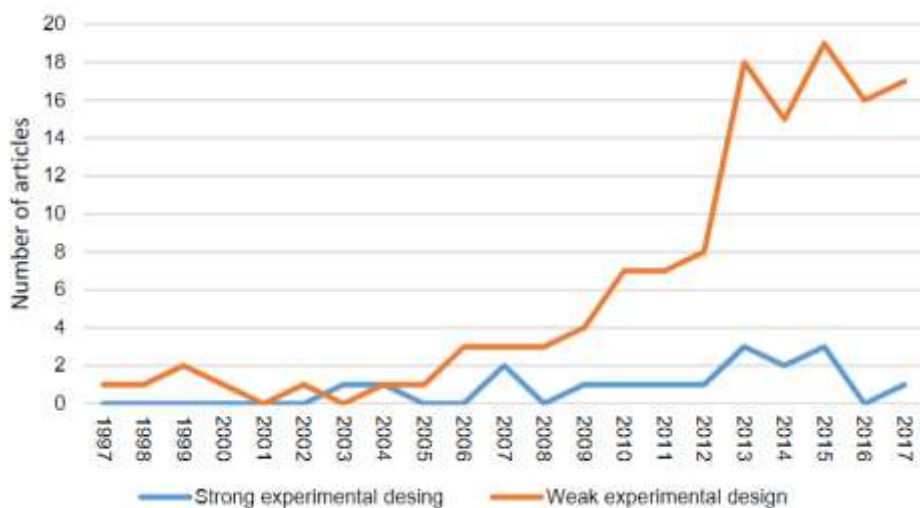


In relation to the evaluation of the effectiveness of entrepreneurship education programs and interventions, we currently have 2 articles that meta-analyze the effectiveness of these interventions (Bae et al., 2014; Martin et al., 2013). As mentioned in the introduction, both publications highlighted how the lack of methodological quality produces an overestimation of the positive effects of the interventions. Given that both were published about 10 years ago, we wonder how their conclusions would be updated in light of recent publications. Although the increase in the development of

experimental or quasi-experimental empirical studies does not seem to have increased significantly in recent years, some new ones have appeared that would be worth considering (Longva & Foss, 2018) (see Figure 2). In addition, we have a more recent meta-analysis, but it focused exclusively on the change in entrepreneurial intention (Alanazi, 2019). In this context, the need arises from **Study 1**, which proposes a systematic review and meta-analysis that focuses exclusively on those empirical studies conducted with samples of students and an experimental design with a control group and pre- and post-intervention evaluations.

Figure 2

Quantitative impact studies in entrepreneurship education (from Longva & Foss, 2019)



Study 1. Effect of Entrepreneurship Education on Entrepreneurship Intention and Related Outcomes in Educational Contexts: A Meta-analysis

Martínez-Gregorio, S., Badenes-Ribera, L., & Oliver, A. (2021). Effect of entrepreneurship education on entrepreneurship intention and related outcomes in educational contexts: a meta-analysis. *The International Journal of Management Education*, 19(3), 100545. <https://doi.org/10.1016/j.ijme.2021.100545>

Abstract

Although some meta-analyses have investigated the effect of Entrepreneurship Education (EE), they mixed studies with high and low methodological quality. Thus, their results might overestimate the impact. This paper aims to examine the efficacy of the EE in student samples, attending to studies with a pre-posttest design and a control group. The results showed small effect sizes for EE in increasing Entrepreneurship Intention (EI) and Self-efficacy. Moreover, meta-regression confirmed that the duration of intervention programs predicted larger effect sizes for the EI. Finally, the practical implications of other potential moderator variables are discussed.

Keywords: Entrepreneurship education; Entrepreneurship intention; Education impact; Meta-analysis

Introduction

To the extent that education has a transformative role in societies, educational agents have shown a growing interest in Entrepreneurship Education (EE), especially in higher education (Alanazi, 2019; Lorz et al., 2013). Entrepreneurship is considered a crucial element for economic development that can be promoted and developed through education (Kuratko, 2005; O'Connor, 2013).

However, EE goes beyond entrepreneurs' production. It is a valuable skill for citizens' personal and not just for professional development. From the beginning, Joseph Schumpeter's in the 1940s describes entrepreneurs as agents of change. The Consortium for Entrepreneurship Education (2008) states that entrepreneurship is more than teaching someone how to run a business, it is also promoting critical thinking and sense of self-worth. Today's world challenges are both economic and social. It is essential to mobilize science, technology, and innovation not solely for encouraging economic benefits, but also for anticipating and responding to social problems (Organization for Economic Co-Operation and Development, 2011).

Researchers share the interest in EE. Consequently, research related to EE has significantly increased in recent years (Aparicio et al., 2019; Liñán & Fayolle, 2015). Despite this growth in scientific production, there is still no accord in the definition of "entrepreneurship education" (Liñán, 2004; Mwasalwiba, 2010; Pittaway & Cope, 2007). Bae et al. (2014) would simplify the issue in their study by stating that "by entrepreneurship education, we are referring to education for entrepreneurial attitudes and skills" (p. 219), leaving a broad framework where diverse interventions and programs would have space. Some scholars are sceptical about considering new venture creation as the main and unique educational objective of EE (Kuratko, 2005;

Mwasalwiba, 2010). From a wider point of view, EE aims to promote entrepreneurial attitudes, spirit, and culture, which could be applied in different life fields.

Given the interest in the field and the mentioned increase in related publications, several authors have carried out literature reviews in order to pool the knowledge generated (Aparicio et al., 2019). Specifically, there has been a proliferation of reviews and meta-analyses that attempt to highlight and compile the evidence found regarding the efficacy or impact of these types of interventions (Alanazi, 2019; Bae et al., 2014; Brüne & Lutz, 2020; Kuratko, 2005; Longva & Foss, 2018; Martin et al., 2013; Nabi et al., 2017; Peterman & Kennedy, 2003).

Among the set of variables used to measure the impact of the interventions, entrepreneurship intention seems to occupy a principal place in the literature (Alanazi, 2019). As several authors recognized (Liñán & Fayolle, 2015; Rahm, 2019), a great part of the research on EE and entrepreneurship intention is based on the theoretical framework of the Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991). According to this theory, planned behaviors (such as starting a business) can be predicted through intentions to carry out those behaviors. Furthermore, following this theory, entrepreneurship intention is influenced by three previous independent determinants: attitude toward entrepreneurship, subjective norm, and perceived behavioral control (Kolvereid, 1996b).

According to the TPB, EE would not only directly affect entrepreneurship intention but it would also affect its antecedents (Rauch & Hulsink, 2015; Varamäki et al., 2015). For this reason, we can find studies of the efficacy of EE that include these antecedent variables to observe its possible change (for example, González-López et al., 2019; Varamäki et al., 2015)).

Apart from the TPB model, alternative approaches in literature could be found. Firstly, some authors propose to use the TPB model using Entrepreneurial Self-efficacy instead of Perceived Behavioral Control (for example, Kumar & Das, 2019; Rueda et al., 2015). Entrepreneurial self-efficacy is described as the personal confidence in their capability to achieve entrepreneurial goals (C. C. Chen et al., 1998).

Additionally, there are studies developed in the framework of Shapero's Entrepreneurial Event model (Shapero & Sokol, 1982). This model considers perceived desirability and perceived feasibility as the antecedents of entrepreneurship intention. Perceived desirability refers to how attractive or desirable is the behavior. Instead, perceived feasibility is related to the perception of the capability to perform the behavior (Lorz et al., 2011). Consequently, some impact studies include perceived desirability and perceived feasibility as variables to measure the effect of EE (for example, Costa et al., 2018; Dickel et al., 2019). Although the TPB and Shapero's model are the ones most commonly found in the literature, alternative models continue to emerge (Tomy & Pardede, 2020).

Having described what can be understood as the impact of EE, we return to the aforementioned literature reviews. There are two clear consensus from the literature reviews of the impact of EE. Firstly, empirical studies on the impact of EE are contradictory (Bae et al., 2014; Longva & Foss, 2018; Lorz et al., 2013; Martin et al., 2013). We can find studies that show a positive impact (for example, Gielnik et al., 2015; Souitaris et al., 2007), as well as a negative one (for example, Mentoor & Friedrich, 2007; Oosterbeek et al., 2010), or non-significant (for example, Huber et al., 2014; Varamäki et al., 2015). Among the previously mentioned reviews, it is worth noting the presence of three meta-analyses (Alanazi, 2019; Bae et al., 2014; Martin et al., 2013). All

of them included samples of nascent or active entrepreneurs and they found a small relationship between entrepreneurship and its possible results. Martin et al. (2013) suggest that the methodologically less rigorous studies cause an overestimation of the impact of the intervention programs.

This controversy regarding the effect of EE may be related to lack of methodological rigor in the investigations (Bae et al., 2014; Liñán & Fayolle, 2015; Longva & Foss, 2018; Martin et al., 2013; Nabi et al., 2017; Peterman & Kennedy, 2003). Several methodological reviews of the literature have pointed out a variety of weaknesses that might undermine confidence in the belief that EE can produce entrepreneurship. One of the methodological weaknesses in research design: most of the studies use one-group pretest-posttest and posttest-only with a non-equivalent comparison group (Liñán & Fayolle, 2015; MICHAEL Lorz et al., 2013; Rideout & Gray, 2013). Lorz et al. (2013) found 69% of studies applied solely posttest data collection. Moreover, only 31% of the reviewed studies applied pretest-posttest design, but 61% of them did not use a control group.

If we return to the aforementioned meta-analyses, it can be seen that specific inclusion criteria regarding methodologic aspects of the study design were not included in any of these meta-analyses. In this way, Martin et al. (2013) concluded that, of the 42 studies identified, only 11 investigations had a design with pre and post-treatment measures and a control group. In reviewing the meta-analysis of Bae et al. (2014), it has been concluded that, of the 73 articles included, only 8 share the aforementioned design characteristics.

To overcome this problem regarding the methodology of the studies, Longva and Foss (2018) proposed a review of the literature published before 2018 that had the following inclusion criteria: 1)

quantitative measurement of the effect of EE, 2) participants had to be students at primary, secondary or tertiary level, 3) longitudinal study (with pre and posttest) and 4) design with a control group. They identified a total of 17 articles, which seem to show contradictory results.

The present paper aims to shed light by carrying out a meta-analysis to integrate the knowledge on the impact of EE specifically attending to studies with a rigorous methodological design. Additionally, this study is the first attempt to study the effect of EE in student samples without including nascent or active entrepreneurs. Consequently, the specific objectives were: (1) to compute the mean efficacy of the EE to improve entrepreneurship intention and other outcome measures such as Control, Attitude toward entrepreneurship, Self-efficacy, Feasibility, Desirability, and Need for achievement; (2) to analyse the heterogeneity among the effect size estimates; (3) to search for substantive (for example, treatment, participant, context) and methodological studies' characteristics that can be statistically related to the effect size indexes and, thus, can account for the effect size variability.

Method

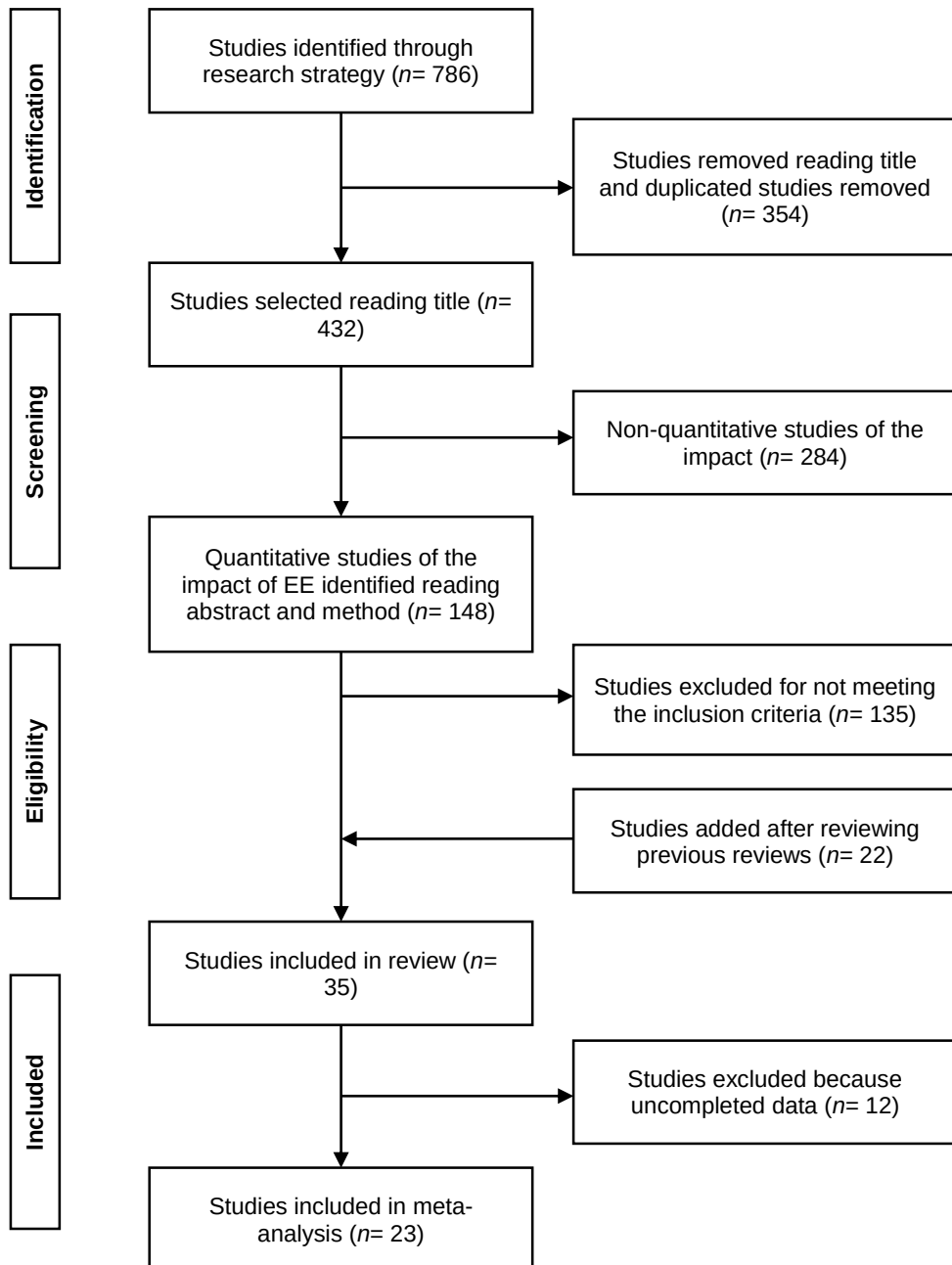
A meta-analysis was performed following the guidelines for Reporting Systematic Reviews and Meta-Analyses (Moher et al., 2009), and the recommendations proposed by the American Psychological Association Publications and Communications Board Task Force (Appelbaum et al., 2018, Table 9, pp. 21–23).

The study selection criteria were partially based on those proposed by Longva and Foss (2018). In order to be included in the meta-analysis, each study should meet the following criteria: (1) to be an original, quantitative study; (2) to include a quantitative measure of

EE impact; (3) participants in the study had to be students at primary, secondary or tertiary level (nascent entrepreneurs were not included); (4) due to the methodological aspects, the studies had to use pre and posttest design and (5) a control group; (6) to be written in English or Spanish; (7) available in full text; and (8) statistical data provided in the study had to allow us to calculate the effect sizes. No restrictions were included concerning cultural context, type of EE, or year of publication. The exclusion criterion was: case series studies or $N = 1$.

Search Strategy of Studies

A literature search for articles that meet the aforementioned requirements was conducted based on the two previous meta-analyses (Bae et al., 2014; Martin et al., 2013), whose bibliographic searches have been expanded until April 2020. In order to make exhaustive research, several databases were consulted: Web of Science, Scopus, PROQUEST, and Science Direct. The search was performed using different combinations of the following terms: “entrepreneurship training”, “entrepreneurship program”, “entrepreneurship curriculum”, “entrepreneurship education”, or “enterprise education”; and “impact”, “effect”, “outcome”, “learning”, “entrepreneurship intention”, “willingness to start a business” or “willingness to start a venture”. Additionally, the reference section of previous literature reviews and meta-analyses were reviewed to identify additional studies that meet the criteria. Specifically, the consulted literature reviews were: Bae et al., (2014), Brüne & Lutz, (2020), Dickson et al. (2008); Longva & Foss (2018), Lorz et al. (2013), Martin et al. (2013), Mwasalwiba (2010), Nabi et al. (2017), Rahm (2019), Rideout & Gray (2013). The process of screening and selection of the studies can be seen in Figure 3.

Figure 3*Stages in the process for selecting studies for the meta-analysis*

The database search produced a total of 786 results. The titles of these articles were reviewed, and 432 studies were pre-selected, after removing duplicated ones. A total of 148 studies that carried out a quantitative measurement of the impact of EE were identified, only 13 of them fulfilled the inclusion criteria. Afterward, 22 additional articles that meet the criteria were identified reviewing the aforementioned previous reviews. Finally, a total of 35 were enclosed in the review. Nevertheless, twelve articles did not report on effect size or statistical data to compute it. Authors were emailed to obtain these data but they did not reply to the request. Thus, these studies were excluded from the meta-analysis. Consequently, the meta-analysis enclosed 23 published articles; all of them were published in a peer-reviewed journal, except Lorz et al. (2011), between 1998 (Hansemark, 1998) and 2020 (Cera et al., 2020). Four of the 23 articles provided data of two (Dickel et al., 2019; Ismail et al., 2018; Varamäki et al., 2015), and three (Mentoor & Friedrich, 2007) independent samples. Therefore, the database for the meta-analysis included a total of 28 independent samples.

Coding of the Studies

Studies' characteristics were extracted in a standardized and systematic manner applying to each study the protocol established. The characteristics extracted were: (1) year of the study; (2) geographical location; (3) sample size (total and by groups); (4) mean age (total and by groups); (5) sex distribution (total and by groups); (6) education level (primary, secondary or tertiary); (7) outcome; and (8) statistics reported to calculate the effect sizes. Finally, methodological quality was measured using an ad hoc 12-dichotomous item checklist (see Appendix 1) based on checklists previously used and in other methodological reviews (Lorz et al., 2013; Maher et al., 2003; Sánchez-Meca et al., 2014).

Each item rated 1 when the study met the criteria and 0 if the criteria are not met or the information is not available to evaluate it. A total quality score is calculated by adding up the results of all the criteria. The total score range between 0 and 12, a higher score means higher quality.

The inter-rater reliability for methodological quality was satisfactory, with an intraclass correlation of .979. Minimum inconsistencies between coders were resolved by consensus, and a third reviewer was consulted if necessary.

Computing Effect Sizes

Although all studies enclosed in the meta-analysis ($n = 23$) employed a research design pretest-posttest with a control group, some of them ($n = 7$) did not report statistical data to compute the effect size for the control group. The lack of statistical data for control groups conditioned the selection of the effect size index. Consequently, the analysis unit was the group, not the study, and the effect size index was the standardized mean change scores index (d), computed as the difference between the posttest and means divided by the standard deviation within groups. Because d has a slight positive bias, the unbiased estimate called Hedges' g was applied: $g = c(m) * d$, $c(m)$ being a correction factor for small sample sizes (Hedges & Olkin, 1985). To control some of the validity threats of this effect size index, the d index was computed for both intervention and control groups, separately. And then, an adjusted average effect was used, d_{adj} , computing the difference between the average d indices of the intervention groups, d_I , and the control, d_C , groups ($d_{adj} = d_I - d_C$). The adjusted index allowed us to control the testing effects and, thus, it offers a more appropriate estimate of the true intervention effect. Positive values for d represented a favourable change in the group from the pretest to the posttest. According to

Cohen's (1988) criteria, effect sizes of 0.2, 0.5, and 0.8 can be interpreted as reflecting small, moderate, and large effect sizes, respectively.

Separate effect sizes were calculated for Entrepreneurship intention, Control, Attitude toward Entrepreneurship, Self-efficacy, Feasibility, Desirability, Need for achievement and Subjective norm.

To measure the reliability of the effect size computations a double process of effect size calculations was performed. The inter-coder reliability was excellent, with a mean intra-class correlation of 0.88 ($SD = 0.18$). In addition, the calculation for which the raters disagreed was discussed and easily resolved by consensus.

Statistical Analysis

Independent meta-analyses were conducted with the effect sizes for each outcome measured in at least 3 independent samples. As not all studies measured all outcomes, each meta-analysis enclosed a different number of studies, which ranged from 20 to 3 studies. Random-effects models were assumed in the statistical calculations (Borenstein et al., 2009). For each meta-analysis, a pooled standardized mean change difference and its corresponding 95% confidence interval (CI) were calculated. Additionally, the statistical significance of the pooled standardized mean difference was examined by the Z test.

Forest plots were elaborated to display the individual and pooled effect size estimates, with their 95% CIs, and to allow visual inspection of variability among effect sizes. Additionally, both Cochran's Q-statistic and the I^2 index were calculated (Higgins et al., 2003). A Q-statistic with $p < .05$ denoted a variability among the effect sizes. I^2 index values of around 25%, 50%, and 75% indicated low, moderate, and large variability, respectively (Huedo-Medina et al., 2006).

To assess the potential effect of moderator variables on effect size heterogeneity, weighted analyses of variance (ANOVAs) were performed for categorical variables and meta-regressions for continuous variables, by assuming a mixed-effects model (Borenstein et al., 2009; López-López et al., 2014). The statistical significance was assessed with the Q_B statistic for categorical moderators and Q_R statistic for continuous moderators. Additionally, an estimate of the proportion of variance accounted for by the moderator variable was calculated (López-López et al., 2014; Raudenbush, 2009). The model misspecification was assessed with the Q_W statistic for categorical moderators and the Q_E statistic for continuous moderators.

Lastly, to examine publication bias, a funnel plot with Duval and Tweedie's trim-and-fill method for imputing missing data and the Egger test were performed (Duval & Tweedie, 2000; Sterne & Egger, 2006). When there are fewer than 10 studies the power of Egger's test is insufficient to distinguish chance from genuine asymmetry (Higgins & Green, 2011).

The statistical analyses were conducted using the Comprehensive Meta-analysis software program version 3.0 (Borenstein et al., 2014), and were interpreted assuming a significance level of 5% ($p < .05$) and, using two-tailed tests.

Results

Descriptive Characteristics of the Studies

Appendix 2 displays a summary of the studies' characteristics included in the systematic review. As it can be seen, 17 articles have been found after the years of publications of the previous meta-analysis (Bae et al.,

2014; Martin et al., 2013). It should be noted that 82.85% of them have been carried out with university population.

Overall, all studies used a convenience sample selected from primary schools ($n = 1$), secondary schools ($n = 5$) or university ($n = 29$) setting and a pre-post design with control group. A large number of studies were conducted in Europe ($n = 22$), with three of them being carried out in the United States of America (USA) and the other five in Asia, three in Africa, and two in Australia.

Regarding the participants' characteristics, the mean age of all participants ranged from 11.63 to 26 years, with a mean age of 21.12 ($SD = 3.70$). The percentage of females ranged from 21% to 70%, with an average percentage of 51.5 ($SD = 12.69$). Eleven studies did not report on the age and/or sex distribution of participants.

Teaching methods. Another difference among entrepreneurship programs is the teaching method used (Mwasalwiba, 2010). It seems that previous research sorts teaching methods into two categories: "passive methods" (also known as "traditional methods" or "teacher-centered methods") and "active methods" (also known as "innovative methods" or "student-centered methods" (Ismail et al., 2018; Mwasalwiba, 2010; Varamäki et al., 2015).

The studies identified were classified according to this categorization. Those that included an approach focused on student's experiences were considered as "active methods" and they should include activities as participating in real companies, making a business plan, or virtual simulations (Varamäki et al., 2015). The most used teaching method is "active methods" ($n = 26$), whereas only 6 studies used "passive methods". Two papers specifically studied the effect of the teaching method (Ismail et al., 2018; Varamäki et al., 2015). Categorization is found in Appendix 2.

Outcomes measures. The 35 articles have been classified according to the dependent variables that were taken into consideration in the study to see the effect of the intervention. Specifically, 10 variables have been measured most frequently in the literature (see Appendix 2). The most analysed outcome was the entrepreneurship intention ($n = 22$), followed by control ($n = 12$), self-efficacy ($n = 12$), and attitude toward entrepreneurship ($n = 9$). The outcome least frequently examined was social orientation ($n = 2$) followed by feasibility, risk-taking, and need of achievement ($n = 5$), desirability, and subjective norm ($n = 6$).

Additionally, a set of entrepreneurial skills as proactivity (Huber et al., 2014; Sánchez, 2013) or innovation (Mentoor & Friedrich, 2007) are often considered. However, they have not been investigated in a sufficient number of studies to be included in the meta-analysis and these variables are sufficiently different from each other that they cannot be considered as a whole.

Methodological Quality Assessment

The detailed results obtained from methodological quality assessment, that is, the scores of individual studies on each quality item and the Total Quality Score (TQS) are available under request. The TQS was obtained by adding up the 1s and 0s for the checklist items (range = 0–12). The average methodological quality score of the studies was 8.97 ($SD = 1.62$ Mode = 10), ranging from 6 to 12 points.

All of studies applied appropriate statistical tests (non-parametric vs. parametric methods) to measure the effect ($n = 35$) and did not dichotomize the assessment of dependent variables ($n = 35$). In addition, most of them met the following criteria: (a) the expected effect was theoretically based ($n = 34$); (b) they provided a detailed description of entrepreneurship intervention which included learning objectives ($n = 25$), intervention duration ($n = 20$) and/or pedagogical methods used (n

= 27); (c) they had an adequate sample size in the posttest ($n = 24$); (d) they employed measurement instruments with good psychometric properties (validity and reliability) to assess dependent variables ($n = 25$); (e) they reported results of between groups statistical comparison for at least one key outcome ($n = 34$), and (f) they had no private financial support ($n = 32$).

However, most of the studies did not run a random assignment of the participants to control and intervention group ($n = 5$), and only in the 50% of them, control and intervention groups were similar at baseline regarding important indicators ($n = 18$).

Synthesis of Results

Table 1 displays the results of the meta-analysis obtained separately for the intervention groups and the control groups in each outcome measure. In most of them, there was not a statistically significant average effect of EE for the intervention groups. The results only revealed a statistically significant average effect of EE for the intervention groups on Entrepreneurship intention and Self-efficacy scores.

Table 1

Results for the effect sizes according to the outcome measure for the intervention and control groups

Outcome measure	<i>k</i>	<i>d</i> ⁺	Intervention groups 95% CI		<i>Q</i>	<i>I</i> ²	<i>k</i>	<i>d</i> ⁺	Control groups 95% CI		<i>Q</i>	<i>I</i> ²
			<i>dl</i>	<i>du</i>					<i>dl</i>	<i>du</i>		
Entrepreneurship intention	20	0.215	0.098	0.332	243.854***	92.2	12	0.008	-0.125	0.141	97.63***	88.7
Control	10	-0.007	-0.327	0.312	372.514***	97.6	4	-0.020	-0.160	0.120	7.497***	56
Attitude	8	0.020	-0.141	0.182	58.905***	88.2	3	0.031	-0.112	0.173	4.308***	53.6
Self-efficacy	7	0.337	0.159	0.514	120.258***	95	4	0.002	-0.085	0.090	7.744*	61.3
Feasibility	5	0.139	-0.100	0.379	24.247***	83.5	4	-0.161	-0.361	0.040	9.929***	69.8
Desirability	5	0.031	-0.056	0.118	4.803	16.7	3	0.187	-0.234	0.609	16.239***	87.7
Need for achievement	5	0.044	-0.243	0.331	119.596***	96.7	3	-0.048	-0.234	0.139	7.598*	73.7
Subjective norm	4	0.058	-0.167	0.284	22.424***	86.6	1	0.075	-0.018	0.168	--	--

Note. **p* < .05. ***p* < .01. ****p* < .001. 95% C.I.: 95% confidence interval. *k*: number of studies. *d*⁺: mean effect size. *dl* and *du*: lower and upper confidence limits. *Q*: heterogeneity statistic. *I*²: heterogeneity index (%)

Focusing on the Entrepreneurship intention, the results revealed a statistically, significant average effect for the intervention groups ($d_+ = 0.215$, $k = 20$), whereas the average effect for the control groups was practically null ($d_+ = 0.008$, $k = 12$). Moreover, a weighted ANOVA employed to compare the two average effects revealed statistically significant differences between both ($Q_B(1) = 4.938$, $p = .026$, $R^2 = .09$). Nevertheless, the average d index obtained for the intervention groups may be overestimating the true effect (due to its low internal validity). To resolve this issue and controlling the testing effects suffered by these d indices, an adjusted average effect, d_{adj} , was defined and computed as the difference between the average effect of the intervention groups, d_I , and the average effect of the control groups, d_C : $d_{adj} = d_I - d_C$. Thus, for the global measures of Entrepreneurship intention an estimate of the true treatment effect was $d_{adj} = 0.215 - 0.008 = 0.207$, an effect estimate that can be considered of small magnitude (Cohen, 1988). Figure 4 shows a forest plot for the Entrepreneurship intention classified as function of the intervention groups and the control groups.

Regarding to Self-efficacy, the results revealed a statistically, significant average effect for the intervention groups ($d_+ = 0.337$, $k = 7$), whereas the average effect for the control groups did not yield statistical significance ($d_+ = 0.002$, $k = 4$). When the two average effects were statistically compared, the difference between them led to a statistically significant difference, ($Q_B(1) = 7.053$, $p = .008$, $R^2 = .24$). The difference between the two average effects provided an adjusted effect size of a small to medium magnitude: $d_{adj} = 0.337 - 0.002 = 0.335$ (Cohen, 1988). Figure 5 shows a forest plot for the Self-efficacy classified as a function of the intervention groups and the control groups.

Figure 4

Forest plot entrepreneurship education on entrepreneurial intention (also presented in a larger format in page 443)

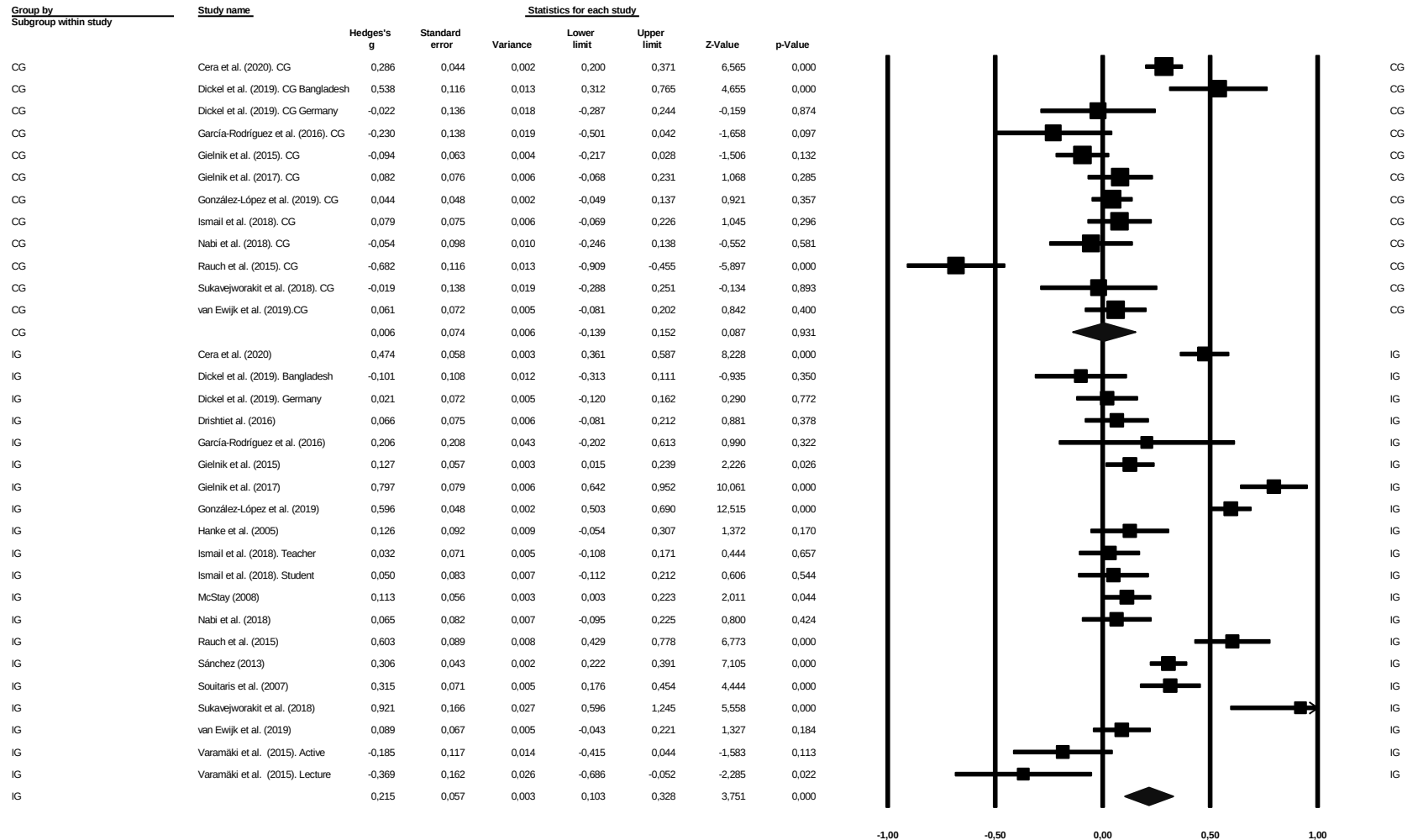
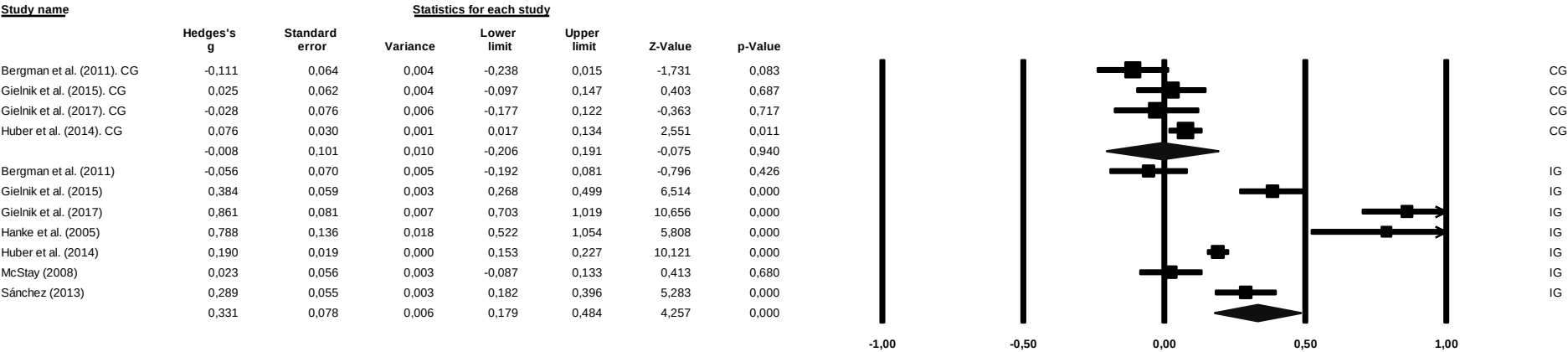


Figure 5
Forest plot entrepreneurship education on self-efficacy (also presented in a larger format in page 445)



Moderator Analysis

As Table 1 presents, effect sizes for the intervention groups exhibited large variability in Entrepreneurship intention and other outcome measures, with I^2 ranging between 83.5% and 97.6%, except to desirability outcome ($I^2 = 16.7$). Hence, an analysis of the studies' characteristics that might influence the effect size heterogeneity was performed. However, due to the few studies and some studies not reporting sociodemographic variables, it was not possible to conduct further analyses that might explain the heterogeneity of effect sizes for most of the meta-analyses carried out. It was only possible to perform a moderator variables analysis for Entrepreneurship intention measures ($k = 20$) by sample characteristics (for example, mean age, percentage of females, geographical location, and socioeconomic context by country), study characteristic (for example, year publication and methodological quality), and intervention characteristics (for example, duration in months). Specifically, weighted ANOVAs for categorical moderator variables and simple meta-regression for continuous moderator variables were used, with the standardized mean change as the dependent variable.

Table 2 shows the results of the weighted ANOVAs performed on the categorical variables, such as continent where the study was conducted, socioeconomic context of the country where the study took place, which was coded as Emerging market and developing economies and Advanced economies, following the International Monetary Fund (IMF) classification (Found, 2020). The results of the ANOVA did not reach statistically significant values on examined categorical variables. Nevertheless, focusing on continent where the study was conducted, only the studies carried out in Europe ($d_+ = 0.208$, $k = 11$) or Africa ($d_+ = 0.455$, $k = 2$) reached a small to moderate and statistically significant mean effect.

Table 2

Results of the weighted ANOVAs for the influence of categorical variables on the effect sizes

Moderator variable	k	d+	95% CI		ANOVA results
			dl	du	
Geographic location:					
Europe	11	0.208	0.046	0.370	$Q_B(3) = 2.042, p = .564; R^2 = 0.0; Q_W(16) = 202.821, p < .001$
Asian	5	0.167	-0.075	0.409	
Africa	2	0.455	0.087	0.823	
Others (USA, Australia)	2	0.119	-0.251	0.490	
Socioeconomic context for country:					
Advanced economies	11	0.178	0.013	0.343	$Q_B(1) = 0.419, p = .517; R^2 = 0.0, Q_W(18) = 242.171, p < .001$
Emerging market and developing economies	9	0.259	0.079	0.438	

Note. C.I.: 95% confidence interval. *k*: number of studies. *d*₊: mean effect size. *d*_l and *d*_u: lower and upper confidence limits. *+*. *Q*_B: between-categories *Q* statistic. *Q*_W: within-categories *Q* statistic. *R*²: proportion of variance accounted for by the moderator variable.

On the other hand, focusing on the socioeconomic context for the country, for both groups, a small and statistically significant mean effect was obtained. Specifically, for the Advanced economies the mean effect was *d*₊ = 0.178 (*k* = 11), and for the Emerging market and developing economies the mean effect was *d*₊ = 0.259 (*k* = 9).

Table 3 presents the simple meta-regressions performed on continuous variables, such as mean age, and gender (% female) of the sample, as well as the duration of intervention program. The only moderator variable that yielded a statistically significant relationship with effect sizes was the duration of intervention program for the individual studies, accounting for 23% of the variance ($p < .05$).

Table 3

Results of the simple weighted meta-regressions of continuous moderators on the effect sizes for Entrepreneurship intention measures

Moderator variable	<i>k</i>	<i>b_j</i>	<i>Q_R</i>	<i>Q_E</i>	<i>R</i> ²
<i>Participant characteristics:</i>					
Mean age (years)	10	-0.0192	0.32	126.16***	0.0
Gender (% females)	16	-0.0007	0.02	219.83***	0.0
<i>Intervention characteristics:</i>					
Duration (months)	15	0.0538	4.68*	118.60***	0.23
<i>Study characteristics:</i>					
Year publication	20	0.0067	0.15	236.86***	0.0
Number items used to assess EI	19	-0.0330	1.52	235.45***	0.02
Methodological quality checklist (0-12)	20	0.0239	0.32	243.47***	0.0

Note: *k*: number of studies. *b_j*: unstandardized regression coefficient. *Q_R*: *Q* statistic to test for the moderator variable significance. *Q_E*: *Q* statistic to test for model misspecification. *R*²: variance accounted for by the moderator variable. * $p < .05$. *** $p < .001$.

Analysis of publication bias

Of the 8 funnel plots elaborated (available under request), the trim- and-fill method required the imputation of effect sizes in two of them to

achieve symmetry. One of these was the funnel plot that showed the effect size for the feasibility measures. In this case, Duval and Tweedie's method imputed one effect estimate. However, the adjusted average d ($d_+ = 0.068$; 95% CI [-0.168, 0.305]) presented a slight difference from the original average d ($d_+ = 0.139$). The other asymmetrical funnel plot displayed the meta-analysis of the effect size for the desirability measures. In this case, Duval and Tweedie's method imputed two effect estimates, but the adjusted average d ($d_+ = 0.027$; 95% CI [-0.052, 0.106]) presented a negligible difference from the original average d ($d_+ = 0.031$).

In addition, the Egger test yield statistical significance only for the meta-analysis of attitude measures ($p = .004$, $k = 8$) and subjective norm ($p = 0.21$, $k = 4$) (see Table 4). Consequently, based on the results of these different analyses, publication bias can reasonably be ruled out as a threat to meta-analytic findings.

Table 4

Analyses of Publication Bias with the Egger Test

Outcome	k	Intercept	SE	T	df	p -value
Entrepreneurship intention	20	-2.650	2.346	1.1309	18	.273
Control	10	-4.94	5.48	0.90	8	.303
Attitude	8	-6.84	1.50	4.57	6	.004
Self-efficacy	7	3.170	2.92	1.09	5	.326
Feasibility	5	3.09	3.63	0.85	3	.457
Desirability	5	-0.43	1.45	0.30	3	.784
Need for achievement	5	-2.94	3.97	0.74	3	.514
Subjective norm	4	-5.36	0.79	6.75	2	.021

Note. SE: Standard error; T: T-test; df : Degrees of freedom.

Discussion

The objective of this research was to perform a meta-analysis to investigate the efficacy of EE interventions on entrepreneurship intention and other outcome measures, specifically attending to studies carried out in the academic context with a pre and posttest design and a control group. As for the maximum value is 12, the mean methodological quality score of 8.97 for all the studies enclosed in this systematic review ($n = 35$) represents moderate-to-large quality, enhancing the credibility of the conclusions.

The findings clearly show that there was not a statistically significant average effect of EE for the intervention groups on most of the outcome measures. There was only a statistically significant average effect of EE for the intervention groups on Entrepreneurship Intention ($d_+ = 0.215$) and Self-efficacy scores ($d_+ = 0.337$). As aforementioned, given the problems with the internal validity of the d index obtained from one-group designs, an adjusted average effect was used, d_{adj} , calculating the difference between the average d indices of the intervention, d_I , and the control. The adjusted index for Entrepreneurship intention was $d_{adj} = 0.207$, an effect estimate that can be considered of small magnitude (Cohen, 1988), and for Self-efficacy was $d_{adj} = 0.335$, an effect estimate that can be considered of small to medium magnitude (Cohen, 1988).

These results found in academic samples with high methodological rigor agree with the findings of previous meta-analyses. Although its small or medium magnitude, a positive relationship between EE and entrepreneurship intention and entrepreneurship-related human capital assets was established (Bae et al., 2014; Martin et al., 2013). Although the lack of methodological rigor may have overestimated the

results (Martin et al., 2013), they still occur in similar sizes in more rigorous studies.

It has been argued that the variability of results in the primary studies may be due to the diversity of programs, lengths, and samples used in the impact studies (Longva & Foss, 2018; Lorz et al., 2013). Nevertheless, there are other tentative explanations in the literature. Fretschner and Lampe (2019) focused on the “alignment” and “sorting” effects to explain the controversial results related to the impact of EE on entrepreneurship intention. The alignment effects explain how the students with low entrepreneurship intention at the beginning of the course will increase their entrepreneurship intention because they might find something they would enjoy in entrepreneurship. This effect is contrary for the students with high entrepreneurship intention before the course, who will acquire a more realistic view of entrepreneurship. The alignment effect could affect other variables in the same way.

Publication bias was ruled out as a threat to the meta-analytic findings, and a large heterogeneity was found among the individual effect sizes. However, it was only possible to perform moderator variables analysis to determine the studies’ characteristics that might explain at least part of the effect size heterogeneity for Entrepreneurship intention measures, due to few studies and the fact that some of them did not report on sociodemographic variables. Findings from moderator analysis revealed that only the intervention duration was statistically related to effect sizes. Specifically, studies with longer intervention duration produce more change in entrepreneurship intention. As Oosterbeek et al. (2010) claimed, the duration of the entrepreneurship programs is an interesting research area. Our results reinforce the statement of Oosterbeek et al. (2010) and contradict the results of Lorz et al. (2011), who found that the duration of the program only affected the perceived behavioral control. Consequently, although most of the

courses taught in the university context last approximately one semester, it would be advisable to extend the duration of the courses to consolidate the acquisition of the outcomes of interest.

Previous research shows cultural differences in entrepreneurship intention (Iakovleva et al., 2011; Shneor et al., 2013). Our study suggests that the differential effectiveness of EE is not the reason for these differences. The country or socio-economic context (advanced vs. emerging markets) has not shown moderator effects. It means that entrepreneurship programs are being equally effective despite the country of application. Although the effect of subjective norms on entrepreneurship intention varies across the country (Moriano et al., 2012), the programs seem to be well adapted to each context.

Limitation and Strengths

Some limitations should be acknowledged. First, our study focuses on evaluating the impact at the second level of the Kirkpatrick model (1996), that is, we do not measure the impact of the programs directly on behavior. However, this approach continues to be the predominant perspective in evaluating the impact of programs carried out in educational contexts and this study collects previous literature.

Second, the meta-analysis is based on few studies, given that twelve studies could not be enclosed in the final analysis because they did not provide the statistical data necessary to compute the effect sizes. Moreover, some of the included studies did not supply statistical data to calculate the effect size for the control group. Consequently, the effect size index was the standardized mean change scores index for intervention and control groups, separately. To resolve the problems with the internal validity of this effect size and provide a more realistic estimate of the true effect, an adjusted average effect was used, d_{adj} ,

calculating the difference between the average d indices of the intervention and the control groups.

Additionally, most of the studies enclosed in this meta-analysis used convenience samples taken from a university setting, which limits the generalization of these results to other education levels. Consequently, it is necessary to conduct more research on the EE effect in other levels of education (for example, secondary level).

On the other hand, the lack of information in primary studies on variables related to participants' characteristics or intervention characteristics limited our ability to analyse moderating variables that could explain heterogeneity across studies. Therefore, it is possible that other moderator variables not considered might be relevant in explaining this variability (for example, intervention characteristics). Moreover, some primary studies did not provide all the information needed to code all moderator variables enclosed in the meta-analysis.

However, several strengths should also be mentioned. Foremost, this study employs a meta-analytic approach to examine the impact of EE, specifically attending to studies with a rigorous methodological design, pooling estimates across a wide range of studies. The rigorous selection of the studies tried to assure the quality of the evidence. Thereby, it was more relevant to summarize the evidence selecting studies with high methodological quality than to review and synthesize a larger number of studies with poor methodological quality. Consequently, this meta-analysis allows a more accurate view of the impact of EE, with the limitations mentioned above. In addition, international studies are enclosed in this meta-analysis and, consequently, results are not country-specific, which strengthens the external validity of this study.

Recommendation for Future Research

Throughout the discussion, recommendations for future research arising from the current findings and review of the literature have been identified (for example, Lorz et al., 2013; Rideout & Gray, 2013). These suggestions include (1) representative sampling of participants (for example, probabilistic sampling with diverse recruiting methods), (2) samples selected from secondary level and in vocational schools; (3) detailed information about the intervention program (for example, duration, pedagogical methods, so on); (4) validity and reliability tests to assess outcome measures; (5) detailed information about descriptive statistics for outcome measures (for example, means and standard deviations) for both intervention and control group, separately, in pretest and posttest phases, (6) detailed information about potential moderators to advance theoretical understanding (for example, sociodemographic characteristics of the participants). This would not only facilitate the carrying out of meta-analyses, but also the replication of primary studies and the comparison of different studies.

Recent research has highlighted the need to explore the intention-behavior gap. Students may lose their entrepreneurial intention because of the difficulties they face as independent entrepreneurs (Harima et al., 2021). Consequently, it is recommended to study the effect directly on entrepreneurial behavior with longitudinal follow-up (Rahms, 2019).

Additionally, future research should deepen in the process through which the EE impacts the entrepreneurship outcomes. Ndofirepi (2020) found that psychological traits as need for achievement partially mediated the relationship between EE and entrepreneurial intention.

Conclusion

The present **Study 1** contributes clarifying the effectiveness of entrepreneurship programs in an essential context: the educational field without including nascent entrepreneur samples.

Additionally, it is based exclusively on methodologically rigorous studies. As a result, these programs have shown effectiveness in promoting entrepreneurship intention and self-efficacy across the students. These results support the development of initiatives to boost entrepreneurship in educational centers, with samples that have not necessarily shown prior interest in entrepreneurship.

Furthermore, it is still necessary to improve the quality of impact studies of EE and the reporting of its results. To continue deepening the knowledge of the moderating variables of the impact of the programs, we need the research works to provide detailed information on the procedures used in the entrepreneurship programs. Rigorous and comprehensive efficacy studies are needed to learn about good practices that guarantee the desired results with methodologies adapted to each education stage.

Adaptation and psychometric studies of measurement instruments

The previous section evidences that, during the last few years, rigorous empirical research on high school students has remained scarce. Of the 35 effectiveness studies reviewed in **Study 1**, just six of them were carried out with pre-university samples. Although the call for more studies in adolescent samples was made more than two decades ago (Dainow, 1986; Gorman et al., 1997) and has been repeated several times since (Brüne & Lutz, 2020; Liguori et al., 2019; Lorz et al., 2013), the trend in favor of higher education research remains.

When Duval-Couetil (2013) highlighted the need for instruments with adequate psychometric properties that can be used in different studies to improve the generalizability of the findings, we could assume that her comment was based mainly on previous studies with university samples. This issue, however, is shared by studies conducted on pre-university samples.

Along with the consideration of how the entrepreneurship education outcomes are measured, the controversy is related to the broad set of attitudes, competences, and skills that are considered as outcomes. Following the categorization of outcomes presented by

Brüne and Lutz (2020), previous research has evaluated the impact of entrepreneurship education on different high school students' variables.

Non-cognitive skills. Maybe this is the more diverse cluster that includes a broad group of competences traditionally related to entrepreneurial behavior. Previous studies have considered the impact of entrepreneurship education on leadership (Athayde, 2012), creativity (Athayde, 2012; Huber et al., 2014), interpersonal skills (Cheung, 2008), risk-taking (Huber et al., 2014; Sánchez, 2013; Schröder & Schmitt-Rodermund, 2006; Volery et al., 2013), need for achievement (Huber et al., 2014; Schröder & Schmitt-Rodermund, 2006; Volery et al., 2013), proactivity (Huber et al., 2014; Sánchez, 2013), among others.

Cognitive skills. The evaluation of cognitive skills is approached from two perspectives. Some authors investigated the impact of entrepreneurship education on general knowledge by evaluating its effect on school grades (Fitzgerald, 1999; Johansen & Schanke, 2014), while others investigated its specific impact on entrepreneurial knowledge (Bergman et al., 2011; Cárcamo-Solís et al., 2017; do Paço et al., 2011; Huber et al., 2014; Kourilsky & Esfandiari, 1997; Volery et al., 2013).

Beliefs, attitudes and perceptions. According to Mwasalwiba (2010), the consideration of attitudes, self-efficacy, or interest constitutes the third group of impact indicators in terms of their prevalence in effectiveness studies, just above academic standards and behavior. In this cluster, the outcomes that have been more frequently studied have been the attitudes toward entrepreneurship (Cárcamo-Solís et al., 2017; A. do Paço et al., 2015; Marques et al., 2012) and entrepreneurial self-efficacy (Bergman et al., 2011; Huber et al., 2014; Sánchez, 2013), with its closely related perceived desirability (Peterman & Kennedy, 2003; Volery et al., 2013) and perceived feasibility (Peterman & Kennedy,

2003; Volery et al., 2013). Apart from those variables, we can find others, such as the desire for future self-employment (Athayde, 2012) or entrepreneurial interest (Schröder & Schmitt-Rodermund, 2006).

Entrepreneurial intention. Although entrepreneurial intention could be highly related to beliefs and attitudes, it deserves its own category. It has been the most considered variable to assess a positive impact of entrepreneurship education in general entrepreneurship education research by far (Bae et al., 2014; Martin et al., 2013; Martínez-Gregorio et al., 2021). Furthermore, it is still one of the variables most frequently assessed despite not being that prevalent in pre-university studies (Huber et al., 2014; Marques et al., 2012; Peterman & Kennedy, 2003; Sánchez, 2013; Volery et al., 2013).

Actual venture creation and/or performance. This last category refers to actual entrepreneurial behavior. Although some authors argue that considering behavior is critical due to the gap between intention and behavior (Nabi et al., 2017), the main goal of developing these initiatives at the pre-university level is to provide students with information about future career paths (Schröder & Schmitt-Rodermund, 2006; von Graevenitz et al., 2010). Therefore, the creation of companies by students who discover a vocational interest as entrepreneurs would be as desirable as the prevention of the development of an entrepreneurial initiative by those students who do not want that professional career once they have more information about it (Schröder & Schmitt-Rodermund, 2006). This reason, along with the fact that the pre-university students are far from the possibility of creating a new venture, explains why few studies consider such variables in this educational stage (Elert et al., 2015; Sobel & King, 2008).

Except for the last category, all other variables are latent variables that cannot be directly observed in the evaluation. This fact

indicates that, in order to increase the methodological robustness of empirical studies, a step is needed to guarantee the adequate psychometric properties of the instruments used. Although in recent years some authors have made efforts in this direction, a review of the instruments used in previous empirical studies shows that there is still work to be done.

The main criticism that could be made is that most of them use ad hoc adaptations based on scales used in adults (Bergman et al., 2011; Cárcamo-Solís et al., 2017; Huber et al., 2014; Sánchez, 2013). These adaptations generally only report the results of reliability, without providing evidence of the validity of their inferences in the new group of application. Additionally, some of the studies do not include the items adapted and the reader cannot know which adaptations have been made. In addition, some of the constructs measured, such as entrepreneurial intention, are measured by single indicators (Athayde, 2012; Peterman & Kennedy, 2003).

So far, the disparity of constructs measured, the lack of psychometric studies, and the small number of empirical studies means that we still do not have "golden standards" for the measurement of each variable in the field. Consequently, we have chosen a set of outcomes to further explore its measurement to provide adequate instruments that could be used in future research with high school students. In this section, five studies share this objective, each of them focused on one specific outcome. Given that the most commonly used variable for the evaluation of the effectiveness of entrepreneurship interventions has been entrepreneurial intention (Bae et al., 2014; Martin et al., 2013; Martínez-Gregorio et al., 2021), the first study in this block focuses on adapting a scale commonly used for its measurement in adults for use in samples of adolescents (**Study 2**). Given the good performance of the scale in the Spanish sample, a second study was carried out to

ensure its adaptation to the Dominican Republic context (**Study 6**). As one of its main antecedents is entrepreneurial self-efficacy, we included a study specifically focused on it (**Study 5**). As objectives of the broad vision of entrepreneurship education, it is expected to promote positive competencies for students transferable to their personal and professional lives. Within these competencies, this thesis focuses on Psychological Capital (**Study 3**), as a variable that is receiving recent interest in the field of education and entrepreneurship (Martínez et al., 2019; Welter & Scrimshire, 2021), and prosocial behavior (**Study 4**), an expected outcome of those interventions based on teamwork and social orientation of entrepreneurship (Barba-Sánchez & Atienza-Sahuquillo, 2016; Cárcamo-Solís et al., 2017).

The approval of the Ethics Committee of the University of Valencia for these studies is included in the Appendix 3.

Study 2. Measuring Entrepreneurial Intention in Secondary Education: Validation of the EIQ

Martínez-Gregorio, S., & Oliver, A. (2022). Measuring Entrepreneurship Intention in Secondary Education: Validation of the Entrepreneurial Intention Questionnaire. *Journal of Psychoeducational Assessment*, 40(4), 499-513.
<https://doi.org/10.1177/07342829211069222>

Abstract

This article is the first attempt to validate the Entrepreneurial Intention Questionnaire (EIQ) in secondary education students. It is based on the Theory of Planned Behavior (TPB) and includes its constructs: attitude toward entrepreneurship, subjective norm, entrepreneurial self-efficacy, and entrepreneurial intention. The promotion of entrepreneurship in early education requires valid and reliable measures to assess the desired outcomes and evaluate the effectiveness of the interventions. The EIQ presents good psychometric qualities in a Spanish sample of high school students ($N= 226$): (a) the four-factor structure fits the data with factor loadings ranging between .378 and .862; (b) Each dimension presents satisfactory reliability results (above .7); (c) The dimensions reproduce expected relationships with entrepreneurial attitudes. Additionally, the adjustment of the TPB has been evidenced and entrepreneurship self-efficacy is the main antecedent of entrepreneurial intention. Consequently, the EIQ is adequate for secondary education in Spain, being especially useful for longitudinal studies.

Keywords: scale validation; entrepreneurship; entrepreneurial intention; secondary education; theory of planned behavior

Introduction

Entrepreneurship is an important factor in the economic development of the countries (Acs et al., 2017). Entrepreneurship is considered as a result of a conscious and planned decision (Liñán & Chen, 2009), that can be promoted and taught through education and experience (İyigün, 2015). From the European Commission (2016), entrepreneurship is understood as a lifelong skill that must be introduced in the early stages of education. Some European countries are actively promoting entrepreneurship education in secondary education. In the Spanish context, the Organic Law of Education (LOE, 2006) includes autonomy and personal initiative as competencies that must be promoted in compulsory education (Bernal-Guerrero, 2014). Entrepreneurship is considered a key competence for secondary education since the Organic Law for the Improvement of Education Quality (LOMCE, 2013). According to Johansen and Schanke (2013), almost 90% of secondary schools in Norway provide some kind of entrepreneurship education.

To foster entrepreneurship education in secondary schools is considered as a key instrument for the promotion of innovation systems and entrepreneurship (Fagerberg & Srholec, 2008). Huber et al. (2014) concluded that early entrepreneurship education is essential because entrepreneurial skills could be developed easier if they are promoted from the early education. Longitudinal studies evidence that the students who took a junior entrepreneurship program in high school were more likely to be enroll in entrepreneurship ventures (Elert et al., 2015).

Despite the tendency in government policy to promote entrepreneurship education in early education, entrepreneurship research has focused on the university population (Longva & Foss, 2018; Mwasalwiba, 2010; Nabi et al., 2017). Although not being

prevalent, some research has studied the effectiveness of entrepreneurial education in secondary students (e.g. Athayde, 2012; Peterman & Kennedy, 2003; Sánchez, 2013). Within the methodological rigorous impact studies, the effectiveness could be measured through the improvement in entrepreneurial attitudes (Athayde, 2012), entrepreneurial self-efficacy (Bergman et al., 2011; Sánchez, 2013), or entrepreneurial intention (Sánchez, 2013; Schröder & Schmitt-Rodermund, 2006), among other outcomes. Among all these possible variables, the most frequently used to assess the entrepreneurial education impact is entrepreneurial intention (Bae et al., 2014; Longva & Foss, 2018; Martínez-Gregorio et al., 2021).

The entrepreneurial intention could be understood as “the conscious state of mind that precedes action and directs attention toward entrepreneurial behaviors such as starting a new business and becoming an entrepreneur” (Moriano et al., 2012, p. 165). Its importance resides in its predictive power on behavior (Armitage & Conner, 2001). Although some controversy regarding the intention-behavior link exists in the entrepreneurship field, recent research supports Krueger’s claim (2000), who considered entrepreneurial intention as the single best predictor of entrepreneurial behavior. Since Kautonen et al. (2015) carried out a longitudinal study that supported the effect of entrepreneurial intention on behavior, some authors have added evidence in the same direction (Belchior & Lyons, 2021; Gieure et al., 2020).

Regarding the conceptualization of entrepreneurial intention and its antecedents, the most frequent theoretical framework is the Theory of Planned Behavior (TPB) (Ajzen, 2001) (Liñán & Fayolle, 2015). This theory posits three antecedents of intention: attitude toward the behavior, subjective norm, and perceived behavioral control. The rest of

the factors are considered to influence intentions through these factors (Moriano et al., 2012).

The first antecedent is the attitude toward entrepreneurship, it is understood as the positive or negative personal evaluation of the condition of being an entrepreneur (Kolvereid, 1996b). Subjective norm refers to the social support to carry out (or not) an entrepreneurial behavior (Liñán & Chen, 2009). Currently, some controversy regarding the effect of subjective norm exists. Since Armitage and Conner (2001) questioned its predictive power, alternative models have been tested. Heuer and Liñán (2013) satisfactorily tested a modified model in which subjective norm has an indirect effect on entrepreneurial intention through attitudes toward entrepreneurship and perceived behavioral control. Finally, perceived behavioral control is defined as the perceived ease to perform an entrepreneurial behavior. Although Ajzen (2002) stated perceived behavioral control has the third component of the TPB, numerous studies have replaced perceived behavioral control with entrepreneurial self-efficacy (Krueger et al., 2000; Moriano, 2005; Van Gelderen et al., 2008). Despite being related constructs, Ajzen (2002) emphasized their differences, including the controllability component in perceived behavioral control. In their meta-analytic review, Armitage and Conner (2001) supported a distinction between self-efficacy and perceived behavioral control, concluding that self-efficacy could be a better predictor of entrepreneurial intention.

A related topic of interest is how this variable could be measured. In the beginning, the measurement of entrepreneurial intention in the general population had been full of controversial practices (Liñán & Chen, 2009; Thompson, 2009). Some studies used single items to measure intention (Barba-Sánchez & Atienza-Sahuquillo, 2018; Krueger et al., 2000; Shahin et al., 2021), or defined entrepreneurial intention as the opposite of organizational employment (Kolvereid,

1996). The scale most frequently used was developed by Liñán and Chen (2009). This scale follows the structure of the TPB, including 4 subscales: entrepreneurial intention, subjective norm, attitude toward entrepreneurship, and perceived behavioral control. With this scale, Liñán and Chen (2009) tried to solve the “need to develop more adequate reliable and valid instruments to analyze entrepreneurial perceptions and intentions.” (p. 594). Although some authors have developed alternative scales (e.g. Asghar et al., 2019; Kautonen et al., 2015; Thompson, 2009), one of the most interesting ones is the Entrepreneurial Intention Questionnaire (EIQ), initially developed by Moriano (2005) and updated latterly by Rueda et al. (2015). Surprisingly, despite being different scales, the scale published by Moriano (2005) and Rueda et al. (2015) and the one by Liñán and Chen (2009) share the same name. From now on, in this article, the EIQ will refer to the scale developed by Rueda et al. (2015).

Unlike previous scales, the EIQ follows Ajzen’s (2002) recommendations of how to measure attitudes and subjective norms as a composite measure (Moriano et al., 2012). This scale has been validated in different countries (Da Fonseca Oliveira et al., 2016; Laguía et al., 2017; Rueda et al., 2015), and it has been used in cross-cultural studies (Moriano et al., 2012). Nevertheless, most of the samples were university students (Laguía et al., 2017), and it has never been validated for secondary or high school students.

As previously stated, little attention has been paid to the early stages of compulsory education. However, recently, some scales have been validated in secondary samples to measure basic business knowledge (Bernal-Guerrero et al., 2020), entrepreneurial competencies (Cárdenas-Gutiérrez et al., 2021), or attitudes toward entrepreneurship (Oliver & Galiana, 2015). Sánchez (2013) was the first attempt to explore entrepreneurial intention in the context of secondary

school Spanish students, whereas do Paço et al. (2011) satisfactorily tested the TPB model with secondary students. But there is still a need to develop reliable and valid instruments to measure entrepreneurial intention in secondary education.

This study aims to adapt and validate the EIQ-Entrepreneurial Intention Questionnaire (Rueda et al., 2015) in a Spanish sample of secondary students. The objectives are specifically for secondary student population: (a) to test the factorial structure of the scale, (b) to analyze its reliability, (c) to test the relationships between TPB constructs and entrepreneurial attitudes, as external validity evidence, and (d) to study the adequacy of competing models of TPB (Heuer & Liñán, 2013), in which subjective norm has a different role.

Method

Sample and procedure

Our sample consisted of 226 secondary students from high schools of Valencia (Spain). 58.8% were girls ($n= 133$). The age of the participants ranged between 11 and 17, with an average age of 14.03 ($SD= 1.46$). 56.2% attended public high schools ($n= 127$), whereas 41.2% attended private institutions ($n= 93$).

Data came from a cross-sectional study that met the ethical standards of the American Psychological Association (APA). The research received the ethical approval of the Ethical Commission of #anonymized (anonymized reference). The questionnaires were distributed online (92.48%, $n= 209$) or in paper in the high schools (7.52%, $n= 17$), as required for some schools. The questionnaires were administered once the authorities and parents had been informed about the objectives and procedure of the survey and had approved the

protocol. Participation was voluntary and not rewarded. Anonymity and confidentiality were guaranteed, previously each family had to sign an informed consent to allow the participation of their children. The questionnaire took about 25 minutes to complete, approximately.

Instruments

The survey included a set of socio-demographic questions and the following scales:

Entrepreneurial Intention Questionnaire (EIQ) (Rueda et al., 2015). In this study, we used an adapted version of the EIQ to the high school context. The EIQ scale is available under request to the original authors (Rueda et al., 2015). This scale included four subscales: attitudes toward entrepreneurship, subjective norm, entrepreneurial self-efficacy, and entrepreneurial intention. All items were measured through a Likert scale ranging between 0 and 6.

As mentioned, the EIQ follows Ajzen's (2002b) recommendations, measuring attitudes and subjective norm as composite measures. Consequently, attitude toward entrepreneurship was measured with two groups of six items. The first group asked about the expected results of entrepreneurship and the second one, about the desirability of these results. Both sets of items are multiplied, and a higher score means a more positive attitude toward entrepreneurship. Subjective norm was measured as a composite measure too. It included three items asking for the perception of the significant others about entrepreneurship and three items asking for the importance given to these reference people. These sets of items should be multiple to obtain the 3 final items for subjective norm.

Regarding entrepreneurship self-efficacy, it was measured by 6 items. The subscale of entrepreneurial intention was composed of 5 items asking about the likelihood of the individual to follow an

entrepreneurship career. The psychometric properties of the scale in secondary students are reported in the present paper.

We carried out some modifications to the original scale to adapt it to secondary education students. The dimensions of attitudes toward entrepreneurship and self-efficacy remain identical. In the measurement of subjective norm, Rueda et al. (2015) considered five groups of significant others: close family, close friends, colleagues, partners, and children. Some of these items have no sense in adolescence. Consequently, the modified version asks for the perception about entrepreneurship and the importance given to close family, friends, and teachers. Regarding the dimensions of entrepreneurial intention Item 1, 2, and 6 remain identical. Item 3 has been adapted changing “if the opportunity presents itself” by “If you had the opportunity to choose freely the career to follow, what would you prefer?”. Item 4 asked for the probability to start a business in the following five years. It has been changed by “Imagine you are finishing your studies; with what probability do you consider to create your own business from then to five years in time?” Lastly, Items 5 have been removed because it asked for the entrepreneurial intention in the following 12 months, which is impossible for students 12-16 years old.

Entrepreneurial Attitudes Scale for Students (EASS) (Oliver & Galiana, 2015). This scale measures six entrepreneurial attitudes: proactivity, professional ethics, empathy, innovation, autonomy, and risk-taking. Each attitude constitutes a subscale with 3 items. All items were measured through a Likert scale ranging between 1 (“strongly disagree”) and 6 (“strongly agree”). The six-factor structure fitted the data adequately ($\chi^2(120) = 220.516$ ($p < .01$), CFI = .965, SRMR = .048, RMSEA = .061 [CI .048-.073]) and Composite Reliability Index (CRI) for each subscale were: .67, .70, .81, .83, .86 and .56, respectively. These

results support the psychometric properties reported by Oliver and Galiana (2015).

Statistical analysis

The validation of the scale was carried out following previous objectives. Factorial validity was tested via confirmatory factor analysis (CFA) with WLSMV (Weighted Least Square Mean and Variance corrected). The model fit of the data was assessed following several fit criteria recommended in the literature (Hu & Bentler, 1999): chi-square statistics, a comparative fit index above .90, the root mean squared error of approximation (RMSEA) under .08 and the standardized root mean squared residuals (SRMR) under .08.

The statistical analysis of the scale included items' means, standard deviation, inter-item correlation, and corrected item-total correlations. Reliability was assessed via Cronbach's alpha and Composite Reliability Index (CRI) (Raykov et al., 2010), both considered adequate when values $\geq .70$ (Hair et al., 2014).

Evidence for the external validity was obtained correlating the TPB constructs (attitudes toward entrepreneurship, subjective norm, entrepreneurial self-efficacy, and entrepreneurial intention) with the attitudes included in the EASS (proactivity, professional ethics, empathy, innovation, autonomy, and risk-taking).

Additionally, competing TPB models were tested via structural equation modeling with the aforementioned fit criteria. Jöreskog (1993) three uses of structural equation models as a way for testing a theory: strictly confirmatory, alternative models and model generating. In this paper, alternative models have been used to determinate, between two models, which TPB approach fits better the data.

To perform the analysis, we used IBM SPSS Statistics and Mplus 8.5.

Results

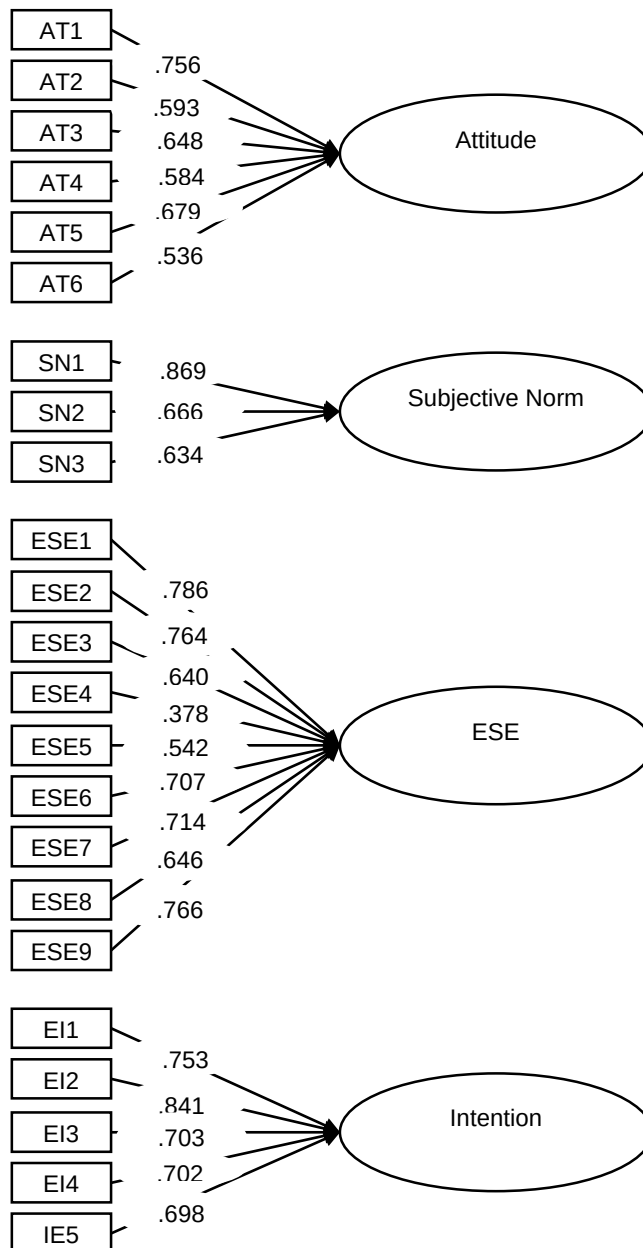
Factorial structure

The four-factor structure proposed in previous literature fitted the data adequately: χ^2 (224) = 502.927 ($p < .001$), CFI = .915, RMSEA = .074, 90% CI [.066, .083], and SRMR = .057. Figure 6 shows the CFA performed with the standardized factor loadings. The factor loadings ranged between .378 and .862. Consequently, each indicator showed a high and statistically significant loading in its theoretical factor ($p < .001$).

As expected, all the factors were positively correlated. The correlations between entrepreneurial intention and attitudes, subjective norm and entrepreneurial self-efficacy were .567, .346, and .665, respectively. The theoretical antecedents of entrepreneurial intention showed a positive correlation between them: attitudes and subjective norm .563, attitudes and self-efficacy .593, and subjective norm and self-efficacy .409.

Reliability and descriptive statistics

Table 5 includes the descriptive statistics (mean, standard deviation, skewness, kurtosis, inter-item correlation, and corrected item overall correlation) of all the items grouped by factor. As reliability measures, two indicators were considered: Cronbach's Alpha and Composite Reliability Index (CRI). The Cronbach's Alpha for attitude was .802, .756 for subjective norm, .842 for self-efficacy, and .807 for entrepreneurial intention. These results were similar to CRIs, whose values were .802 for attitude, .767 for subjective norm, .878 for self-efficacy, and .865 for entrepreneurial intention. Consequently, we report adequate reliability results for all the dimensions in our sample.

Figure 6*Factorial structure*

Note. All the factor loadings were statistically significant ($p < .001$). ESE = Entrepreneurship Self-Efficacy.

Table 5

Means (M), Standard Deviations (SD), skewness (g1), kurtosis (g2), inter-item correlations, and corrected item-total correlations for the EIQ (r_{it})

		M	SD	g1	g2	1	2	3	4	5	6	7	8	r_{it}
Attitude	1	3.78	1.50	.36	-.19									.67
	2	4.03	1.60	.01	-.42	.46								.53
	3	4.37	1.77	.02	-.94	.59	.52							.63
	4	4.01	1.59	.31	-.45	.39	.28	.31						.51
	5	3.19	1.47	.62	.29	.62	.35	.43	.43					.57
	6	4.12	1.97	.02	-1.04	.26	.34	.38	.42	.28				.47
SN	1	5.03	1.63	-.55	-.44									.64
	2	4.18	1.51	-.06	-.44	.63								.62
	3	3.43	1.80	.25	-.64	.47	.44							.50
ESE	1	5.28	1.32	-.44	-.24									.65
	2	5.00	1.41	-.56	-.24	.67								.62
	3	4.66	1.46	-.33	-.27	.50	.43							.59
	4	3.97	1.79	-.21	-.81	.22	.19	.36						.35
	5	5.38	1.38	-.79	.41	.40	.37	.22	.26					.44
	6	5.54	1.35	-.77	.33	.38	.43	.34	.13	.28				.57
	7	4.96	1.36	-.46	.15	.40	.41	.41	.29	.27	.49			.62
	8	5.13	1.38	-.54	.24	.39	.31	.39	.30	.21	.42	.58		.57
	9	5.43	1.27	-.56	.01	.47	.48	.39	.22	.40	.50	.50	.42	.62
Intention	1	3.45	2.22	.35	-1.32									.59
	2	3.83	1.85	.18	-.82	.62								.73
	3	4.72	1.92	-.51	-.62	.40	.60							.60
	4	4.00	1.69	-.03	-.60	.41	.60	.54						.63
	5	5.54	1.82	-1.20	.57	.33	.34	.34	.37					.43

Note. SN: Subjective norm; ESE: entrepreneurial self-efficacy

External validity

As evidence of external validity, we performed correlations between the entrepreneurial attitudes include in the EASS and the TPB constructs

included in the EIQ: attitude toward entrepreneurship, subjective norm, entrepreneurial self-efficacy, and entrepreneurial intention. The results are included in Table 6. All the correlations were positive and statistically significant ($p < .001$). The lowest correlations were between empathy and entrepreneurial intention, and between subjective norm and proactivity. The highest correlations were between attitude and innovation and autonomy and attitude.

Table 6

Correlations between entrepreneurial intention (EIQ) and entrepreneurial attitudes' (EASS) dimensions

EASS						
EIQ	Proactivity	Ethics	Empathy	Innovation	Autonomy	Risk-taking
Attitude	.342	.404	.279	.481	.481	.458
SN	.176	.304	.313	.307	.380	.233
ESE	.398	.439	.285	.475	.410	.407
Intention	.331	.363	.137	.447	.309	.328

Note: SN: Subjective norm; ESE: entrepreneurial self-efficacy

Competing TPB models in secondary students

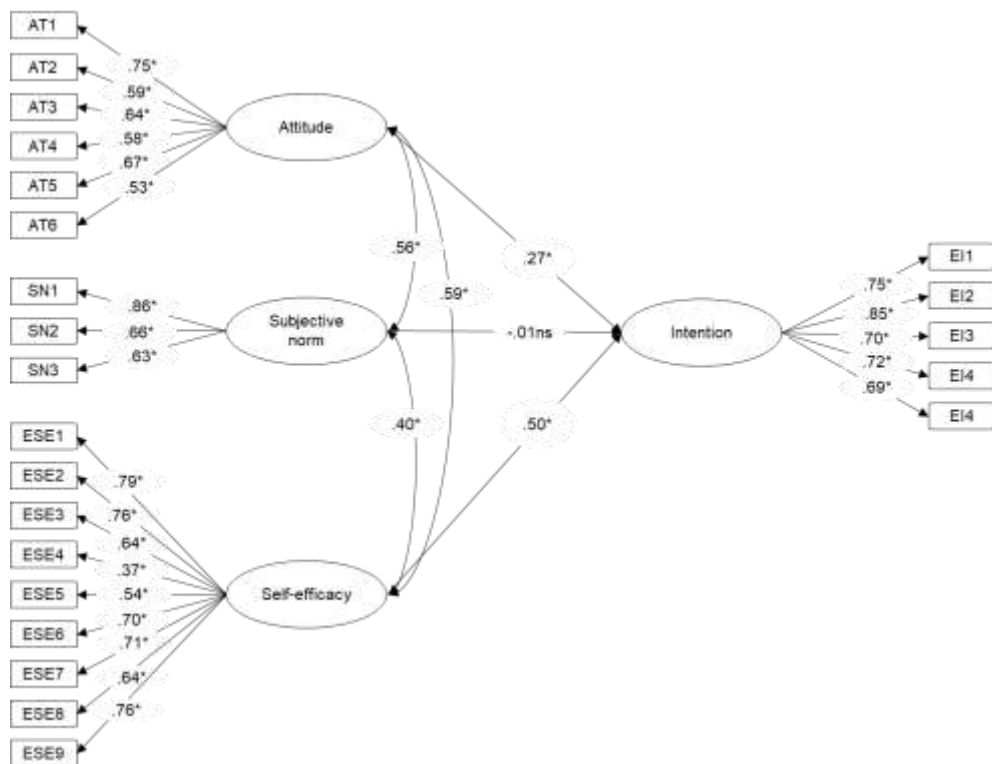
Finally, competing TPB models were tested in secondary education students. Firstly, the goodness of fit of the traditional TPB model proposed by Ajzen (2001) was tested. As theory suggested, Model 1 was proposed with the dimensions of attitude, subjective norm, and entrepreneurial self-efficacy as antecedents of entrepreneurial intention. The model fitted the data satisfactorily: χ^2 (224) = 502.927 ($p < .001$), CFI = .915, RMSEA = .074, 90% CI [.066, .083], and SRMR = .057.

Figure 7 presents the structural equation model with the structural coefficients. As can be seen, the stronger predictor of

entrepreneurial intention was the entrepreneurial self-efficacy ($\beta = .50$, $p < .001$), followed by attitude ($\beta = .27$, $p < .001$). Although the high correlations of subjective norm with attitude ($\beta = .56$, $p < .001$) and entrepreneurial self-efficacy ($\beta = .40$, $p < .001$), it had no direct effect on entrepreneurial intention ($\beta = -.01$, $p > .05$). Moreover, the relationship between attitude and self-efficacy was strong ($\beta = .59$, $p < .001$). Model 1 explained 49.5% of the variance of entrepreneurial intention.

Figure 7

Model 1. Traditional TPB model



Note. * $p < .001$

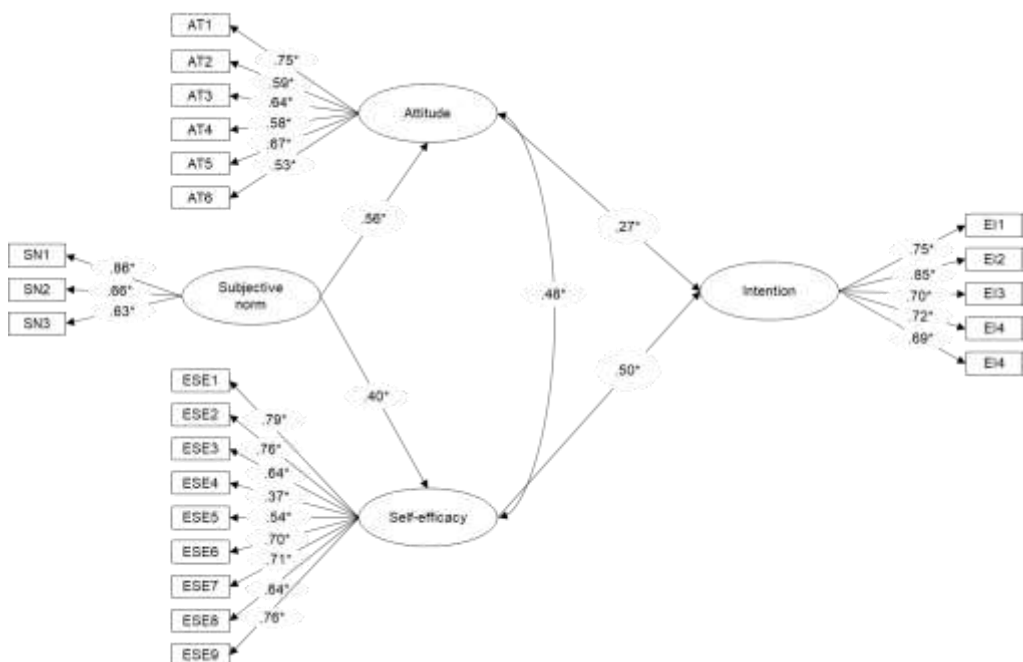
Next, a modified TPB model based on Heuer and Liñán (2013) was tested (Model 2). Model 2 differs from Model 1 by including an

indirect effect of subjective norm on entrepreneurial intention through attitudes toward entrepreneurship and self-efficacy instead of a direct effect. The model presented a satisfactory fit to the data: χ^2 (225) = 494.440 ($p < .001$), CFI = .918, RMSEA = .073, 90% CI [.064, .082], and SRMR = .057.

Figure 8 shows Model 2 with the standardized structural coefficients. The effects of attitudes toward entrepreneurship and self-efficacy are like Model 1: $\beta = .26$ ($p < .001$) and $\beta = .50$ ($p < .001$), respectively. Subjective norm explained 31.5% of attitude toward entrepreneurship and 16.5% of self-efficacy. Consequently, it showed a statistically significant indirect effect on entrepreneurial intention ($\beta = .35$, $p < .001$). Model 2 explained 48.6% of the variance of entrepreneurial intention.

Figure 8

Model 2: Modified TPB model



Note: * $p < .001$

Discussion

The growing interest in entrepreneurial education (Aparicio et al., 2019) in the early educational stages is a challenge for researchers (Aggarwal & Shrivastava, 2021; Bernal-Guerrero & Cárdenas-Gutiérrez, 2017; Liñán & Fayolle, 2015). To follow recent governmental educational recommendations and policies, it is crucial to have adapted entrepreneurship programs and reliable instruments to measure their effectiveness. Consequently, the aim of this study was to provide evidence about the adequacy of the EIQ (Rueda et al., 2015) in secondary student samples.

The EIQ has shown satisfactory psychometric properties that support its use in secondary education. Following the TPB model, the EIQ reproduces the four-factor structure that includes the dimensions of entrepreneurial intention and its three antecedents: attitude, subjective norm, and entrepreneurial self-efficacy. Moreover, all items present high and statistically significant factor loadings into their theoretical latent factor. Our results are similar to those found in previous studies with samples of university students in different countries (Da Fonseca Oliveira et al., 2016; Laguía et al., 2017; Rueda et al., 2015).

Regarding the reliability results, Cronbach alphas and CRIs are all above the cut-off value of .70 for all dimensions. The CRIs are provided to complement the reliability study as they have been considered as a more accurate measure of reliability (Raykov et al., 2010).

Once the factorial validity and reliability are established, the psychometric study is complemented with evidence of external validity. Each dimension is correlated with the entrepreneurial attitudes included in the EASS (Oliver & Galiana, 2015).

Finally, the adequacy of the TPB model in secondary education is supported. Specifically, both models show satisfactory goodness-of-fit indices. As expected, and evidenced in previous studies, attitudes and entrepreneurial self-efficacy are antecedents with an impact on entrepreneurial intention. However, the direct effect of subjective norm on entrepreneurial intention proposed in the traditional TPB model is not supported. This result is consistent with the traditionally weak role of subjective norm in the model (Armitage & Conner, 2001; Liñán & Chen, 2009) and agree with non-significant direct effects in previous studies (Autio et al., 2001; Esfandiar et al., 2019; Krueger et al., 2000; Schlaegel & Koenig, 2014). Previous EIQ validation studies with university samples showed low direct effect of subjective norm on entrepreneurial intention, ranging between .08 and .15 (Da Fonseca et al., 2016; Laguía et al., 2017; Rueda et al., 2015). Liñán and Chen (2009) suggested the possibility of an indirect effect of subjective norm through entrepreneurial self-efficacy and attitude. This effect has been tested following Heuer and Liñán (2013) proposal. Agreeing recent research (Farooq, 2018; Kruse, 2020), subjective norm seem to be an antecedent of attitudes toward entrepreneurship and self-efficacy. Despite not having a direct effect on entrepreneurial intention, it remains theoretical relevant by presenting a moderate indirect effect.

This result is contextualized in a Spanish secondary student sample. Cultural context and sample characteristics are relevant in the study of subjective norm. Moriano et al. (2012) found that the direct effect of subjective norm could vary across countries, not being significant in Spain, but in India or Netherlands. However, the effect of subjective norm is not consistent across studies. Kautonen et al. (2015) hypothesized that differences in the effect of subjective norm across studies could be related to the samples, being subjective norm less important in students' samples than in the adult population.

The traditional TPB model validated with the EIQ explains the 49.5% of the variance of entrepreneurial intention, whereas the modified version explains 48.6%. Both percentages as a little bit higher than the previously found in EIQ validations with university samples, which ranges between 39 to 46.5% (Da Fonseca Oliveira et al., 2016; Laguía et al., 2017; Moriano et al., 2012; Rueda et al., 2015). When TPB is tested with other questionnaires, the quantity of explained variance is also similar in the adult population (Kautonen et al., 2013, 2015) and secondary students (do Paço et al., 2011; Roy et al., 2017). To achieve a better explanation of entrepreneurial intention, researchers have explored different pathways. One alternative is the integration of the TPB model with the Entrepreneurial Event Model (EEM) (Shapero & Sokol, 1982), which could increase the percentage of explained variance of entrepreneurial intention until 50-60% (Esfandiar et al., 2019; Schlaegel & Koenig, 2014; Solesvik et al., 2012). Another fruitful alternative is the consideration of personality traits as background variables in the TPB model, which could increase the predictive power until 40-80% (Eid et al., 2019; Karimi et al., 2017; Maheshwari, 2021; Munir et al., 2019; R. Roy et al., 2017). Consequently, although TPB antecedents seem to be the most predictive variables (Maheshwari, 2021), other constructs should be also measured in secondary education to complement the EIQ.

The present **Study 2** has limitations that should be considered for generalization. First, the study was carried out with Spanish students. Additionally, although the sample size fits literature recommendations according structural complexity of the model (Soper, 2021; Westland, 2010) in order to test the Structural Equation Model (for 4 latent and 23 observed variables with a desired statistical level of .8, anticipated overall effect size of .25 and probability of .05 the minimum required is 209 cases), to generalize the results and strengthen this evidence, it is

necessary to continue research on the application of this scale in different contexts. Second, the study design was cross-sectional and the antecedents of entrepreneurial intention were measured at the same time that entrepreneurial intention. These design characteristics do not allow us to make any causal inferences. Finally, the intention-behavior gap is not studied. As a result, the predictive validity of the scale considering entrepreneurship behavior as the outcome is not evidenced.

In conclusion, the adapted version of the EIQ has evidence of validity and reliability measuring TPB constructs in secondary education in the Spanish-speaking context. Consequently, this scale could be used in future research to evaluate the prevalence of entrepreneurial intention in high schools. It is a useful and standardized instrument to test the effectiveness of entrepreneurship programs. Additionally, our results suggest the adequacy of the EIQ for longitudinal studies, since it is one of the few scales that have validations that support its use in secondary education and university.

Study 3. Bayesian Confirmatory Factor Analysis of the Psychological Capital PCQ-12 Scale

Tomás, J. M., Martínez-Gregorio, S., & Oliver, A. (2022). Bayesian confirmatory factor analysis of the psychological capital PCQ-12 scale. *European Journal of Psychological Assessment*. Advance online publication. <https://doi.org/10.1027/1015-5759/a000738>

Abstract

Psychological Capital (PsyCap) is a key construct in psychological research across the life span. Despite the PCQ-12 is among the most used scales to approach its measurement, its factor structure and reliability remain controversial, in particular, in adolescents' samples. Data came from a cross-sectional survey administered to 267 Spanish adolescents, 59.9% girls (mean age 13.96, $SD= 1.56$). Confirmatory Factor Analyses (CFAs) in Mplus 8.6 were used to compare four competitive models (one factor, four correlated factors, second order structure and a bifactor structure) estimated with Bayesian methods. Although Efficacy, Hope and Optimism significantly explained their indicators, and their cross-loadings were not statistically significant, Resilience operated differently. We obtained evidence supporting the second order structure. Also, it came clear, the scale has difficulties in measuring Resilience in adolescents. Consequently, further research should explore new adaptations or alternative measures to overcome these limitations when researching in adolescents.

Keywords: psychological capital; psychometric properties; adolescence; Bayesian CFA

Introduction

Psychological Capital (PsyCap) emerged as a key construct in the organizational literature (Avey et al., 2011), but its relevance across fields is evident (Siu et al., 2023). PsyCap is “an individual’s positive psychological state of development and is characterized by (1) having confidence (Self-Efficacy) to take on and put in the necessary effort to succeed at challenging tasks; (2) making a positive attribution (Optimism) about succeeding now and in the future; (3) persevering toward goals and, when necessary, redirecting paths to goals (Hope) in order to succeed; and (4) when beset by problems and adversity, sustaining and bouncing back and even beyond (Resilience) to attain success” (Luthans et al., 2015, p. 2). Its study in school-age youth is growing during the last years (Preston et al., 2021). It has been shown to promote subjective well-being (e.g. Datu & Valdez, 2016) or academic performance (e.g. Carmona–Halty et al., 2019; Datu et al., 2018), while reducing anxious and depressive symptoms (e.g. Finch et al., 2020).

The most used PsyCap scales are the 24-item PsyCap Questionnaire (PCQ-24; Luthans et al., 2007), and its brief version, the 12-items Psychological Capital Questionnaire (PCQ-12; Avey et al., 2011). There are alternatives as the Compound PsyCap scale (CPC-12, Lorenz et al., 2016) or an adapted version of the PCQ-12 (Djourova et al., 2019). The PCQ-12 has been adapted to the academic context (Martínez et al., 2021; Schönfeld & Mesurado, 2020) and also new scales have been developed specifically for students partially based on the PCQ-12 (King & Caleon, 2021).

Despite its use, factor structure and reliability of PCQ-12 remain controversial (Dawkins et al., 2013; Djourova et al., 2019). Regarding its factorial structure, the original authors proposed a hierarchical structure with four first-order factors (Self-efficacy, Hope, Resilience, and

Optimism) and one second-order one (PsyCap) (Avey et al., 2011). However, some studies found that a four-factor structure fits better than the second-order model (e.g. López-Núñez et al., 2018; Santana-Cárdenas et al., 2018; Viseu et al., 2012). This controversy seems to appear, largely, in the adaptations of the scale in Portugal and Spain, which could indicate an effect related to the context or translation (Djourouva et al., 2019). Regarding its reliability, some studies showed problems in some dimensions: in Resilience ($\alpha=.5$) and Optimism ($\alpha=.64$) (López-Núñez et al., 2018); and also in resilience (Santana-Cárdenas et al., 2018; Viseu et al., 2012).

In adolescents' samples, to date two validations of the PCQ-12 have been carried out, and both showed some psychometric problems. Martínez et al. (2021) found in Spanish and Chilean samples alphas of .59 and .68, respectively, for Resilience, and .62 for Optimism in the Spanish sample. Besides, the initial second order structure only fitted the data well after covariances among residuals were included. Furthermore, the second-order structure was not compared with the alternative four-factor structure. Schönfeld and Mesurado (2020) tested the scale in Argentinian adolescents with good reliability results but they tested a four-factor model without comparing it with the second-order model initially proposed in the literature. The fact that previous validations in adolescent samples tested different factor structures without compering alternative models evidences the lack of consensus in the field.

As the PsyCap research is receiving attention in recent years and the PCQ-12 is used frequently (Martínez et al., 2019; Siu et al., 2023), it is essential to guarantee its adequate psychometric properties. The PCQ-12 offers a shorter alternative to the PCQ-24 for studies where there are time constraints. This advantage justifies the need to explore its psychometric properties and work to improve them. This study aims

to deepen the study of the PCQ-12 in academic contexts studying its factor structure and reliability.

Method

Participants

Several private and public high schools were contacted to distribute an online questionnaire among their students. Participation was completely voluntary and non-rewarded. Participants were 267 adolescents from Valencia (Spain), with mean age 13.96 ($SD= 1.56$). Ages ranged from 9 to 17 years. In terms of age categories: 22.7% in the range 9-12; 35.4% between 13-14; and 41.9% between 15-17. 59.9% were females. 141 students came from public high schools (52.8%), whereas 116 study in private ones (43.4%). For a CFA model with 12 indicators, four latent variables, power of .8, alpha of .05 and an effect size of .4, the sample size calculator expected a minimum sample size of 200 (Soper, 2021).

Instruments

Psychological Capital was measured with the Spanish version of the PCQ-12 (León-Pérez et al., 2017) adapted to academic contexts with students' samples (v. gr. Luthans et al., 2014; Martínez et al., 2021). The adaptation consists of changing references to "work" to "schoolwork" or "studies". It has four dimensions: Self-efficacy (three items), Hope (four items), Resilience (three items), and Optimism (two items). The response format was from *strongly disagree* (1) to *strongly agree* (5).

Procedure

Data collection was conducted online using SurveyMonkey between January and February 2021. The research met APA's ethical standards

and it was approved by the Ethical Commission of the University of Valencia (UV-INV_ETICA-1283019). Participation in the study was voluntary and anonymous. Prior to the start of the survey, families and participants signed an informed consent.

Data analysis

Confirmatory Factor Analyses (CFAs) were conducted to compare competitive structures in Mplus 8.7 (Muthén & Muthén, 1998-2017), and were estimated with Bayesian estimation. Model fit was assessed with: Posterior Predicted p-value (PPp), Bayesian Comparative Fit Index (BCFI), Bayesian Root Mean Square Error of Approximation (BRMSEA), and Deviance Information Criterion (DIC). In order to assess model fit, we have considered values larger than .95 for the CFI and lower than .08 for the RMSEA (Asparouhov & Muthén, 2021; Hu & Bentler, 1999). For model comparison, BCFI differences of less than .01 are considered negligible (G. W. Cheung & Rensvold, 2002), and lower values of DIC are considered indicative of better relative fit. Two independent Markov Chain Monte Carlo (MCMC) chains were used for BCFA (Asparouhov et al., 2015), with a minimum of 200000 iterations, and thin=4. Muthén and Asparouhov (2012) proposed a new statistical approach, BCFA with near-zero cross-loadings. This approach allows simultaneous estimation of all cross-loadings by using approximate near-zero informative priors to replace the exact zeros for the cross-loadings. Two set of priors were used for BCFA: diffuse priors without cross-loadings (i.e., cross-loadings were fixed to exact zero); and BCFA with informative priors for all cross-loadings. These informative priors were normal with mean hyperparameter set to zero and a small variance hyperparameter of 0.01, which yields cross-loading bounds of ± 0.20 (Muthén & Asparouhov, 2012). Additionally, a sensitivity analysis on priors was made by testing multiple variance hyperparameters: .001, .005, .01, and .05. This sensitivity analyses reinforced the use of .01 as

the variance hyperparameter. Model convergence was monitored by potential scale reduction (< 1.10 suggesting convergence), checking of trace and autocorrelation plots and calculation of effective sample size.

Results

Four a-priori factors structures were tested: one factor, four correlated factors, a second order model, and a bifactor structure. The four-factor and the second order models were also estimated with BCFA with near-zero cross-loadings. Therefore, six CFAs were finally tested.

Goodness-of-fit indices are shown in Table 7. The one-factor structure did not reach a reasonable fit. The four correlated factors, the second order model and the bifactor model had very good model fit. The inclusion of near-zero prior cross-loading lead best fit (cross loadings exactly zero are not tenable). The best fitting models were the second order model and the bifactor. However, fit differences were negligible between these two models, the BCFI differences was .009 (less than .01) and the DIC differences were only 1.6. Therefore, the most parsimonious second order model was retained.

Table 7*Fit indices and statistics for the estimated models*

Model	PPp	DIC	BRMSEA [CI 90%]	BCFI [CI 90%]
One factor	<.01	8343.3	.129 [.125, .133]	.734 [.715, .750]
Four factors	.012	8170.5	.059 [.047, .073]	.952 [.929, .970]
Four factors near-zero priors	.142	8153.8	.044 [.000, .065]	.974 [.943, 1.00]
Second order	.009	8165.3	.056 [.046, .067]	.952 [.931, .968]
Second order near-zero priors	.121	8147.2	.041 [.018, .057]	.975 [.951, .995]
Bifactor model	.217	8145.6	.035 [.000, .054]	.984 [.962, 1.00]

Note. PPp= Posterior Predictive p-value, DIC= Deviance Information Criterion, BRMSEA Bayesian RMSEA, BCFI= Bayesian CFI, CI= Credibility Interval.

Table 8 offers the standardized factor loadings for the best fitting model (second order model with near zero priors). While Self-Efficacy, Hope and Optimism significantly explained their indicators, and their cross-loadings were not statistically significant, Resilience operated differently. Cross-loadings with other factors were also statistically non-significant but its own indicators were not significantly related to Resilience, except for one item in the second order model. The best fitting model is the second order BCFA with near zero priors. Additionally, second-order standardized loadings for Self-efficacy, Hope, Resilience and Optimism were, respectively: .549, .876, .889, and .788.

Table 8

Standardized factor loadings for the best fitting model, the second order model: Bayesian second order model with near-zero cross-loadings in the second column

Item	Self-Efficacy	Hope	Resilience	Optimism
1 Self-Efficacy 1	.699*	.030	.018	.013
2 Self-Efficacy 2	.940*	-.029	-.010	-.002
3 Self-Efficacy 3	.673*	-.015	.025	.041
4 Hope 1	-.055	.486*	.044	.075
5 Hope 2	-.010	.832*	-.007	.037
6 Hope 3	-.013	.544*	.026	.078
7 Hope 4	-.005	.774*	-.006	.022
8 Resilience 1	.013	.024	.654*	.033
9 Resilience 2	.069	-.002	.208	.018
10 Resilience 3	.075	-.011	.126	.014
11 Optimism 1	.054	-.002	-.015	.621*
12 Optimism 2	.023	.011	.002	.648*

Note. * = 95% credible interval (CI) did not include 0, cross loadings in italics.

These results are reinforced when Composite Reliability Indexes (CRIs) are computed for the four factors based on the loadings of their indicators. CRIs are adequate for Self-Efficacy (.82) and Hope (.76), but not for Optimism (.57) and especially for Resilience (.28). This result shows that the amount of shared variance in the Resilience factor is, for this sample, almost irrelevant.

Discussion

Psychological capital (PsyCap) is an important construct that has been related to many different outcomes in psychological research. Some researchers have shown its usefulness in the academic field by showing its relationship with academic performance (Luthans et al., 2019; Martínez et al., 2019). Therefore, its adequate measurement in populations of students is a non-trivial task. In this vein, this research provides psychometric evidence, from a Bayesian approach, for the PCQ-12 in academic contexts.

While the original development and validation found a second-order structure for the scale (Avey et al., 2011), most studies reported evidence for a four-correlated-factor structure (López-Núñez et al., 2018; Santana-Cárdenas et al., 2018; Viseu et al., 2012). This research has tested four alternative models: one factor, four factors, a second-order factor, and a bifactor model. To our knowledge, our research is the first one that explores the possibility of a bifactor structure. Among them, the second-order model and the bifactor showed the best fit to the data. For the sake of parsimony, the second-order model is retained. These results support the original factor structure proposed by the authors (Avey et al., 2011) and some previous research (e.g. Kamei et al., 2018; León-Pérez et al., 2017).

Although the overall model fit of the scale is adequate, this scale has important psychometric problems, specifically in the measure of Resilience. Reliability results of our research show that, with a sample of this age, the valid measurement of Optimism and especially Resilience is jeopardized, which is in line with other results found in the Spanish-speaking context (Martínez et al., 2021; Schönfeld & Mesurado, 2020). The indicators of Resilience in the PsyCap scale simply do not share enough common variance and the measuring of this

dimension of PsyCap is poor. Resilience items came from the Resilience Scale (Wagnild & Young, 1993), a 25-item scale that has been considered the best option to study resilience in the adolescent population (Ahern et al., 2006). However, the items included in the PCQ-12 were chosen based on the psychometric results of the PCQ-24 in a sample of 106 engineers (Avey et al., 2011), retaining those items with higher factor loadings, and better contribution to internal reliability and construct validity. This procedure, based on a small non-representative sample, could not guarantee the adequacy of the item selection in other samples.

The Resilience item with the worst performance in the factor was Item 10 (“I can get through difficult times at school because I’ve experienced difficulty before”). The same item showed a factor loading under .3 in a Spanish adaptation (Léon-Pérez et al., 2017). Item wording could be complex to understand and difficult to answer for adolescents because it is asking for the co-occurrence of two facts: (1) “I can get through difficult times at school” and (2) “I’ve experienced difficulty times”, and the second fact led me to the first one. Younger students could have not experienced difficult times, and still believe in their ability to succeed in the future. However, the reliability problems in the Resilience factor were not always related to this item in previous literature. Some studies have also found problems with item 9 (Martínez et al., 2021; Santana-Cárdenas et al., 2018).

Reliability problems in Optimism and Resilience are a common problem in PCQ-12 validations in Spanish and Portuguese translations (López-Núñez et al., 2018; Santana-Cárdenas et al., 2018; Viseu et al., 2012). However, several previous studies using the PCQ-12 in not Spanish-speaking context just inform the reliability for the global PsyCap and do not report the reliability of its dimensions. For example, in Dawkins et al.’s (2013) review, no studies included using the PCQ-12

reported reliability for the dimensions. It is noteworthy that the study that originally proposed the PCQ-12 does not inform about the reliability of Optimism or Resilience (Avey et al., 2011). Consequently, although the reliability problems could be related to cross-cultural factors and translations, we need further research also in English-speaking countries. A potential solution could be a revision of the items included in these dimensions considering wider representative samples or an increment in items.

Our study presents some limitations. First, it has been developed with a Spanish sample of students, which could compromise the generalizability of the results. Second, as a psychometric evaluation of the scale, this study lacks the consideration of nomological validity. This research was mainly focused on the factorial structure; complementary validity evidence is needed.

In conclusion, our **Study 3** roughly confirmed the theoretically proposed second-order structure and highlighted the reliability problems of some of its dimensions. We ask researchers to improve the scale adaptation process or explore alternative measures developed specifically in academic contexts for Resilience (King & Caleon, 2021). Additionally, it could be good advice to include more indicators of Optimism (Djourova et al., 2019).

Study 4. A Psychometric Study of the Prosocial Behavior Scale: Differential Item Functioning by Gender

Martínez-Gregorio, S., Tomás, J. M., & Oliver, A. (2023). A psychometric study of the Prosocial Behavior Scale: Differential item functioning by gender. *Behavioral Sciences*, 13(3), 259. <https://doi.org/10.3390/bs13030259>

Abstract

Some scales co-exist in the literature to measure prosocial behavior in adolescents. Gender differences in prosocial behavior have been a controversial topic of research. To strengthen future research in the area, the psychometric properties of the most used instruments must be guaranteed, especially its gender non-bias. Our study provides psychometric evidence for the Prosocial Behavior Scale in a sample of adolescents, exploring: (a) its factor structure; (b) reliability; (c) gender-related differential item functioning (DIF); (d) nomological validity. A sample of 512 high school students (mean age = 13.62 (SD = 1.34), 51.6% females) participated in the research. Confirmatory Factor Analysis (CFA) was used to test the factor structure of the scale, which adequately fitted the data ($\chi^2(35) = 152.224$, $p < .001$, Comparative Fit Index (CFI) = .905, Root Mean Squared Error of Approximation (RMSEA) = .085 90%CI [.072–.099], Standardized Root Mean Squared Residual (SRMR) = .079). Reliability results were good ($\alpha = .74$, $\omega = .74$). Regarding the DIF, five items presented some gender-related bias, generally benefiting females. However, the DIF impact could be considered negligible. Correlations with the subdimensions of the psychological capital offered evidence of the nomological validity of the

scale. In conclusion, the scale presented adequate psychometric properties that support its ability to effectively assess prosocial behavior and gender differences in the prosocial behavior samples of adolescents. Additionally, the results obtained imply that gender differences in the manifestations of prosocial behavior require measurements that can fairly sample behaviors characteristic of each gender.

Keywords: differential item functioning; psychological capital; validation; prosociality; adolescence; psychometric properties

Introduction

Prosocial behavior refers to voluntary actions conducted to benefit others (Eisenberg et al., 2013). Although this behavioral tendency would be positive along the lifespan, it may be crucial in some early stages as adolescence. Previous empirical research supports the idea that prosocial behavior promotes positive academic outcomes (Gerbino et al., 2018), psychosocial adjustment/fit (Flynn et al., 2015; Zuffianò et al., 2014), and well-being (Layous et al., 2012; Weinstein & Ryan, 2010).

Different self-reported scales for assessing prosocial behavior in adolescents coexist in the literature. Table 9 includes the scales most widely used internationally. Some of them approach the construct from multidimensional perspectives, whereas others present a unidimensional structure. The Objective Measure of Prosocial Reasoning (PROM) method (Carlo et al., 1992) includes stories that invoke a conflict between adolescent needs, wants, and desires and those of others. The respondents are asked to decide what the main character of the story should do, showing their prosocial reasoning. Another multidimensional worldly spread instrument is the Prosocial Tendencies Measure-Revised (PTM-R) (Carlo et al., 2003). This is the adapted version for adolescents of the Prosocial Tendencies Measure (PTM) (Carlo & Randall, 2002). Not being that common, the Teenage Inventory of Social Skills (TISS) (Inderbitzen & Foster, 1992) measures prosocial behaviors such as cooperation or altruism in one of their two sub-scales. Complementary, the other one assesses asocial behaviors such as aggression or social anxiety.

Table 9*Instruments for assessing prosocial behavior in adolescents*

Scale	Original Authors	N Items	Dimensions	Psychometric Studies	Recent Applications
Objective Measure of Prosocial Reasoning (PROM)	Carlo et al. (1992)	56 items	Hedonistic, needs-oriented, approval, stereotypic, and internalized	English (Carlo et al., 1992); Spanish (Carlo et al., 2013; M. Mestre et al., 2002); Chinese (Lai et al., 2012); Portuguese (Šukys & Šukienė, 2015)	(Carlo et al., 2022; Maria Vicenta Mestre et al., 2019)
Prosocial Behavior Scale (PBS)	Caprara and Pastorelli (1993)	10 items	Unidimensional	Italian (Caprara & Pastorelli, 1993); Spanish (Malonda et al., 2019)	(Sancho et al., 2022; Sporzon & López-López, 2021)
Prosocial Tendencies Measure—Revised (PTM-R)	Carlo et al. (2003)	25 items	Altruistic, compliant, emotional, dire, public and anonymous	English (Carlo et al., 2003); German (Rodrigues et al., 2017); Lithuanian (Šukys & Šukienė, 2015); Chinese (Ngai & Xie, 2018); Portuguese (Simões & Calheiros, 2016); Spanish . Mestre et al., 2015)	(Fatima et al., 2022; Xiao et al., 2019)
Strengths and Difficulties Questionnaire (SDQ)—Prosocial dimension	Goodman (2001)	5 items	Unidimensional	English (Goodman, 2001); Chinese (Yao et al., 2009); Dutch (van Widenfelt et al., 2003; Vugteveen et al., 2018); German (Essau et al., 2012); Norwegian Van Roy et al., 2008) Spanish (Español-Martín et al., 2021; Ortuño-Sierra et al., 2015, 2018); French (Capron et al., 2007); Swedish (Essau et al., 2012; Hagquist, 2007); Cypriot Greek (Essau et al., 2012); Italian (Essau et al., 2012)	(Aarø et al., 2022; Nagaoka et al., 2022)
Teenage Inventory of Social Skills (TISS)	Inderbitzen and Foster (1992)	40 items	Prosocial behavior and asocial behavior	English (Inderbitzen & Foster, 1992); Spanish (Inglés et al., 2003)	(Manzano-Sánchez et al., 2021)

Broad instruments for adolescent adjustment can also include a dimension for prosociality. That is the case for the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 2001). The SDQ is a screening tool for assessing psychosocial adjustment in children and adolescents. Despite not being prosocial-specific, it presents a five-item subdimension that measures prosocial behavior. The use of this dimension as a prosociality scale is interesting because it has been included in the National Health Survey in Europe (Español-Martín et al., 2021); therefore, a large quantity of data is available. The SDQ has alternative versions wherein the rater is a teacher or the parents (Español-Martín et al., 2021; Rodríguez-Hernández et al., 2012). Although our work is focused on self-reported prosociality scales, there are other alternatives for assessing prosocial behavior with external raters, such as the prosocial with peers subscale in the Child Behavior Scale (CBS) (Ladd & Profilet, 1996) or the parent-report Brief Adolescent Prosocial Perceptions Scale (BAPPS-P) (Taylor & Wood, 2014). The latter has a self-reported alternative, the BAPPS-S. However, to date, it has been scarcely used.

The last scale widely used to assess prosocial behavior is the Prosocial Behavior Scale (PBS) (Caprara & Pastorelli, 1993), which is different from the Adult Prosocial Behavior Scale (Caprara et al., 2005). PBS is a 10-item unidimensional scale. Originally, it included 15 items; however, five of them are control items that are not taken into consideration for the total prosocial behavior score. It has been mainly used in a Spanish-speaking context, where we can find many articles using it in the last 20 years (Alvarez et al., 2010; Carlo et al., 2010, 2012; De Minzi et al., 2011; Malonda et al., 2017, 2019; Mestre et al., 2002; Mestre et al., 2004; Mestre, 2017; Mestre et al., 2007; Mestre et al., 2015; Sancho et al., 2022; Sporzon & López-López, 2021; Tur-Porcar et al., 2016; Tur-Porcar et al., 2018). Although being widely used, a

proper psychometric study for the Spanish adaptation has never been carried out. Some papers refer to Del Barrio et al. (Barrio et al., 2001) to justify the adequate psychometric properties of the instrument. However, it is a widespread mislead. Del Barrio et al. (Barrio et al., 2001) studied the psychometric properties of the Aggression and Emotional Instability scales from Caprara and Pastorelli (Caprara & Pastorelli, 1993), but not the psychometric properties of the PBS. Through previously cited research, we know that its reliability results range between 0.60 and 0.85 (Alvarez et al., 2010; Carlo et al., 2010, 2012; De Minzi et al., 2011; Malonda et al., 2017, 2019; Mestre et al., 2002; Mestre et al., 2004; Mestre, 2017; Mestre et al., 2007; Mestre et al., 2015; Sancho et al., 2022; Sporzon & López-López, 2021; Tur-Porcar et al., 2016; Tur-Porcar et al., 2018). However, only two previous studies have reported evidence about its factor structure (Carlo et al., 2012; Malonda et al., 2019). Carlo et al. (2012) found problems with one item and reported the Confirmatory Factor Analysis (CFA) results of a reduced version with nine items. Consequently, as far as our concern, Malonda et al. (2019) were the first authors to report a satisfactory adjustment of the unidimensional structure.

This lack of a properly complete and more updated psychometric study of the PBS affects specifically the validity related evidence. For example, some relevant aspects such as the gender-related differential item functioning remain understudied. By gender-related differential item functioning, we refer to the fact that the item score depends not just on the prosocial behavior of the respondent, as it would also vary considering their gender. Gender differences, while studying global prosocial behavior, consistently benefit females (Eisenberg & Fabes, 1998). Some authors have argued that, rather than a matter of grade differences in the actual prosocial behavior, there are perhaps differences in how each individual, females and males, acts prosocially

(Hastings et al., 2007). Eagly (2009) concluded that females present more prosocial behavior related to communal attributes, whereas males' prosocial behavior may be more agentic. Consequently, it has been criticized that the items of prosocial behavior scales may typically reflect gender-role stereotypes, being more prevalent on the female-type of prosocial behavior (Nielson et al., 2017). Xiao et al. (2019) conducted a meta-analysis of gender differences in adolescents using the PTM-R. They found that gender differences were higher in those dimensions considered "gender-type prosocial behavior". Females report higher levels of altruistic, compliant, and emotional prosocial behavior, whereas males present higher levels of public prosocial behavior (Xiao et al., 2019). Similarly, Nielson et al. (2017) noticed that, on prosocial behaviors oriented to peers, females presented higher emotional support, inclusion, and sharing.

The complexity of the measurement of gender differences in prosocial behavior requires robust psychometric studies that guarantee adequate item functioning. These efforts have been previously carried out when studying the gender invariance of the SDQ (Español-Martín et al., 2021; Ortuño-Sierra et al., 2015), PTM-R (Carlo et al., 2010; Mestre et al., 2015), and PROM (Carlo et al., 2013). All of them were reported in a multigroup CFA analysis conducted to examine invariance across gender. However, not all of them achieved a scalar gender invariance. Ortuño-Sierra et al. (2015) did not test scalar invariance, and only tested the equivalences of the structure and factor loadings, that is, metric invariance. Carlo et al. (2013) did not find support for the scalar gender invariance of the PROM scale, finding differences in five-item intercepts.

Although previous research has used the PBS to explore gender differences in prosocial behavior (Carlo et al., 2010; Mesurado et al., 2018; Tur-Porcar et al., 2016), its gender-related differential item functioning has never been analyzed. Research with other scales of

prosociality suggests that this aspect is crucial to effectively measure prosociality in both genders, not being affected by a gendered vision of prosociality. Consequently, given the importance of the PBS in a Spanish context, a proper psychometric study to guarantee its reliability and validity in its Spanish form is required. Therefore, our study aims to evaluate the psychometric properties in its Spanish adaptation. The study has four objectives: (a) to verify its one-dimensionality; (b) to test its reliability; (c) to explore its gender-related differential item functioning; (d) to collect evidence of its nomological validity. The following hypotheses are derived from these objectives:

Hypothesis 1 (H1). The PBS has a unidimensional structure.

Hypothesis 2 (H2). The reliability results of the scale in Spanish adolescents are adequate.

Hypothesis 3 (H3). The items of the PBS do not present gender-related differential functioning.

Hypothesis 4 (H4). The results of the PBS are positively related to the psychological capital of the students, as evidence of nomological validity (Lyu et al., 2022; S. Zhang et al., 2022).

Method

Participants

The sample was composed of 512 high school students from Valencia, Spain. The mean age was 13.62 (SD = 1.34). Of the participants, 51.6% ($n = 264$) were females and 45.5% ($n = 233$) were males. Nine students (1.8%) self-identified themselves as “other” and six did not answer the question. Regarding their high schools, 57.22% ($n = 293$) attended public ones, whereas 26.37% ($n = 135$) attend private or semi-private ones. Most of the respondents were studying compulsory secondary

education: 132 (25.8%) in their first course, 83 (16.2%) in their second course, 190 (37.1%) in their third course, and 72 (14.1%) in the fourth course. Twenty-five students were in post-compulsory secondary education, baccalaureate: 21 (14.1%) were in their first year and 4 (0.8%) were in the second and final year. The remaining 2% ($n = 10$) did not declare which course they were attending.

Procedure

The sampling for the study was performed at the convenience of the educational centers that were supportive of the research. The only inclusion criteria were that the students were in secondary education and that their families agreed to their participation; no exclusion criteria were considered. The survey and procedure met the American Psychological Association (APA) Ethical Standards for human research and were approved by the Research Ethics Committee of the University of Valencia as well as the Educational Government of Valencia (UV-INV_ETICA-1218680). The research team contacted the high school education authorities to present the research project and ask for their authorization to send the information to the families. In those high schools willing to participate, the families and students were informed about the research, and they signed informed consent. Participation in the survey was anonymous, voluntary, and non-rewarded.

Once informed consent was received, students answered the survey in class. The estimated duration for the entire survey was 20–25 min; however, there was no time constraint for any of the participants. Students who did not wish to participate remained in the classroom studying on their own until the rest of the classmates finished the questionnaire. As data were recruited in class, the lack of response from the participants was negligible (less than 1%).

Instruments

Alongside the socio-demographic questions (age, gender, course, and high school), two questionnaires were administered for the current research:

- **Prosocial Behavior Scale (PBS)** (Caprara & Pastorelli, 1993). Although this scale includes 15 items, just 10 of them ask for prosocial behavior. The remaining five items are control items that do not contribute to the total prosocial behavior score (items PB3, PB6, PB8, PB11, and PB14). This research only analyzes those items measuring prosocial behavior. However, the items are named through the manuscript, retaining their original numeration from 1 to 15. The item content is presented in Table 10. In this study, the items were administered in its Spanish form. The answer format is a 3-point Likert scale (1—never, 2—sometimes, and 3—often).
- **Psychological Capital Questionnaire (PCQ-12)** (Avey et al., 2011). This questionnaire was recently adapted and validated for Spanish adolescent samples by Tomás et al. (2022). It measures the four subdimensions of psychological capital in the educational context: self-efficacy (three items), hope (four items), resilience (three items), and optimism (two items). An example item is “I usually take stressful things at school in stride”. Following Tomás et al.’s (2022) adaptation, we used a 5-point Likert response format, ranging from 1—strongly disagree to 5—strongly agree. The four-factor structure with a second-order factor fits adequately our data: $\chi^2(50) = 269.181$, $p < 0.001$, Comparative Fit Index (CFI) = .936, Root Mean Squared Error of Approximation (RMSEA) = .095 90%CI [.084–.106], and Standardized Root Mean Squared Residual (SRMR) = .052. The reliability results for our sample administration were for self-efficacy ($\alpha = .81$, $\omega = .85$), hope ($\alpha = .76$, $\omega = .81$), resilience ($\alpha = .37$, $\omega = .38$), and optimism ($\alpha = 0.61$; $\omega = .67$).

Table 10*Item content*

	Content
PBS1	I try to make sad people happier
PBS2	I spend time with my friends
PBS3 *	When I have to do things that I don't like I get mad
PBS4	I try to help others
PBS5	I am gentle
PBS6 *	I cry about things that don't matter
PBS7	I share things I like with my friends
PBS8 *	I feel annoyed
PBS9	I help others with their homework
PBS10	I let others use my toys
PBS11 *	I have bad dreams
PBS12	I like to play with others
PBS13	I trust others
PBS14 *	I bite my fingernails
PBS15	I hug my friends

Note: * Control items.

Data analysis

The psychometric properties of the PBS were assessed following four steps: (1) factor structure, (2) descriptive statistics and reliability, (3) differential item functioning, and (4) nomological validity.

The factor structure was assessed using Confirmatory Factor Analysis (CFA) carried out in Mplus 8.7 (Muthén & Muthén, 1998-2017). Due to the categorical nature of the response scale, corrected Weighted Least Square Mean and Variance (WLSMV) was used as the estimation method. Some indices were considered to evaluate the adequacy of the unidimensional structure of the data (Hu & Bentler, 1999), including (1)

the chi-square test; (2) the CFI (adequate if above .9); (2) the RMSEA (adequate if below .08); (4) the SRMR (adequate if below .08). Full Information Maximum Likelihood methods were used for missing data, as they are reliable for missing at random (MAR) and missing completely at random (MCAR) missingness (Enders, 2006).

Some descriptive statistics for the items were calculated with IBM SPSS Statistics 26, i.e., means, standard deviations, skewness, kurtosis, inter-items correlations, and corrected item-total correlations. Reliability was assessed via Cronbach's alpha and McDonald's omega. Both indicators are considered adequate if their value is above .7 (Hair et al., 2014).

Next, the Differential Item Functioning (DIF) was evaluated in R (R Core Team, 2020), using the lordif package (Choi et al., 2011). Based on the Graded Response Model, the lordif package tests DIF, estimating three nested proportional-odds logistic regression models. Model 1 expresses the cumulative probabilities that the true item response falls into if a specific response category is higher based on one's level in the trait (in this case, the prosocial behavior). Model 2 adds the effect of the grouping variable (gender) on this probability, or uniform DIF. Model 3 includes the interaction of the trait and the grouping variable to assess non-uniform DIF. From this framework (Swaminathan & Rogers, 1990), the contrast of the fit of the models, in terms of the likelihood ratio test (χ^2), allows us to detect different kinds of DIF. Uniform DIF is tested by comparing likelihood values for Models 1 and 2, whereas non-uniform DIF is tested by comparing Models 2 and 3. Additionally, a statistically significant result in the chi-square test between Models 1 and 3 could be interpreted as a "total DIF effect" (Choi et al., 2011). Some authors also propose that the magnitude of DIF could be measured through changes in the *pseudo-R*² statistics. We employed the McFadden *pseudo-R*². Zumbo (1999) set some cut-off criteria to interpret them,

being results under .13 and .26 and thus considered negligible and moderate, respectively. Results above .26 were considered large. The DIF analysis was followed with some visual analyses of the plots the *lordif* package offers for items with DIF and the individual-level DIF impact.

Lastly, nomological validity was assessed through Pearson's correlations between psychological capital subdimensions and the total score of prosocial behavior (PB). Based on previous literature, the psychological capital could be consider as a precursor of prosocial behavior (Lyu et al., 2022; Zhang et al., 2022). Consequently, positive correlations between both constructs indicated the nomological validity of the PBS. This analysis was performed in IBM SPSS Statistics 26. To complement DIF analyses, a new aggregate measure of prosocial behavior (PB *), without including items with DIF, was computed and correlated with the psychological capital subdimensions and PB. Correlation comparisons were conducted between PB and PB * correlations with the psychosocial capital dimensions to assess DIF's impact on nomological validity.

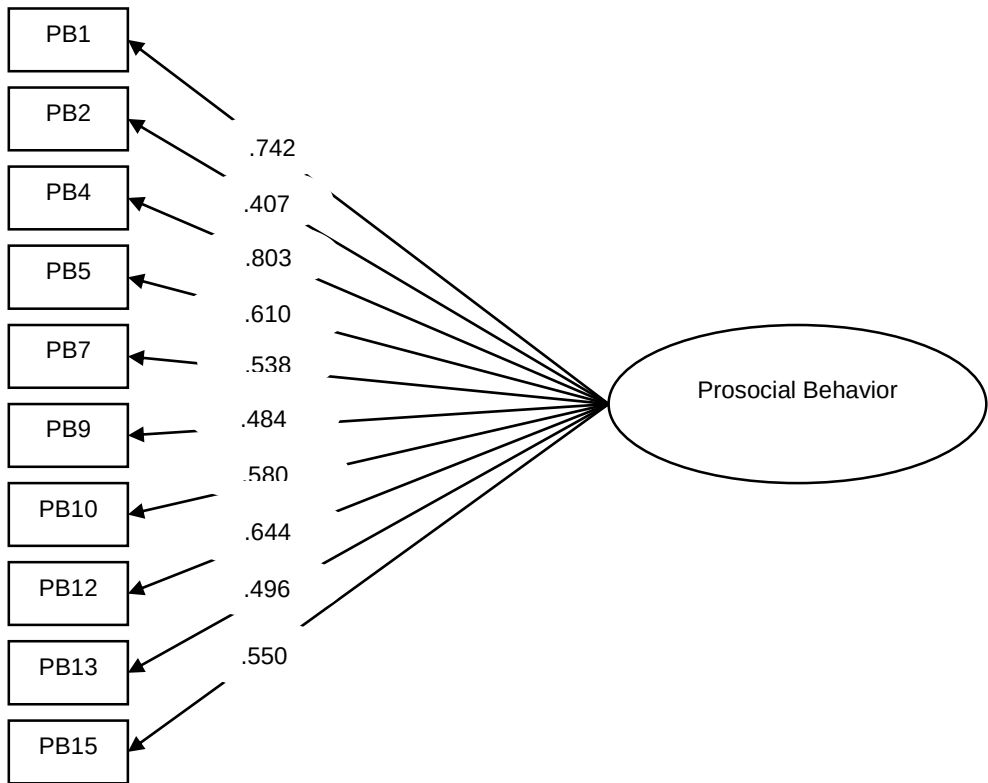
Results

Factorial structure

A CFA was specified and tested to verify the theoretical unidimensional structure. The model fit adequately with the data: $\chi^2(35) = 152.224$, $p < .001$, CFI = .905, RMSEA = .085 90%CI [.072–.099], SRMR = .079. Figure 9 shows the standardized factor loadings of the items. All of them are well above .3, ranging between .407 and .803.

Figure 9

Factorial structure



Note. All the factor loadings are statistically significant $p < 0.001$

Descriptive statistics and internal consistency

Table 11 includes the descriptive statistics (mean, standard deviation, skewness, kurtosis, inter-item correlation, and corrected item-total correlation) of the items. Considering that the Likert scale ranges between 1 and 3, all the item means are above the mid-point. The item-total correlations are all above .3. However, item 2 presents the lowest item-total correlations with non-statistically significant inter-item correlations in items 4, 5, and 9. Item 2 had the lowest factor loading, as shown in Figure 9. The reliability results for the scale are good, with a Cronbach's alpha of .74 and a McDonald's omega of .74.

Table 11

Means (M), standard deviations (SD), skewness (g1), kurtosis (g2), inter-item correlations, and corrected item-total correlations (r_{it})

	M	SD	g1	g2	PB1	PB2	PB4	PB5	PB7	PB9	PB10	PB12	PB13	r_{it}
PB1	2.75	0.48	-1.68	1.93										.44
PB2	2.70	0.50	-1.29	0.58	.15*									.30
PB4	2.73	0.47	1.36	0.62	.52*	.07ns								.48
PB5	2.70	0.50	-1.33	0.73	.29*	.09ns	.39*							.41
PB7	2.50	0.60	-0.75	-0.41	.18*	.19*	.19*	.15*						.42
PB9	2.24	0.63	-0.25	-0.65	.28*	.05ns	.34*	.21*	.21*					.37
PB10	2.40	0.65	-0.61	-0.61	.24*	.14*	.27*	.19*	.28*	.24*				.42
PB12	2.66	0.57	-1.50	1.24	.18*	.30*	.15*	.28*	.31*	.19*	.34*			.46
PB13	2.37	0.62	-0.45	-0.66	.15*	.25*	.16*	.26*	.26*	.11*	.22*	.30*		.39
PB15	2.25	0.76	-0.46	-1.14	.28*	.16*	.35*	.24*	.25*	.16*	.23*	.21*	.20*	.41

Note. * $p < .001$; ns = non-statistically significant.

Gender-related differential item functioning

Figure 10 shows the theta distribution for females and males. Although males show a slightly lower level of prosocial behavior, there is a broad overlap in the distributions. Table 12 presents the results for the χ^2 tests between Model 1 and Model 2, Model 1 and Model 3, and Model 2 and Model 3 for all items. The statistically significant difference between Model 1 and Model 2 indicates the presence of a uniform DIF, whereas the statistically significant difference between Model 2 and Model 3 denotes a non-uniform DIF in the item. The statistically significant chi-square test between Model 1 and 3 may be interpreted as an overall test of the “total DIF effect”. The results in Table 12 indicate that items PB1, PB4, PB12, PB13, and PB15 present DIF. All of them present uniform DIF; however, items PB1 and PB12 also present non-uniform DIF. The non-uniform DIF in these items indicates that the DIF varies depending on the prosocial behavior level. However, considering the *pseudo-R*² changes, the DIF in all the items may be considered negligible (Zumbo, 1999).

Figure 10

Theta distributions by gender

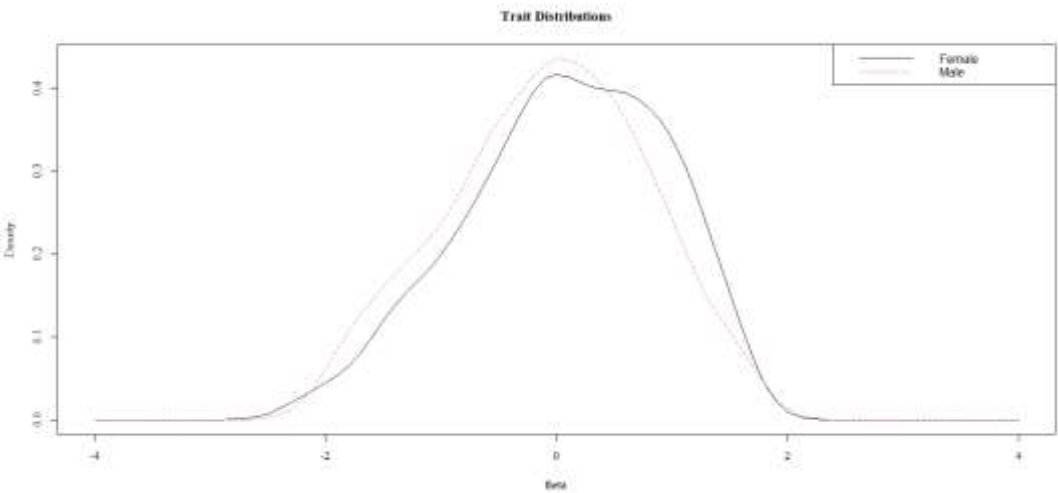


Table 12

Chi-square tests and changes in McFadden's pseudo- R^2 for DIF detection

	Model 1 vs. Model 2		Model 1 vs. Model 3		Model 2 vs. Model 3	
	<i>p</i> -Value χ^2 Test	<i>Pseudo</i> - R^2 Δ McFadden	<i>p</i> -Value χ^2 Test	<i>Pseudo</i> - R^2 Δ McFadden	<i>p</i> -Value χ^2 test	<i>Pseudo</i> - R^2 Δ McFadden
PB1	.000	.053	.000	.088	.000	.035
PB2	.082	.006	.199	.006	.645	.000
PB4	.000	.045	.000	.053	.054	.007
PB5	.847	.000	.968	.000	.867	.000
PB7	.921	.000	.403	.002	.179	.002
PB9	.038	.005	.053	.007	.212	.002
PB10	.190	.002	.290	.003	.383	.000
PB12	.000	.025	.000	.038	.004	.013
PB13	.000	.016	.002	.016	.630	.000
PB15	.000	.084	.000	.087	.106	.003

Figures 11–15 show the diagnosis plots for each item with DIF. While interpreting the plots, we should keep in mind that items PB1 to PB4 retain two response categories from the original 3-point Likert scale because the program, by default, retains those categories with a minimum of five cases per cell. Each figure displays four graphics: (1) the upper-left graphic presents the item characteristic curves (ICCs) for each group; (2) the upper-right plot shows the differences between the ICCs for each group; (3) the lower-left graphic shows item response functions for each group and the values for the slopes and category threshold values (in that order); (4) the lower-right plot shows the ICCs' differences when weighted by the distribution for the focal group (males).

The visual analysis of item PB1 (Figure 11) indicates a DIF, especially on the lower levels of prosocial behavior, where females present higher item scores with the same theta value. Additionally, the item presents a non-uniform DIF, being more discriminant for males (2.11 vs. 1.01).

As can be seen in Figure 12, item PB4 only presents uniform DIF, which is more prevalent in the lower levels of prosocial behavior. As in item PB1, females tend to select higher categories than males with the same overall prosocial behavior. The graphics show the lack of large changes in the item slope between groups (1.38 vs. 1.83), which supports the null non-uniform DIF.

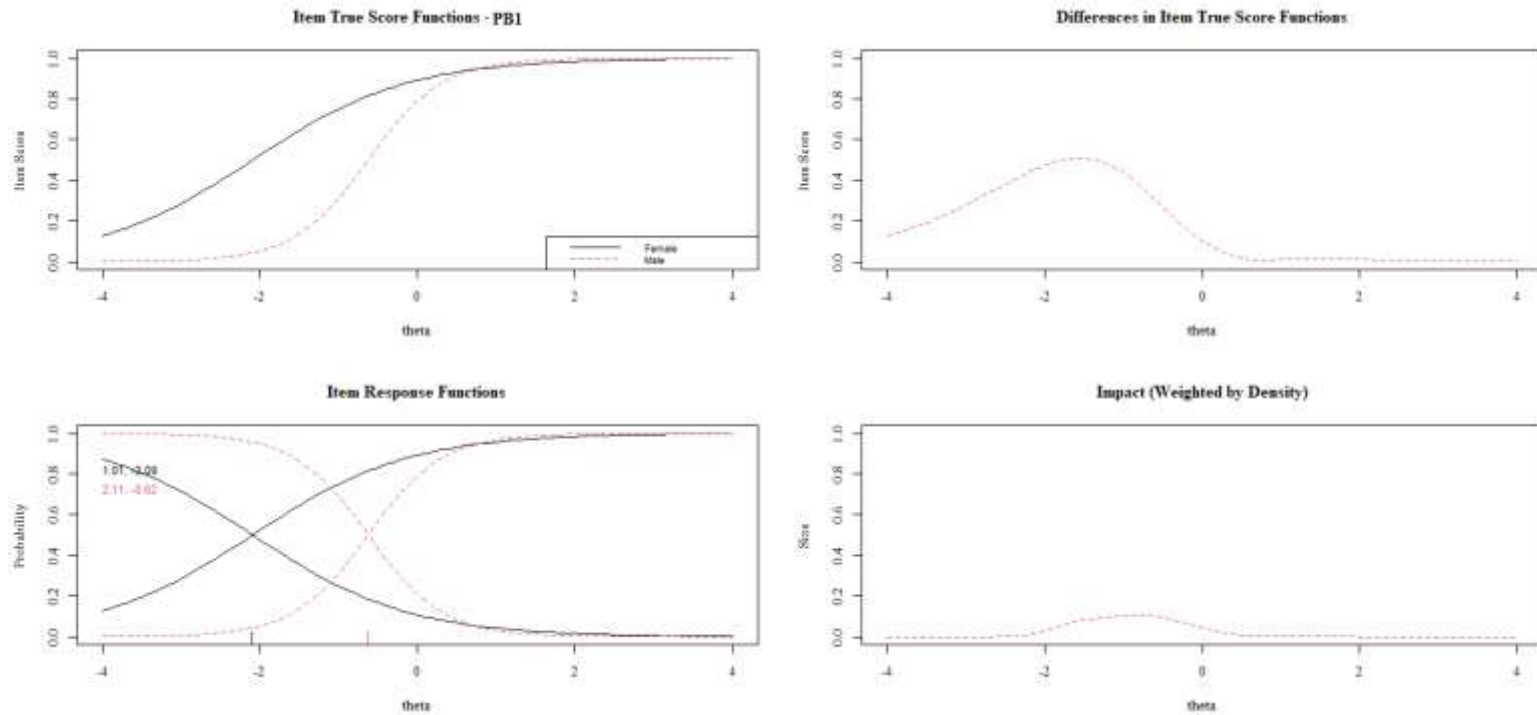
Figure 11*DIF plots for item PB1*

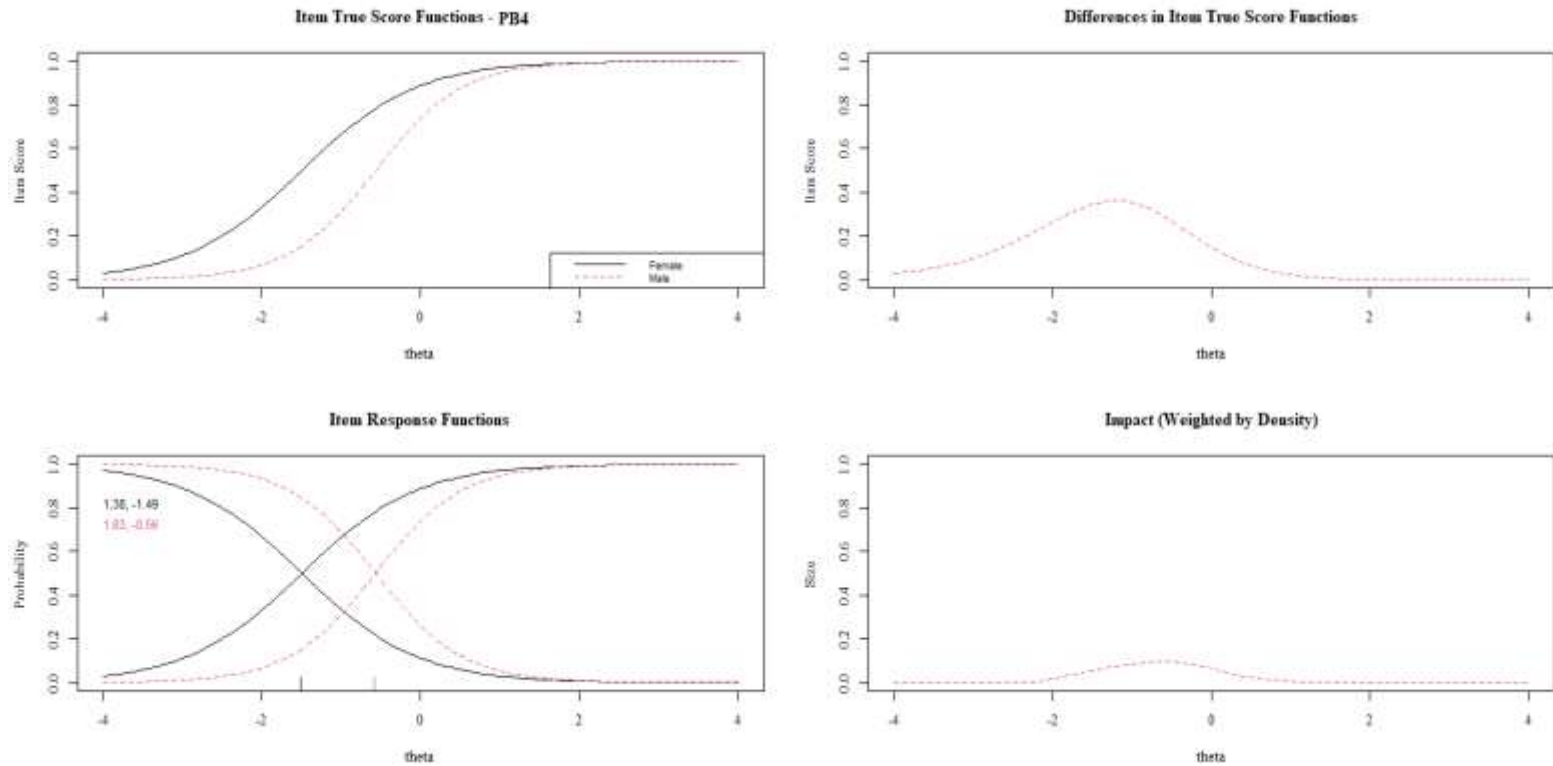
Figure 12*DIF plots for item PB4*

Figure 13 offers DIF results for item PB12. Although the DIF is mainly due to the first threshold (-1.9 vs. -2.9), as in previous items, item PB12 shows the opposite DIF. In this case, the males present a higher item score with the same level of overall prosocial behavior. Additionally, item PB12 shows a non-uniform DIF, with a higher slope value for females (2.37 vs. 1.46).

Figure 14 demonstrates that item PB13 presents a slightly uniform DIF, benefiting male results. Contrary to the previous items, in this case, the DIF is more pronounced in the middle levels of prosocial behavior.

Lastly, Figure 15 displays a uniform DIF for item PB15. As in most of the items with DIF, females present a higher item score than their male counterparts with the same overall prosocial behavior. Once the DIF has been analyzed item by item, Figure 16 shows the impact of these DIFs on the test characteristic curves (TCCs). The DIF effect on TCCs seems to be scarce while considering all the items, which is in line with the interpretations of the *pseudo-R*² differences.

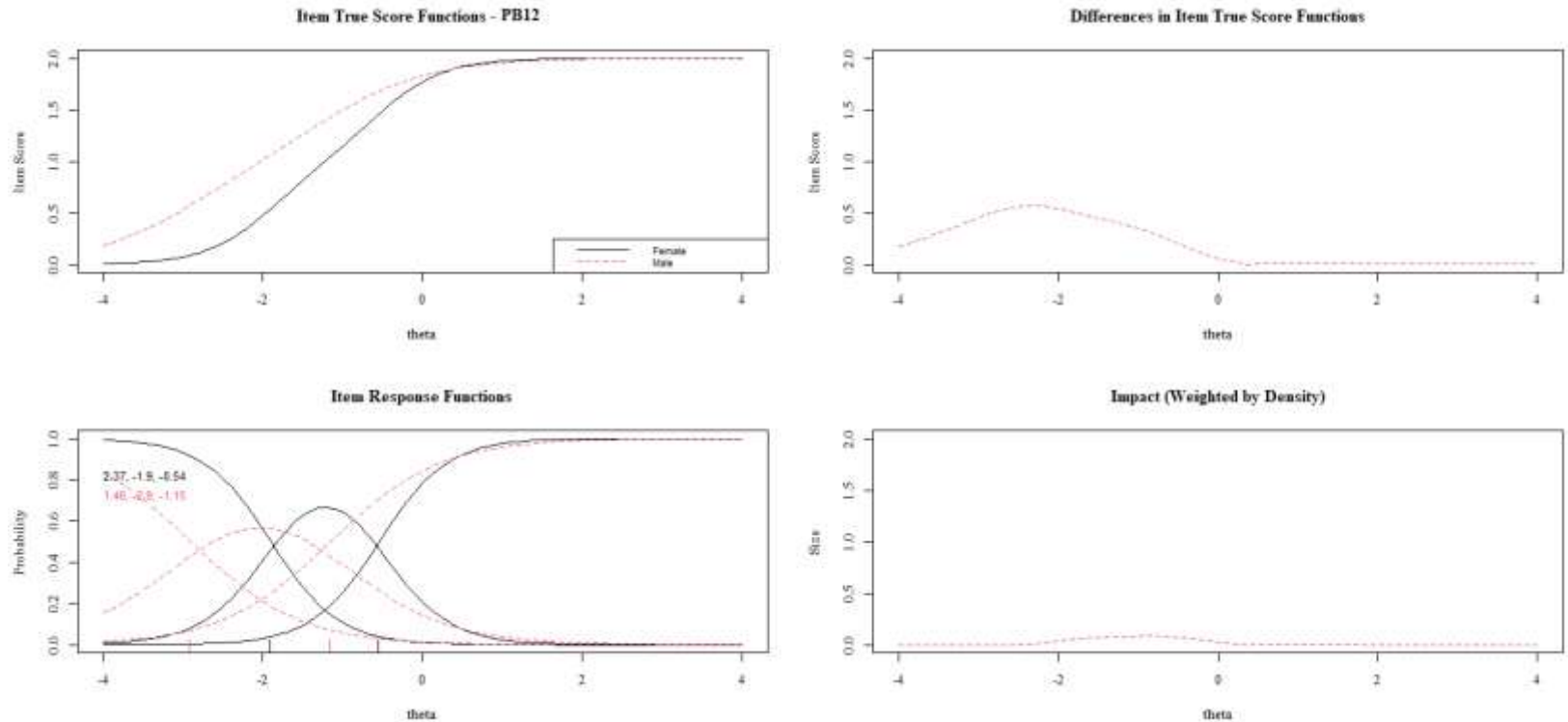
Figure 13*DIF plots for items PB12*

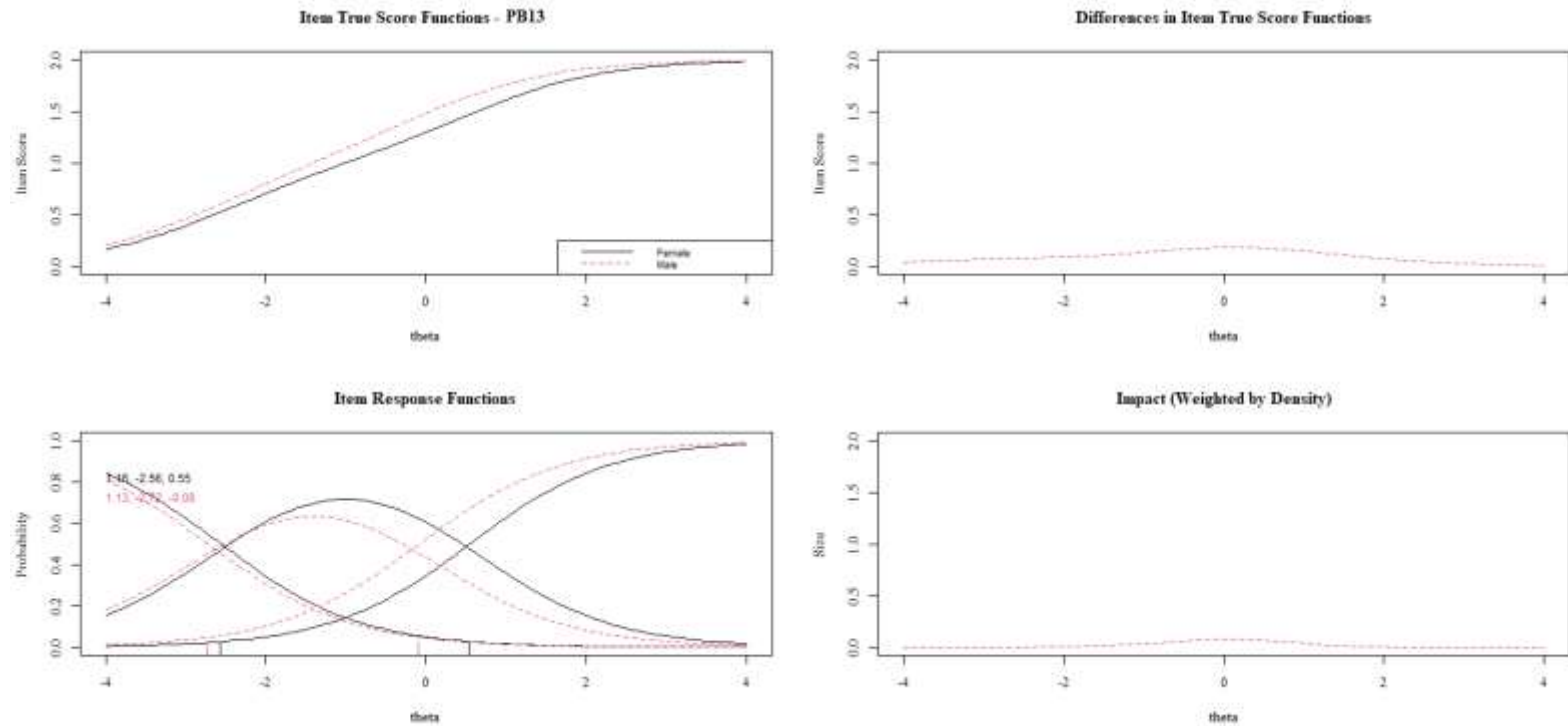
Figure 14*DIF plots for item PB13*

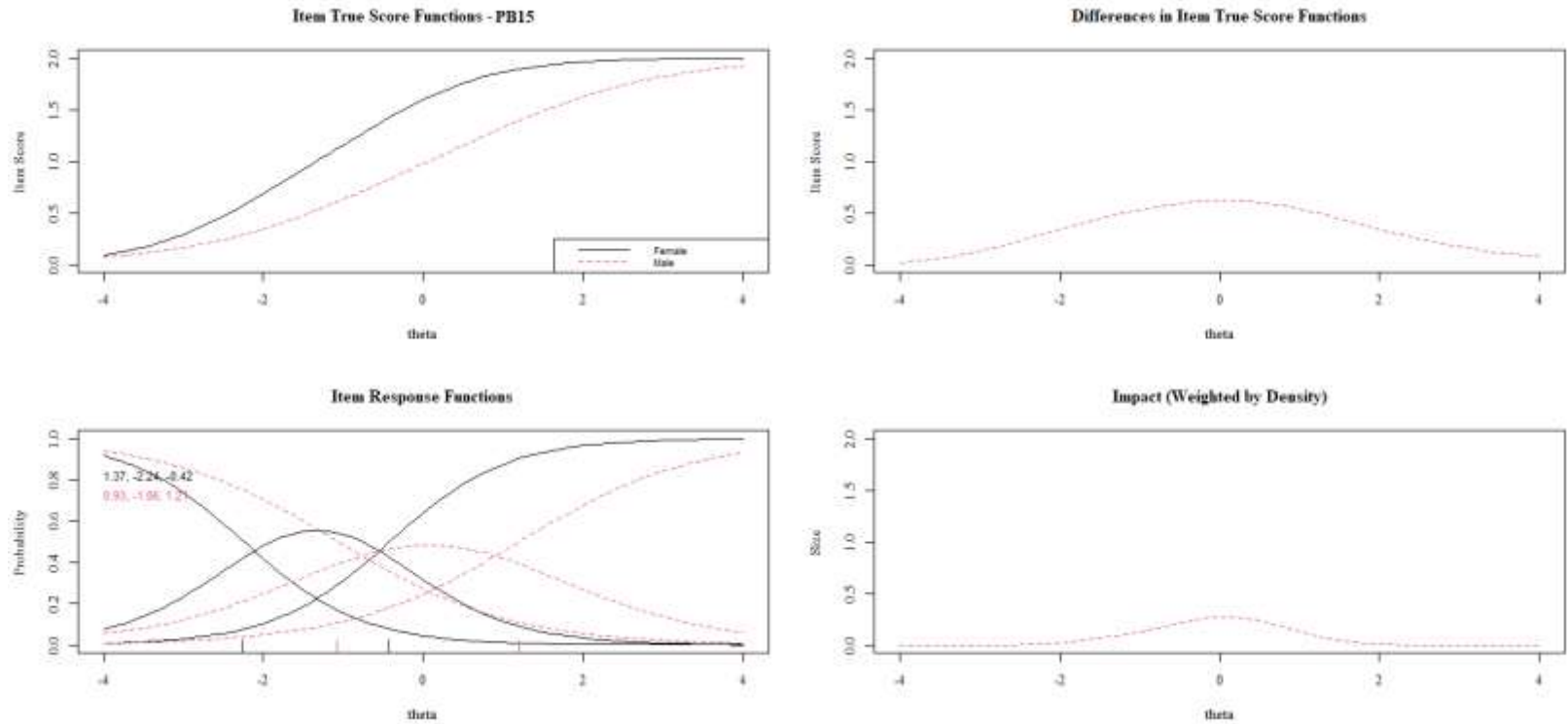
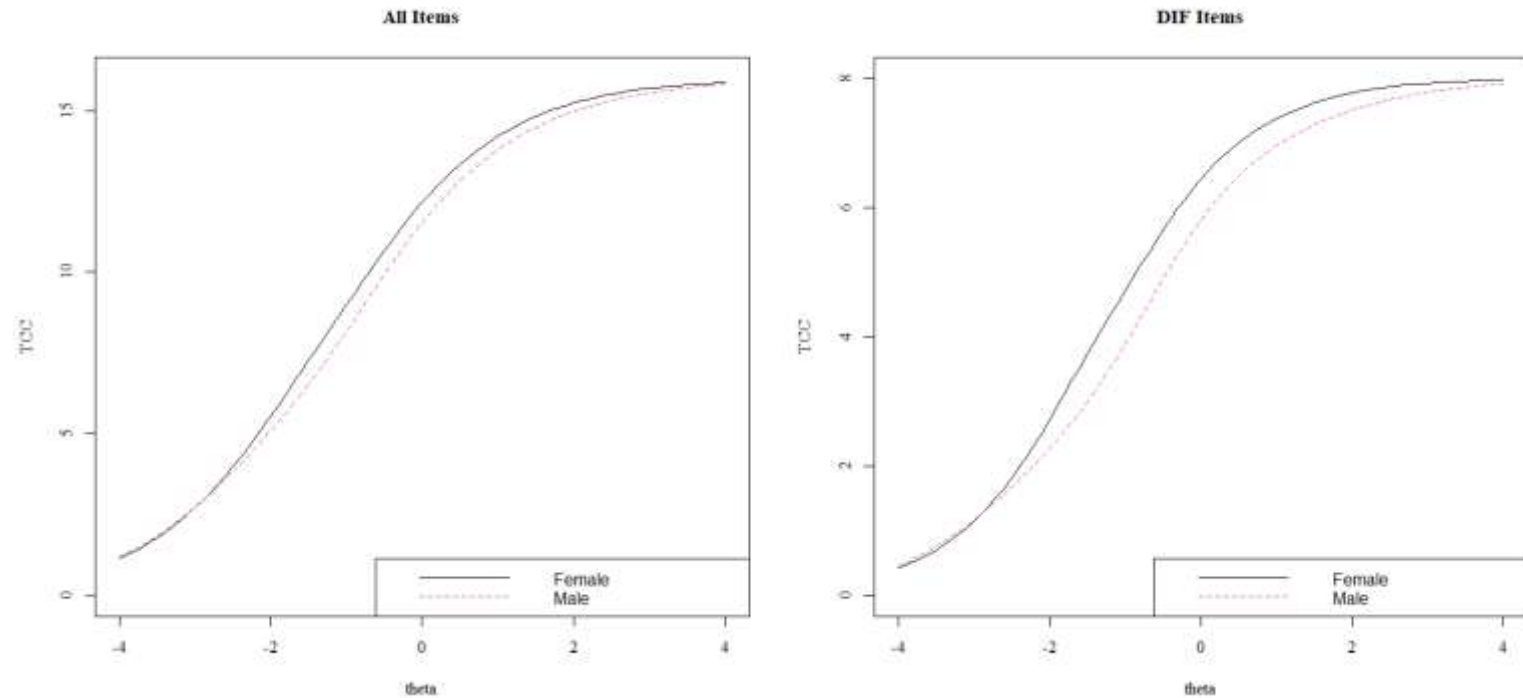
Figure 15*DIF plots for item PB15*

Figure 16

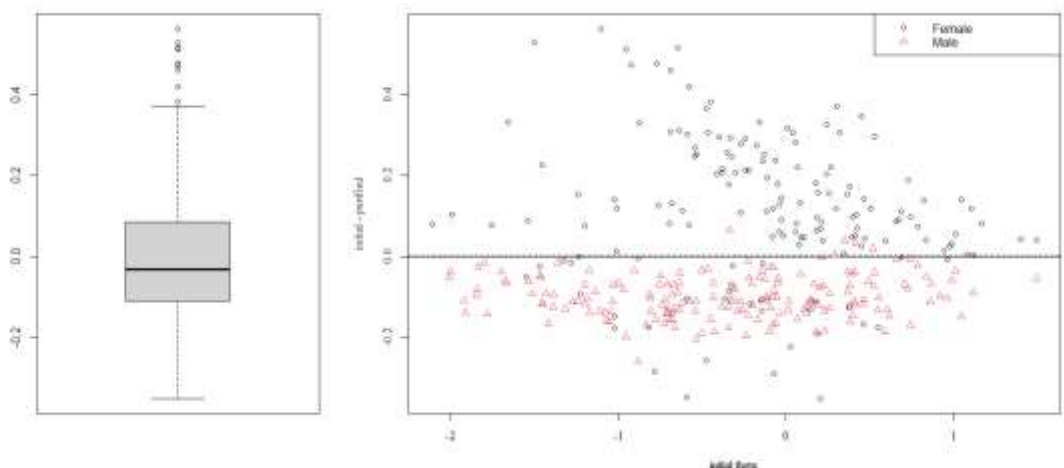
Tests characteristics curves (TCCs) by group



The analysis of the individual-level DIF impact complements the DIF exploration. The boxplot in Figure 17 indicates the differences between the individual scores ignoring DIF and those that consider it (purified). The median difference in theta estimation for the global sample is close to zero. However, the second plot in Figure 17 indicates that, in all levels of prosocial behavior, the females, in almost all cases, would receive a lower score if we account for DIF. Contrarily, the correction for DIF would lead to higher scores in males.

Figure 17

Individual-level DIF impact



Nomological evidences for validity

The nomological validity of the scale was assessed by correlating the prosocial behavior (PB) results with other theoretically related constructs, such as the psychological capital subdimensions, namely, self-efficacy, hope, resilience, and optimism. Table 13 presents all the correlations. Additionally, an aggregated measure of the items without

DIF (PB*) was calculated and included in the correlations. All the correlations were positive and statistically significant ($p < .001$). The correlation between the Prosocial Behavior Scale with and without items with DIF is positive and high ($r = .89, p < .001$). Contrasts between the validity coefficients obtained with PB and PB* show no statistically significant differences ($p > .05$), indicating a small or null impact of the DIF in the nomological validity of the scale.

Table 13

Nomological validity

	Self-Efficacy	Hope	Resilience	Optimism	PB	PB *
Self-efficacy	1	.38	.32	.36	.30	.26
Hope		1	.29	.50	.31	.31
Resilience			1	.29	.15	.15
Optimism				1	.26	.25
PB					1	.89
PB*						1

Note. All the correlations are statistically significant $p < 0.001$; PB = Prosocial Behavior; PB* = Prosocial Behavior scale without items with Differential Item Functioning.

Discussion

This paper aims to conduct the first psychometric study of the PBS in a Spanish sample. In doing so, we offer evidence of its one-dimensionality, reliability, differential item functioning, and nomological validity. Our results support the use of the scale in Spanish-speaking contexts as a brief and robust measure of global prosocial behavior.

Additionally, we develop the study of the conceptualization of prosocial behavior by considering gender differences.

The unidimensional factor structure adequately fitted the data, and all the items presented factor loadings above .3, which is in line with the previous study that reported PBS factor structure in a similar sample (Malonda et al., 2019). Its reliability was also adequate and fit into the range of reliability results of previous studies (Alvarez et al., 2010; Carlo et al., 2010, 2012; De Minzi et al., 2011; Malonda et al., 2017, 2019; Mestre et al., 2002; Mestre et al., 2003; Mestre, 2017; Mestre et al., 2007; Mestre et al., 2015; Sancho et al., 2022; Sporzon & López-López, 2021; Tur-Porcar et al., 2016; Tur-Porcar et al., 2018).

Regarding the DIF study of PBS items, our results could be considered consistent with previous literature. Although half of the items presented DIF, its effect on the global scale functioning may be considered negligible. However, some insights arise from them. Firstly, the measurement of prosocial behavior using this scale benefits females' scores. The DIF analysis could help us to understand those behaviors that are more characteristic in males and those that are more prevalent in females' prosocial behavior. The items that did not present a DIF were the ones related to sharing behaviors, such as PB7 ("I share things I like with my friends") or PB10 ("I let others use my games"), the helping behavior with classmates' homework (PB9), and items PB2 and PB5, related to the time spent with friends and kindness, respectively. These results are similar to those reported by Eisenberg and Fabes (1998).

Our results suggest that these kinds of prosocial behaviors would be equally present in females and males. Contrary, differences emerged in the rest of the scale. Females presented a higher probability to manifest a higher score on those items related to emotional support

as PB1 (“I try to make sad people happier”), PB4 (“I try to help others”), and PB15 (“I hug my friends”). This result agrees with Xiao et al. (2019), who found that females present higher results on the emotional dimension of the PTM-R as well as in the results of the qualitative studies with adolescents (Bergin et al., 2003). The only items where males performed better were PB12 (“I like to play with others”) and PB13 (“I trust others”).

These results should not be interpreted as innate differences between men and women. For example, although some studies presented gender differences in empathy (Christov-Moore et al., 2014), these differences could not exist on natal levels of empathy (Rochat, 2022). Rather, they would be attributable to different patterns of socialization (Hyde, 2014). It would be the predominant culture that favors the appearance of some behaviors and not others in each gender (Hine & Leman, 2013). Additionally, another factor that could artificially generate gender differences is the self-reported method, where females could tend to declare higher prosocial behavior to show congruency with the female stereotype of “kindness” (Eisenberg & Fabes, 1998; Hine & Leman, 2013; Löffler & Greitemeyer, 2023). All these aspects should be kept in mind while developing prosocial behavior measures and when studying gender differences. Nielson et al. (Nielson et al., 2017) developed a longer multidimensional scale that includes twenty items classified into five categories (defending, emotional helping, inclusion, physical helping, and sharing), trying to balance male characteristics behaviors with female ones. They did this to generate a scale that offers a comparable total score.

Finally, we tested the nomological validity of the scale by correlating the total prosocial behavior score with the subdimensions of the psychological capital. As expected, all the correlations were positive and statistically significant. Our results were similar to those found in an

adult sample by Aydin Sünbül and Aslan Gördesli (2021), who also found that the subdimension with the lowest relationship with prosocial behavior was resilience. Zhang et al. (2022), through a longitudinal study, tested the predictive power of psychological capital on prosocial behavior, verifying its antecedent role. In this case, only optimism and self-efficacy showed statistically significant coefficients. Studies that included psychological capital as a global dimension also reported a positive effect on prosocial behavior (Younas et al., 2020; Zhang et al., 2022). Consequently, the PBS scores reproduce the relationships previously found in the literature with other prosocial behavior scales.

Our **Study 4** presents some limitations. First, it is based on a cross-sectional sample of high school students from Spain. Consequently, the generalizability of the psychometric properties reported to primary students or Latin American countries requires further research. Future studies may propose longitudinal investigations to ensure scale invariance over time. These studies will make the results obtained from different educational levels comparable and will guarantee the robustness of the studies of the development of prosocial behavior during education. Additionally, the inclusion of more than one-time measurement would allow future researchers to complement the psychometric study with evidence of test–retest reliability. As another limitation to be acknowledge, gender has been considered only as a dichotomous variable. Other variables, such as gender-role orientation, would be also interesting to understand regarding the interaction of the individual gender alignment with the DIF.

In summary, the PBS has shown adequate psychometric properties and, when the items are administered together, their gender bias is negligible. Consequently, it could be a good alternative for researchers or practitioners who need to administer a global and relatively short prosocial behavior scale. Additionally, our results

indicate that a consideration of the specific characteristics of the prosocial behavior in each gender is crucial to properly understand gender differences without biases that systematically benefit females or, less frequently, males. Once we more accurately approach an understanding of these differences, we could better design more effective initiatives to promote sustainable prosociality.

Study 5. Measuring Gender Differences in Entrepreneurial Self-efficacy: Validation and Gender Invariance of a Brief Scale in Higher Education

Martínez-Gregorio, S., Oliver, A., & Revuelto-Taboada, L. Measuring gender differences in entrepreneurial self-efficacy: Validation and gender invariance of a brief scale in higher education. *(Under review)*

Abstract

This study provides evidence on the confirmatory validation and gender measurement invariance of one of the most employed measures for Entrepreneurial Self-Efficacy (ESE) included in the Global University Entrepreneurial Spirit Students' Survey (GUESSS). To study gender differences in ESE and, by extension, how gender moderates the relation between self-efficacy and relevant variables such as entrepreneurship education, configural, metric and scalar invariance by gender of the scale is tested. Data from 998 Spanish undergraduates from different grades are analyzed. The Confirmatory Factor Analysis supports the unidimensional structure, with high factor loadings and large reliability estimates. Regarding invariance, the scale may be considered scalar invariant. Latent means of men and women are compared with no statistically significant differences. An adapted model of the Theory of Planned Behavior is tested finding support to the nomological validity of scale. The ESE scale extensively used in GUESSS survey has shown evidence of reliability, validity, and gender non-bias.

Keywords: entrepreneurial self-efficacy; gender; gender invariance; theory of planned behavior; validity

Introduction

Previous research has shown that entrepreneurial self-efficacy (ESE) has become a crucial psychological construct for the understanding of entrepreneurship (Newman et al., 2019), the gender differences in small business (Fielden et al., 2003) and entrepreneurship education success (Martínez-Gregorio et al., 2021). Authors tend to define ESE, according to the definition of self-efficacy claimed by Bandura et al. (1999), as the individual's belief in his or her capability to perform behaviors to achieve a specific entrepreneurial outcome (for example; Chen et al., 1998; DeNoble et al., 1999). This perspective emerges from the social cognitive theory, which emphasizes social context impact in the development of self-efficacy (Newman et al., 2019).

Although it has been proved that generalized self-efficacy has an impact on business creation and success (Miao et al., 2017), it is relevant to study the effect of ESE since Bandura (Bandura, 2006; Bandura et al., 1999) argued that self-efficacy is task-specific and domain-specific. In this line, a meta-analysis has been carried out that support the relationship between ESE and firm performance (Miao et al., 2017).

Apart from the evidenced relationship between ESE and firm performance, ESE is considered a key factor for the promotion of the intention to be an entrepreneur (Newman et al., 2019). These relationships are frequently explained by the Theory of Planned Behavior (TPB) (Ajzen, 1991). Schlaegel and Koenig (2014) carried out a meta-analysis, based on TPB, finding that the effect of ESE in entrepreneurial intention may be partly mediated by perceived feasibility and perceived desirability of performing the behavior.

Whereas the relationship between ESE and entrepreneurial intention is consistent through the literature, Schlaegel and Koenig

(2014) suggested that there are moderators that have not been properly studied yet. For example, Shinnar et al. (2014) found a weaker relationship between ESE and entrepreneurial intention for males than females.

Gender differences in entrepreneurship is a current topic in the field. Despite the interest in promoting gender entrepreneurship and the growing participation of women in the enterprise sector, women still express less entrepreneurial intention and actions than men. One of the possible antecedents of this disparity is the gender gap in ESE (Chowdhury et al., 2019).

To guarantee reliable research in ESE gender differences is important to own reliable and gender unbiased instruments of measurement. As far as we are aware, the gender invariance of the ESE scale has not been tested yet. Consequently, this study aims to provide evidence on the psychometric goodness and to do the first attempt to examine the configural, metric, and scalar invariance across gender of an ESE scale, which is used in the Global University Entrepreneurial Spirit Students' Survey (GUESSS). This unidimensional 7-item scale has been used in previous academic publications (for example; Brändle et al., 2018; Hand et al., 2020). If scalar invariance is established, the latent means of men and women will be compared to provide evidence about the gender gap in ESE. Furthermore, the alternative model of the TPB proposed by Heuer and Liñán (2013) will be tested as a convergent validity test for the scale.

Literature review

ESE's role in the Theory of Planned Behavior

The relationships between ESE and entrepreneurial intention are frequently explained by the TPB (Ajzen, 1991). From this theoretical perspective, the best predictor of human behavior is the intention to perform the behavior. The intention has three kinds of antecedents: (a) attitude toward entrepreneurship, (b) subjective norm, and (c) perceived behavioral control (PBC). Attitude toward a behavior refers to the personal valuation of the behavior. Subjective norm denotes the opinions of the significant social groups. Finally, PBC refers to the subjective degree of control over performance (Ajzen, 2002b). Despite being quite similar, PBC and self-efficacy are different concepts (Ajzen, 2002b). Notwithstanding, self-efficacy is more related to intention than PBC (Armitage & Conner, 2001). In fact, entrepreneurial self-efficacy is used instead of PBC in a diverse number of studies in the field of entrepreneurship (for example; Kumar & Das, 2019).

Another controversial aspect of TPB is the role of subjective norm in the model. Although it was initially considered as an antecedent of entrepreneurship intention (Ajzen, 1991), its predictive power has been called into question (Armitage & Conner, 2001). Heuer and Liñán (2013) proposed that there is an indirect effect of subjective norm through self-efficacy and attitude toward entrepreneurship. Despite the lack of unanimity in the position of subjective norm in the TPB model, this alternative model has been satisfactory proven in recent studies (Farooq, 2018; Kruse, 2020).

Gender differences in ESE

Although there are studies that have found gender differences in entrepreneurial intention (for example: Haus et al., 2013; Nowiński et al., 2019; Wilson et al., 2007), it still being a controversial topic. To sum

up the previous literature, Haus et al. (2013) conducted a meta-analysis of the gender effects on entrepreneurial intention. These authors concluded that men present a higher mean in entrepreneurship intention, although the effect is small.

One of the possible causes of the lower entrepreneurial intention in women is the gender gap in the level of ESE. Generally, previous research has shown that women present lower levels of ESE than men (for example: Chowdhury et al., 2019; Wilson et al., 2007). However, there are research data that point to the opposite direction (Coleman & Kariv, 2014) or do not find gender differences (for example; Agarwal & Satsangi, 2018; Zhao et al., 2005). These controversial results could be explained by the different measures used in previous research. Although all of them are composed of items asking about the perceived capability in a set of entrepreneurial competencies, the competencies included and the number of them vary across the studies. Coleman and Kariv (2014) found that differences between male and female ESE depend on the asked competence. Despite being a current research topic, none of these studies includes a measurement invariance routine to guarantee the comparability of the ESE results between women and men.

Gender differences seem to be a matter of perception and self-perception (Minniti & Nardone, 2007). Women tend to perceive more obstacles in the entrepreneurial process, feeling less capability to deal with them (Rico & Cabrer-Borrás, 2018). Kourilsky and Walstad (1998) detected that while boys and girls present low levels of entrepreneurial knowledge, females are more aware of their limitations.

As has been evidenced, the gender relationship with ESE is a controversial topic, which needs more research. Given the importance

of entrepreneurial self-efficacy in gender studies in entrepreneurship, it is important to have adequate instruments for its measurement.

ESE measurement

Across the aforementioned literature, there is not a consensus regarding the better instrument to measure ESE (Newman et al., 2019). The most widely-used scale was developed by Chen et al. (1998) under a multidimensional perspective. Of the 113 studies reviewed by Newman et al. (2019), 22 used this scale or a modified version of it. The second most used scale was developed by DeNoble et al. (1999). This 22-item multidimensional scale is frequently used in the ESE literature (for example: Naktiyok et al., 2010), and it was adapted to the Spanish context by Moriano et al., (2006).

Another relevant contribution was the scale proposed by McGee et al. (2009). It brings a different approach to the ESE measurement focused on the phases of business creation (searching, planning, marshaling, and implementation). It is surprising that the three most frequently used scales have a multidimensional approach (Schjoedt & Craig, 2017), contrary to Bandura's recommendation (Bandura, 2006; Bandura et al., 1999).

Subsequently, new scales have continued to be developed and validated (for example: Adebusuyi et al., 2022; Schjoedt & Craig, 2017; Zhao et al., 2005). In addition, other studies are using ad hoc ESE scales without previous validation (for example; Agarwal & Satsangi, 2018).

Although gender differences in ESE are being studied using the cited scales, scale invariance tests have not been carried out. Factorial invariance across gender is needed to perform reliable gender comparisons, obtaining evidence of whether the outcome of ESE scales can be interpreted in the same way in men and women.

The ESE scale used in the Global University Entrepreneurial Spirit Student's Survey (GUESSS) is based on the cited scales (Chen et al., 1998; DeNoble et al., 1999; Zhao et al., 2005). It presents a unidimensional factorial structure, following Bandura's recommendation (Bandura, 2006; Bandura et al., 1999). The GUESSS is an international research project focused on students' entrepreneurial intentions and activities with data collections every two years. Since the first survey in 2003, the project has grown up until the 208.000 respondents, 54 countries, in its 2018 edition. Consequently, the ESE scale used in the survey is worldly used in the university context for entrepreneurship research (for example; Brändle et al., 2018; Hand et al., 2020). Therefore, it is relevant to improve the knowledge about the psychometric adequacy of the scale and its gender measurement invariance to conduct gender comparisons.

Based on the literature review and the study aims, we propose the following hypotheses:

Hypothesis 1 (H1). The scale used in the GUESSS project is unidimensional and reliable.

Hypothesis 2 (H2). The scale used in the GUESSS project shows configural, metric, and scalar invariance across gender.

Hypothesis 3 (H3). Men present higher latent means of ESE than women.

Hypothesis 4 (H4). Subjective norm has an indirect effect on entrepreneurial intention through self-efficacy and attitudes toward entrepreneurship.

Method

Participants and procedure

This research was undertaken within the framework of the GUESSS project. For the year of data collection, in the 2018 edition, 54 countries and more than 3100 universities already participated in this collaborative research entrepreneurship observatory (www.guesssurvey.org). This initiative is organized by the University of St. Gallen (KMU-HSG) and the University of Bern (IMU-U).

Once obtained the approval of the Ethics Committee and the University of Valencia's Data Protection Officer, researchers contacted representatives of the university degrees to participate. The students were enrolled for anonymous participation through an online survey (10-15 minutes long) referred by their faculty responsible and encouraging for response in the period October to December 2018.

The sample consisted of 998 Spanish undergraduate students enrolled in the GUESSS cross-cultural survey in 2018 at the University of Valencia, age (mean = 23.26, $SD = 5.31$) ranging from 17 to 53 years old ($Q_1 = 20$, $Q_2 = 22$, $Q_3 = 24$). 55.4 percent female and 44.6 percent male.

Instruments

The Entrepreneurial self-efficacy scale used in GUESSS (for example; Brändle et al., 2018; Hand et al., 2020) is measured by 7 items asking "Please indicate your level of competence in performing the following tasks" with Likert scale from 1 to 7 (1= very low competence, 7= very high competence) as displayed in Table 16. This scale is based on previous research (Chen et al., 1998; DeNoble et al., 1999; Zhao et al., 2005). The alpha coefficient for the measure was .921, CI 95 percent (.809, .984) and the Composite Reliability Index, CRI was .933.

Three scales from Liñán and Chen (2009) measuring their core entrepreneurial intention model and included in their *Entrepreneurial Intention Questionnaire* (EIQ) were used: Subjective Norm, Entrepreneurship Intention and Attitudes toward Entrepreneurship. All of them use a 7-point Likert scale (from 1 very negatively to 7 very positively).

Subjective Norm, “If you would pursue a career as an entrepreneur, how would people in your environment react?”, measured in a 3 item. These 3 items are focused on close family, friends and fellow students. According to Ajzen (1991), in Liñán and Chen (2009) conception is approached through an aggregate measure of the kind “what do reference people think?”. In the current application, the reliability by alpha was .799, CI 95 percent (.776, .819) and CRI = .680.

Entrepreneurship Intention includes 6 items asking “Please indicate your level of agreement with the following statements”. In this scale entrepreneur refers to someone who creates a new business and is representative of the scale items such as “I am ready to do anything to be an entrepreneur” or “I am determined to create a firm in the future”. The reliability for this sample was alpha = .956, CI 95 percent (.952, .960) and CRI = .970.

Attitudes toward Entrepreneurship finally measures the level of agreement with 5 items as “Among various options, I would rather be an entrepreneur”. The reliability of the scale in this sample was alpha = .937, CI 95 percent (.931, .943) and CRI = .955.

Statistical analysis

A measurement invariance study needs to consider a series of Confirmatory Factor analyses (CFA), some of them hierarchical. All these CFAs were estimated in Mplus 8.6 (Muthén & Muthén, 1998-2017) with WLSMV for categorical variables. Model fit was assessed by: chi-

square statistic, the Comparative Fit Index (CFI), the Standardized Root Mean Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA). An adequate model fit was considered CFI above .90 (better if above .95) and RMSEA and SRMS below .08 (Marsh et al., 2004) have been used as approximate cut-off criteria employed to declare model fit reasonable. Parameter estimates were also considered to study models' goodness.

The original solution of one factor found by Zhao et al. (2005) was tested separately in each of the groups studied: men and women (gender). Once an adequate model fit was established for each group, the invariance routine for gender was performed. The invariance routine consisted of a set of increasingly constrained models that tested for configural, metric and scalar invariance of the scale (van de Schoot et al., 2012). The configural model constrains the same structure across groups but parameter estimates are freely estimated within each group, and the fit of this configural model is used as the baseline fit. Second, metric invariance sets factor loadings to be the same across groups. Third, scalar invariance imposes equal factor loadings and intercepts across groups. These models are nested and may be compared with two different rationales (Little, 1997): a formal statistical test and a modeling strategy. The statistical approach employs χ^2 differences ($\Delta\chi^2$) to compare nested models, with non-significant values suggesting invariance. This approach has been criticized for been too powerful to detect trivial differences, and therefore, a modeling approach has been advocated with CFI differences (for example; Cheung & Rensvold, 2002). Usually, CFI differences (ΔCFI) are used to evaluate measurement invariance, with differences lower than .01 (G. W. Cheung & Rensvold, 2002) or lower than .05 (Little, 1997) used as cutoff criteria. In a simulation study, Chen (2007) recommended different cutoff points for CFI, RMSEA, and SRMR indices to test for loading and intercept

invariance. These new cutoff points were .005 for differences in the CFI, along with .01 in RMSEA or .025 in RMSEA for loading invariance, and a change of .005 in CFI, supplemented by .01 in RMSEA and .005 in SRMR for intercept invariance.

Descriptive statistics as mean, standard deviation, skewness and kurtosis for items and corrected item-total correlations were estimated in SPSS 26. Estimates of internal consistency, Cronbach's α with the 95 percent confidence interval (Diedenhofen & Musch, 2016) were calculated for all measures. For the self-efficacy scale the composite reliability index, CRI was also calculated. CRI has been determined to be a better estimate of the true reliability (Raykov, 2004).

Results

Factor structure

The one-factor solution fit according to the original structure was adequate as follows: $\chi^2(14) = 422.506$, $p < .001$, RMSEA = .187, 90 percent confidence interval [CI] = [.172, .202], CFI = .970, SRMR = .028. Factor loadings are presented in Table 14.

Reliability and descriptive statistics

As could be seen in Table 14, all the means are in the test anchor 4, with item 4 scoring the highest, and item 2 the lowest. Items present a quite homogeneous pattern in variability also reporting asymmetry and kurtosis with values under ± 2 , showing an adequate fit to univariate normality (Curran et al., 1996). Additionally, there is no multicollinearity since the correlations among items are all below .90 (Tabachnick & Fidell, 2012). Factor loadings showed that all the items were strongly related to the Self-efficacy factor, with values ranging from .740 to .851.

Table 14

Means (M), Standard Deviations (SD), skewness (g1), kurtosis (g2), inter-item correlations, factor loadings (λ) and corrected item-total correlations for the Entrepreneurship Self-Efficacy scale (r_{it})

	M	SD	g1	g2	1	2	3	4	5	6	λ	r_{it}
1	4.13	1.56	-.243	-.592							.797	.734
2	4.07	1.58	-.147	-.623	.715						.806	.722
3	4.30	1.65	-.352	-.611	.643	.696					.844	.794
4	4.92	1.60	-.583	-.284	.505	.476	.596				.740	.666
5	4.37	1.64	-.369	-.513	.602	.585	.656	.662			.844	.789
6	4.30	1.65	-.373	-.547	.618	.609	.683	.562	.720		.851	.791
7	4.54	1.66	-.501	-.448	.608	.568	.676	.565	.690	.737	.832	.777

The corrected item-total correlations for the Entrepreneurship Self-Efficacy scale revealed a high and similar performance for all the items. Item 4 about competencies in “Being a leader and communicator” offered the lowest loading (.740) and also, the lowest corrected item-total correlation (.666). Item 6 about “Commercializing a new idea or development” was the best-performing one, as seen in Table 1 with the highest factor loading (.851) and second higher corrected item-total correlation (.791).

The alpha coefficient for the measure was .921, CI 95 percent (.809, .984) and the Composite Reliability Index, CRI was .933.

Factor invariance across gender

Table 15 shows goodness-of-fit indices for the groups under study: men and women. The one-factor model tested fitted the observed data in the two samples. Given that a good model fit was established for each model, a measurement invariance routine by gender was tested. Goodness-of-fit indices, as well as chi-square and CFI differences, of the invariance routine are presented in Table 15. Concerning gender invariance, the configural model fitted the data well in both samples, the metric invariance model was not statistically different from the configural, and therefore metric invariance was supported. When scalar invariance was tested, there was no significant increase in the chi-square, and the modeling approach showed that scalar invariance was tenable by gender. The values for CFI as the rest of the indexes support that conclusion. When introducing constrictions, the fit is expected to be worse, but instead remains adequate. So, as seen in Table 15, DIFFTESTS (chi-square differences) statistically significant, when all thresholds were constrained to equality (scalar invariance), the fit remains adequate (CFI difference = -.001) and the three types of invariance are assured. The same findings are supported with SRMR and RMSEA, as could be seen in Table 15, although are usually

admitted values up to .015 for the difference, there is no increase in the values for every step of the invariance (for instance, .167, .138 and .095 are the values for RMSEA, decreasing with the lowest for scalar).

Unstandardized and standardized factor loadings are included in Table 16. Once scalar invariance was established, latent mean differences could be calculated: the latent mean difference for men and women in entrepreneurial self-efficacy of -.050 was not statistically significant ($p = .702$) and the effect size as measured by Cohen's d was -.027.

Convergent validity

With respect to the criterion-related evidence for validity, all the correlations were in the hypothesized direction and may be considered adequate. The Pearson correlation between Self-Efficacy and Entrepreneurship intention was .548 ($p < .001$); .310 ($p < .001$) with Subjective Norm and finally the highest relation was shown with Entrepreneurship Attitudes .573 ($p < .001$). When studying Self-Efficacy nomological validity, a structural equation model with latent variables following Ajzen's TPB (1991) was used (see Figure 18). Subjective norm predicts attitudes and self-efficacy, and both predict entrepreneurship intention. We found support for the indirect effect of subjective norm through self-efficacy and attitude as suggested by Heuer and Liñán (2013) according to previous research (Armitage and Conner, 2001). With an adequate fit ($\chi^2(185) = 2760.991$, $p < .001$, RMSEA = .118 90 percent CI [.114 , .122], CFI = .965, SRMR = .059), the model offers high R^2 , with a 80.2 percent of variance accounted for intentions, 54.8 percent for attitude and 56.7 percent for self-efficacy.

Table 15

Goodness-of-fit indices for each group studied and for the set of nested models to test for measurement invariance by gender

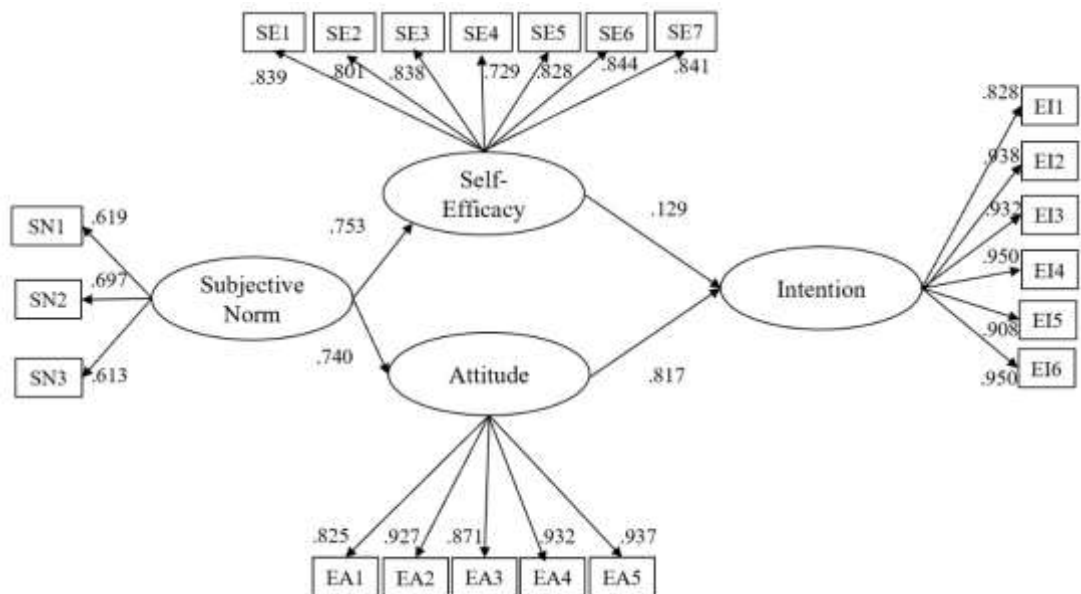
Model	χ^2	df	p	$\Delta\chi^2$	Δdf	p	CFI	ΔCFI	SRMR	RMSEA	90 percent CI
<i>Gender</i>											
Male	126.907	14	< .001	--	--	--	.978	--	.024	.150	.127-.174
Female	293.291	14	< .001	--	--	--	.967	--	.032	.205	.185-.226
Configural	517.689	35	< .001	--	--	--	.990	--	.016	.167	.154-.179
Metric	426.839	41	< .001	14.291	6	.026	.992	-.002	.016	.138	.126-.150
Scalar	409.260	75	< .001	79.845	34	< .001	.993	-.001	.019	.095	.086-.104

Note. df = degrees of freedom; Δ = differences

Table 16*Unstandardized and standardized factor loadings by Gender*

Item	Factor loadings		
	UN	ST Female	ST Male
1. Identifying new business opportunities	1.000	.891	.895
2. Creating new products and services	0.953	.898	.887
3. Managing innovation within a business	1.052	.915	.904
4. Being a leader and communicator	1.029	.860	.900
5. Building up a professional network	1.188	.905	.922
6. Commercializing a new idea or development	1.093	.904	.910
7. Successfully managing a business	1.104	.899	.912

Note: UN= unstandardized estimates (constrained to equality in the two samples); ST= standardized estimates.

Figure 18*Model for nomological validity of Entrepreneurial Self-Efficacy*

Discussion

Entrepreneurial self-efficacy (ESE) has become a relevant construct in entrepreneurship and entrepreneurship intention research (Miao et al., 2017; Newman et al., 2019). Additionally, in recent years, the gender gap in ESE is getting attention to improve female entrepreneurship (for example; Chowdhury et al., 2019; Elliott et al., 2020). Despite this interest, there is a lack of consensus on the ESE scale used in research and there are not gender invariance studies for these scales that guaranteed the reliability of gender comparisons. This study aims to provide evidence for the adequate reliability, factor structure, gender invariance, and validity of the ESE scale used in the GUESSS survey. The obtained results indicate that this brief one-factor ESE scale is suitable for its use in Spanish university samples to study gender differences.

The CFA shows the unidimensional structure of the scale in the total sample, with factor loading ranging between .740 and .851. This result agrees with the conclusions obtained in other similar previous scales (Schjoedt & Craig, 2017; Zhao et al., 2005). Regarding the reliability analysis, the scale presents high coefficients for alpha and CRI.

Regarding the factorial gender invariance, the results confirm that the factorial structure of the scale is invariant by gender. Configural, metric and scalar invariance were supported by the results, which means that we can do latent mean comparisons between males and females. The result shows that there are no statistically significant differences in ESE by gender. Although gender differences in ESE is a controversial topic with conflicting results in the literature (Newman et al., 2019), these results agree with those previous research that not

found gender differences in ESE (Agarwal & Satsangi, 2018; Mueller & Conway Dato-on, 2013; Zhao et al., 2005).

The validity of the ESE scale used in the GUESSS survey has also been proven with high correlations with the rest of the constructs involved in the Theory of Planned Behavior, TPB (Ajzen, 1991). Furthermore, evidence of the adequacy of the alternative TPB model proposed by Heuer and Liñán (2013) has been obtained. Subjective norm is a background predictor of attitude toward entrepreneurship and ESE. This result is consistent with other recent studies (Farooq, 2018; Kruse, 2020).

Limitations and future research

Current research has some limitations; the study only includes Spanish university population in the sample. The absence of gender differences in other educational stages or age groups may not be maintained (Wilson et al., 2007), and gender invariance should be tested in representative samples from the general population for widespread use.

Additionally, the GUESSS survey collects gender as a dichotomous variable, and this conceptualization of gender could the study of gender effect in ESE (Newman et al., 2019). Gender differences in ESE, when they have appeared in the research, have been explained as a result of gender roles and cultural expectations resulting from a differential socialization process (Scherer et al., 1990), and this pattern is not consistent across cultures (Mueller & Conway Dato-on, 2013). More cross-cultural approaches are needed to understand the complex relationships among gender (considered beyond the traditional and limited male-female dichotomy), cultural gender roles, and ESE.

Conclusions

This **Study 5** contributes to studying gender differences in entrepreneurship by providing an ESE scale that has shown evidence of reliability, validity, and gender non-bias in a Spanish university sample. This first attempt to guarantee gender invariance has allowed us to check that men and women share the same conception of ESE. These results encourage the use of this scale to delve into the study of the gender gap in entrepreneurship.

Primarily, these findings have practical implications for researchers. Although gender invariance is a requirement to carry out mean contrasts between women and men, it had never been tested. As a result, these findings endorse the past and future use of the scale. Furthermore, since no gender difference has been found, this study provides new evidence that the explanation of gender differences in entrepreneurial intention must be explained by something other than entrepreneurial self-efficacy. As Mueller and Conway Dato-on (2013) suggested, gender differences may be the result of complex relationships between gender, gender roles, and culture.

Additionally, our results contribute to the understanding of the role that subjective norm plays in promoting entrepreneurial intention.

Study 6. Psychometric Properties of the Entrepreneurial Intention Questionnaire (EIQ) in Dominican Republic Adolescents

Martínez-Gregorio, S., Pérez-Jiménez, M., Torres, Z., Oliver, A., & Tomás, J. M. Psychometric properties of the Entrepreneurial Intention Questionnaire (EIQ) in Dominican Republic adolescents. *Revista Latinoamericana de Psicología*. In press.

Abstract

Introduction: This work represents the first attempt to obtain evidence of the validity of an entrepreneurial intention questionnaire in the adolescent population of a Latin American or Caribbean country. The objectives are to study the factor structure, the reliability, the external validity and to test the gender invariance of the Entrepreneurial Intention Questionnaire, in its adaptation for adolescents. **Methods:** The sample consisted of 708 adolescents from the Dominican Republic with a mean age of 15.49, 65.2% of whom were women and 35.8% were men. Analyses included confirmatory factor analysis, Cronbach's Alpha and Omega scores for reliability, correlations, and a gender invariance routine. Finally, latent means of females and males are compared. **Results:** The confirmatory factor analysis showed a good fit to the data and the reliability results were adequate. In addition, the correlations with the Entrepreneurial Attitudes Scale for Students were positive and statistically significant. Also, strict gender invariance was successfully verified. Although males presented a higher subjective norm, females showed higher entrepreneurial intentions. **Conclusions:** The Entrepreneurial Intention Questionnaire shows adequate psychometric

properties and proves useful in conducting research on the promotion of entrepreneurship in early stages.

Keywords: entrepreneurial intention, secondary education, psychometric properties, Theory of Planned Behavior, gender invariance

Introduction

Entrepreneurship has evidenced a positive impact on national economies (Acs et al., 2017), which has led to an increase in initiatives for its promotion (UNESCO, 2008). If we focus on the case of the Dominican Republic, its rate of entrepreneurial culture is above the average for Latin America and the Caribbean (Schwab, 2019). The results of the latest Global Entrepreneurship Monitor report in the country show that 56% of the people surveyed presented entrepreneurial intention (GEM Dominican Republic, 2022).

Entrepreneurial intention is defined as the "conscious state of mind that precedes action and directs attention towards entrepreneurial behaviors such as starting a new business and becoming an entrepreneur" (Moriano et al., 2012, p.165). This variable has emerged as an important predictor of entrepreneurial behavior (Belchior & Lyons, 2021; Gieure et al., 2020; Kautonen et al., 2015). Thus, the effectiveness of interventions to promote entrepreneurship is usually evaluated by observing the change produced in entrepreneurial intention (Bae et al., 2014; Martínez-Gregorio et al., 2021).

Throughout the literature, entrepreneurial intention has been studied from different perspectives, with the Theory of Planned Behavior (TPB, Ajzen, 1991) having the greatest impact (Wu & Tian, 2022). According to this theory, entrepreneurial intention is promoted by three antecedents: attitude toward entrepreneurship, subjective norm, and perceived behavioral control. The attitude toward entrepreneurship refers to the personal appraisal, positive or negative, that the person makes regarding entrepreneurship (Kolvereid, 1996a). The subjective norm would be the perceived social support from relevant people in the environment (Liñán & Chen, 2009). Behavioral control constitutes the perceived ease of developing an entrepreneurial behavior. This last

dimension has been the subject of some controversy and, in several studies, has been replaced by entrepreneurial self-efficacy (Moriano, 2005; Van Gelderen et al., 2008). A previous meta-analysis had already shown that entrepreneurial self-efficacy would be a better predictor of entrepreneurial intention than perceived behavioral control (Armitage & Conner, 2001), both constructs being distinguishable (Ajzen, 2002b).

Given the importance of entrepreneurial intention in the context of entrepreneurship promotion, it is necessary to have valid and reliable measurement instruments to study it. If we review the literature, we can find that for the adult population the most used scale was developed by Liñán and Chen (2009), within the framework of the TPB, but it is not the only one (Asghar et al., 2019; Kautonen et al., 2015; Moriano, 2005). In contrast, when it comes to scales validated in child or adolescent populations, the list of alternatives is shortened (Brüne & Lutz, 2020). Traditionally, when entrepreneurial intention has been studied in these groups, a single indicator has been used (Patuelli et al., 2020; Shahin et al., 2021) or adaptations of existing scales validated in adults (e.g., Barba-Sánchez & Atienza-Sahuquillo, 2016). Again, the most widely used scale has been the one developed by Liñán and Chen (2009) (e.g., Aggarwal & Shrivastava, 2021; Buli & Yesuf, 2015; D'Souza et al., 2018; Mothibi & Malebana, 2019; Ni & Ye, 2018; Xu et al., 2016).

The study of the psychometric properties of these adaptations has traditionally been reduced to the study of their reliability (e.g. Mothibi & Malebana, 2019; Ni & Ye, 2018) and on occasion to their factor structure (e.g. Buli & Yesuf, 2015; Xu et al., 2016). Recently, an adaptation of the Entrepreneurial Intention Questionnaire (EIQ) has been undertaken for the Spanish adolescent population (Martínez-Gregorio & Oliver, 2022). The EIQ was originally developed by Rueda et al. (2015) for the measurement of entrepreneurial intention and its antecedents in adults. The scale is framed into the TPB. It presents the

particularity of following the methodological recommendations of Ajzen (2002a) for the measurement of the dimensions of attitude and subjective norm as composite measures (Moriano et al., 2012). Additionally, it replaces the dimension of perceived behavioral control with entrepreneurial self-efficacy due to its greater explanatory capacity with regard to entrepreneurial intention (Armitage & Conner, 2001). This scale has also obtained evidence of validity in Spanish (Rueda et al., 2015), Portuguese (Da Fonseca Oliveira et al., 2016) and Colombian (Laguía et al., 2017) adult populations. The adaptation for high school students introduced various modifications to the scale (Martínez-Gregorio & Oliver, 2022). Although the dimensions of attitudes toward entrepreneurship and entrepreneurial self-efficacy remain identical, the relevant people for subjective norm measurement change to family, friends, and teachers. Additionally, two items of entrepreneurial intention were modified, and a third one was deleted (for more detail, see Martínez-Gregorio & Oliver, 2022).

Regarding the context of the Dominican Republic, empirical research on entrepreneurship and its antecedents is scarce (Carlo Martínez, 2017), so no studies have been found on the psychometric properties of these instruments in the adolescent population in that country or in any other Latin American or Caribbean country. This educational stage is crucial for the promotion of entrepreneurship (Huber et al., 2014), hence instruments are required to evaluate and study the effectiveness of the interventions developed. Expressly, in the context of the Dominican Republic, where it has been seen that it is precisely young people who currently have the fewest entrepreneurial intentions (GEM Dominican Republic, 2022).

Research on entrepreneurial intention and attitudes in pre-university students is scarce in the Dominican Republic. However, the Ministry of Education of the Dominican Republic (MINERD, 2016)

acknowledges the importance of promoting transversal competences in high school students as the personal and professional development that contributes to the generation of an entrepreneurial ecosystem (MICM, 2019). The Dominican Republic participates in international surveys to assess entrepreneurial variables. However, all of them are focused on adults and/or university students (GEM Dominican Republic, 2022; Sieger et al., 2021). Consequently, it is crucial to have instruments which assess these competences in earlier educational stages with methodological rigor in order to orient future actions and evaluate their effectiveness.

Although the EIQ has been recently validated in a sample of Spanish high school students, its adequacy in the Dominican Republic high school students cannot be assumed. The conceptualization of entrepreneurship may not be equivalent between the adolescents of both countries. In terms of cultural differences with implications regarding entrepreneurship, the Dominican Republic presents a higher power distance and masculinity, with a predominance of necessity entrepreneurship compared to Spain (Carlo Martínez, 2017). Contrarily, Spain shows a more individualistic tendency and uncertainty avoidance (Carlo Martínez, 2017). These differences need to be considered when approaching the measurement of entrepreneurial intention to ensure that the instruments used in other Spanish-speaking contexts are equally valid for use in the Dominican Republic.

The present work aims to report evidence of the validity and reliability of the Entrepreneurial Intention Questionnaire posited by Rueda et al. (2015), following the adaptations made by Martínez-Gregorio and Oliver (2022), in young people in the Dominican Republic. Specifically, we will study its: (a) factor structure; (b) reliability; (c) nomological validity; and (d) gender invariance.

Method

Participants

The sample consisted of a total of 708 secondary school students from different centers randomly selected from Regional 15 in Santo Domingo, a region inside the urban area of the capital of the Dominican Republic. The mean age of the participants was 15.49 years ($SD = 1.58$). 65.2% of the sample were females ($n = 458$) and there were 3 people who did not self-identify as either male or female, choosing the "other" option in the questionnaire. 88.7% ($n = 625$) had never participated in any entrepreneurship promotion program and 61.7% showed total indecision or considerable doubts about what they wanted to continue studying.

Instruments

A set of sociodemographic questions (for example, gender and age) and the following instruments were administered:

- **Entrepreneurial Intention Questionnaire (EIQ)** (Rueda et al., 2015). The version adapted for adolescents in a Spanish-speaking context by Martínez-Gregorio and Oliver (2022) was administered. This scale assesses the dimensions of attitudes toward entrepreneurship, subjective norm, entrepreneurial self-efficacy and entrepreneurial intention. The adaptation for adolescents includes two groups of six items to measure entrepreneurial attitude, the first items concerning the expected outcomes of entrepreneurship (e.g. "Creating a business (being an entrepreneur) for you would mean.... Creating jobs for other people") and the second group of items regarding the desirability of such outcomes (e.g. "Now you should indicate to what extent they are desirable for you in your general life.... Creating employment for other people"). These two sets of items are multiplied to obtain the final

attitude toward entrepreneurship score. The same system is employed in the subjective norm dimension, where we find a first group of three items regarding the support that various agents would offer for the idea of entrepreneurship (e.g. "To what degree would they agree with you if you decided to become an entrepreneur and start your own business? My friends") and a second group of three items regarding the degree of importance that the opinion of these people has for the respondent (e.g. "Indicate to what extent you care about what they think as you decide whether or not to pursue a career as an entrepreneur? My friends"). The entrepreneurial self-efficacy dimension consists of nine items (e.g. "Define your business idea and the strategy of your company"), and the entrepreneurial intention dimension consists of five items (e.g. "Do you think that in the future you will create your own business?"). All items are evaluated on a Likert scale from 1 to 7. The psychometric properties of the instrument will be studied in detail in this paper.

- **Entrepreneurial Attitudes Scale for Students (EAEE)** (Oliver & Galiana, 2015). This scale includes three items to assess each of the six entrepreneurial attitudes: proactivity (e.g., "Planning my future options is an important part of my training"), professional ethics (e.g., "I consider myself someone with high motivation at work"), empathy (e.g. "I have a strong desire to help others"), innovation (e.g. "I can imagine myself doing something innovative as a professional"), autonomy (e.g. "I want to work where new opportunities matter to all employees"), and risk-taking (e.g. "I think I am risk-taking compared to others I know"). The response method is a Likert scale from 1 to 5. The factor structure proposed by Oliver and Galiana (2015) fits the data satisfactorily ($\chi^2(120) = 645.104$ ($p < .001$), CFI = .963, RMSEA = .079, 90% CI [.073, .085], and SRMR = .035), with reliability scores (omega) of .73 for proactivity, .59 for professional ethics, .79 for empathy, .86 for innovation, .83 for autonomy, and .61 for risk taking. Consequently, the

reliability results for the dimensions of professional ethics and risk taking were under the cut off criterion of .7.

Procedure

The survey and the procedure were approved by the Human Research Ethics Committee of the Regional 15 of Santo Domingo (Ref. 201221). The research team contacted the high schools in the Regional 15 to present the research project and request for their support. Once the parents or legal tutors signed the informed consent to allow the participation of the students, the protocol was administered online through the SurveyMonkey platform. The students completed the questionnaire during their school time. At the beginning of the questionnaire, the high school services of vocational counseling and psychology informed the students that their participation was anonymous, voluntary, and unpaid.

Data Analysis

To evaluate the psychometric properties of the EIQ questionnaire, the statistical programs JASP 0.16 and Mplus 8.5 (Muthén & Muthén, 1998-2017) were used.

First, its factor structure was tested using confirmatory factor analysis (CFA) with the MLR (maximum likelihood robust) estimation method. The fit of the model to the data was assessed using the fit indices traditionally employed in the literature: (a) chi-square, (b) CFI (adequate if above .9), (c) RMSEA (adequate below .08) and (d) SRMR (adequate below .08) (Hu & Bentler, 1999).

Successively, some descriptive statistics of the items were obtained (mean, standard deviation, correlation with the rest of the items of the dimension and corrected item-total correlation), as well as the reliability results of the different dimensions by Cronbach's alpha and

McDonalds' omega, both considered adequate when they show results above .7 (Hair et al., 2014).

The external validity of the questionnaire was tested by correlating its different dimensions with the entrepreneurial attitudes included in the EAEE, trying to replicate the evidence provided by Martínez-Gregorio and Oliver (2022). The entrepreneurial attitudes are included as a relevant variable to test the nomological validity of the EIQ as there is a clear agreement regarding its positive relationship with entrepreneurial intention (e.g., Hassan et al., 2021; Martínez-Gregorio & Oliver, 2022; Singh & Mehdi, 2022).

Finally, a gender invariance routine was carried out. The estimation method continued to be MLR. The different levels of invariance are tested by several steps: (a) configural invariance: which checks that the same factor structure fits in both groups simultaneously; (b) metric invariance: factor loadings are fixed; (c) scalar invariance: factor loadings and intercepts are fixed; and (d) strict invariance: the error variance constraint is added to the above. The fit of the different models is evaluated using the same criteria defined for the CFA. Comparison between models can be assessed by the change in the chi-square, where a non-statistically significant change indicates invariance. This method has received criticism given the excessive statistical power of the chi-square (Cheung & Rensvold, 2002). For this reason, it is recommended to evaluate changes in CFI (less than .01), RMSEA (less than .015) and SRMR (less than .03) as evidence of invariance (Chen, 2007). Once the strict invariance is verified, latent means were compared.

Results

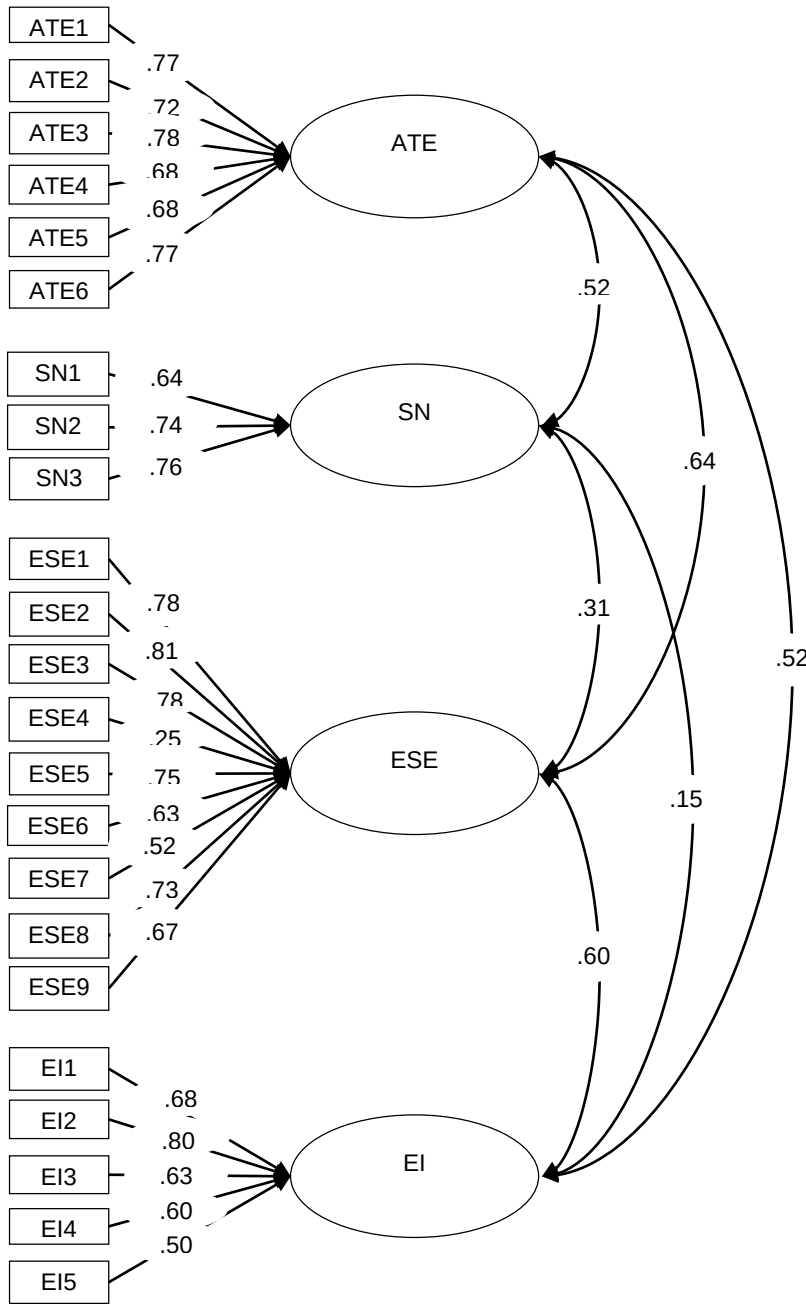
Factor Structure

The 4-dimensional factor structure proposed by the original authors (Rueda et al., 2015) was tested. The model shows a satisfactory fit to the data: $\chi^2(224) = 649.261$ ($p < .001$), CFI = .918, RMSEA = .052, 90% CI [.047, .057], and SRMR = .047. Figure 19 shows the standardized factor loadings, as well as the correlations between factors. As can be seen, all factor loadings are statistically significant ($p < .001$), ranging from .25 to .81. Item ESE4 presents a factor loading under the recommended cut-off criteria (.30 - .40; Boateng et al., 2018). However, as the total factor structure fits the data, the item was retained to preserve the comparability of future research results.

All correlations between factors are positive and statistically significant ($p < .01$). We can observe that, among antecedents, we found the highest correlation between entrepreneurial self-efficacy and attitude toward entrepreneurship ($\rho = .64$). Subjective norm would be the antecedent showing the lowest correlation with entrepreneurial intention ($\rho = .15$).

Figure 19

Factor structure



Note. ATE: Attitude toward entrepreneurship; SN: Subjective norm; ESE: Entrepreneurial self-efficacy; EI: Entrepreneurial intention

Descriptive statistics and reliability

Table 17 shows the descriptive statistics for the items, as well as the reliability results for the dimensions. All the items are homogeneous, with item 4 of the entrepreneurial self-efficacy dimension showing the least relationship with the rest of its dimension. This result was already observed in the factor loadings analyzed in the previous subsection. The reliability results for Cronbach's alpha and McDonalds' omega are satisfactory for all dimensions ($> .7$).

Table 17

Descriptive statistics, inter-item correlations, item-total correlation and reliability results

		M	SD	g1	g2	1	2	3	4	5	6	7	8	r _{it}	α	Ω
ATE	1	4.20	1.83	-0.04	-0.97									.70	.87	.88
	2	4.25	2.04	-0.24	-1.05	.57								.67		
	3	4.82	1.90	-0.56	-0.61	.60	.59							.72		
	4	4.80	1.87	-0.47	-0.77	.47	.46	.53						.64		
	5	3.55	1.88	0.29	-0.78	.58	.49	.49	.49					.63		
	6	4.95	2.09	-0.67	-0.74	.55	.55	.60	.62	.48				.71		
SN	1	4.86	1.85	-0.58	-0.54									.52	.75	.76
	2	3.54	1.83	0.23	-0.71	.46								.61		
	3	3.61	1.88	0.23	-0.86	.47	.59							.62		
ESE	1	5.81	1.60	-1.42	1.42									.66	.85	.86
	2	5.74	1.61	-1.32	1.03	.72								.70		
	3	5.59	1.67	-1.16	0.61	.63	.72							.67		
	4	3.67	2.37	0.16	-1.54	.14	.16	.20						.26		
	5	5.88	1.55	-1.48	1.58	.56	.56	.59	.20					.69		
	6	5.82	1.65	-1.48	1.46	.42	.44	.40	.14	.52				.60		
	7	5.13	1.94	-0.85	-0.37	.32	.35	.30	.25	.36	.42			.52		
	8	5.65	1.65	-1.25	0.93	.49	.55	.53	.24	.54	.57	.54		.71		
	9	5.77	1.64	-1.45	1.48	.48	.48	.48	.16	.53	.52	.39	.54	.63		
EI	1	5.19	2.45	-0.86	-1.00									.56	.77	.78
	2	5.87	1.85	-1.50	0.98	.57								.67		
	3	6.08	1.84	-1.93	2.35	.43	.51							.56		
	4	5.58	1.86	-1.20	0.40	.36	.47	.39						.52		
	5	6.17	1.82	-2.14	3.14	.30	.35	.35	.36					.44		

Note. M= Mean; SD= Standard deviation; g1= Skewness; g2= Kurtosis;
 ATE=Attitudes toward entrepreneurship; SN=Subjective norm;
 ESE=Entrepreneurial self-efficacy; EI=Entrepreneurial intention

External Validity

As a test of external validity, the correlations of the dimensions of the EIQ with the entrepreneurial attitudes included in the EAEE were tested. The results obtained are included on Table 18. All correlations are positive and statistically significant ($p < .01$). The highest correlation is observed between attitudes toward entrepreneurship and autonomy ($r = .49$), while the smallest correlation is between risk-taking and entrepreneurial intention ($r = .15$).

Table 18

Correlations between EIQ dimensions and entrepreneurial attitudes

	Proactivity	Ethics	Empathy	Innovation	Autonomy	Risk-taking
ATE	.41	.41	.39	.48	.49	.37
SN	.27	.26	.27	.23	.24	.20
ESE	.30	.30	.28	.36	.39	.28
EI	.20	.21	.20	.36	.26	.15

Note. ATE=Attitudes toward entrepreneurship; SN=Subjective norm; ESE=Entrepreneurial self-efficacy; EI=Entrepreneurial intention

Gender invariance

The fit indices of the set of models tested in the invariance routine are shown on Table 19. First, the model was tested in each group: men and women. Self-identified "others" were not included in the analysis as the sample size was too small to be considered as a third independent group. Once the satisfactory fit was verified for each of the groups, the configural model that would serve as a baseline was established. Compared to this, the metric model does not produce a considerable worsening of the fit if we consider the differences in CFI, RMSEA and

SRMR, although the chi-square difference is statistically significant. Therefore, metric invariance is supported. When constraining the intercepts (scalar invariance), the impact on the fit indices is small, so scalar invariance is proven. Finally, when testing strict invariance, setting the error variance equal, it is found that the differences in the fit indices are again small and, on this occasion, the CFI and RMSEA even improve. Consequently, the strict invariance of the scale by gender is supported.

Latent mean differences

To compare latent means across gender, the strict invariant model is tested with the females' latent means fixed to zero and the males' means freely estimated. The model adequately fits the data: $\chi^2(509) = 946.066$ ($p < 0.001$), CFI = .914, RMSEA = .050, 90% CI [.045, .055], and SRMR = .062. Latent mean differences exist in subjective norm, benefiting males (0.230, $p = .012$, $d = .23$) and entrepreneurial intention, favoring females in this case (-0.281 $p < .001$, $d = .28$). There are not statistically significant latent mean differences in attitudes (-0.089, $p = .275$, $d = .09$) and entrepreneurial self-efficacy (-0.142, $p = .080$, $d = .14$).

Table 19

Goodness-of-fit indices for each group (men and women) and set of nested models to test gender invariance

Model	χ^2	df	<i>p</i>	$\Delta\chi^2$	Δ gl	<i>p</i>	CFI	Δ CFI	SRMR	Δ SRMR	RMSEA	Δ RMSEA	90% CI
Men	395.170	224	< .001	--	--	--	.914	--	.053	--	.057	--	.047-.066
Women	496.499	224	< .001	--	--	--	.912	--	.052	--	.052	--	.046-.058
Configural	893.500	448	< .001	--	--	--	.913	--	.052	--	.054	--	.049-.059
Metric	916.334	467	< .001	22.99	19	.24	.912	-.001	.057	.005	.053	-.001	.048-.058
Scalar	959.529	490	< .001	42.88	23	< .01	.908	-.004	.061	.004	.053	0	.048-.058
Strict	963.455	513	< .001	22.36	23	.50	.912	.004	.065	.004	.051	-.002	.046-.055

Note. df = degrees of freedom; Δ = differences

Discussion

Although international organizations defend the need to promote educational actions that promote entrepreneurship (UNESCO, 2008), this continues to be a pending issue in the Dominican Republic. According to the MICM (2019), in the national report of the GEM, the different educational levels in the Dominican Republic do not contribute to improving entrepreneurial skills. In order to study this reality in a rigorous manner and evaluate actions to improve it, it is necessary to have valid and reliable instruments to assess the key antecedents of entrepreneurial behavior. The present work is the first attempt to obtain evidence of validity and reliability of a scale to measure entrepreneurial intention in the Dominican Republic and its immediate context for adolescents. This is an understudied and crucial educational stage in the development of entrepreneurial attitudes and subsequent entrepreneurial behavior (Elert et al., 2015; Huber et al., 2014).

The scale studied has been the Entrepreneurial Intention Questionnaire posited by Rueda et al. (2015). More specifically, the psychometric properties of the adaptation carried out by Martínez-Gregorio and Oliver (2022) for secondary education students have been analyzed. First, its factorial structure has been tested by a CFA. Next, evidence of its adequate reliability has been obtained and the correlation of its dimensions with the entrepreneurial attitudes included in the EAEE (Oliver & Galiana, 2015) has been studied to obtain evidence of external validity. Finally, its invariance by gender has been tested.

In relation to its factorial structure, the CFA has shown a satisfactory fit of the four-factor structure proposed by the original authors (Rueda et al., 2015). These results are in line with those obtained in previous validation in the Spanish adolescent population (Martínez-Gregorio & Oliver, 2022), as well as in university samples (Da

Fonseca Oliveira et al., 2016; Laguía et al., 2017; Rueda et al., 2015). Despite the overall good fit, it is observed that item 4 ("Working under continuous stress, pressure and conflict") of the entrepreneurial self-efficacy dimension shows a saturation below .30 in its factor. Although the result was not lower than .30, Martínez-Gregorio and Oliver (2022) also reported that this was the scale indicator with the lowest factor saturation in their sample.

Regarding reliability, the results of Cronbach's Alpha and Omega were adequate for all dimensions. Once the factorial structure and reliability were tested, the correlations of the dimensions with the entrepreneurial attitudes collected in the EAEE (Oliver & Galiana, 2015) were studied. All correlations were positive and statistically significant. The highest correlations can be observed between the different entrepreneurial attitudes and the global measure of attitude toward entrepreneurship included in the EIQ.

Despite being outside the scope of the present research, the reliability results for the EAEE (Oliver & Galiana, 2015) were problematic for two dimensions. The dimensions of risk taking and professional ethics presented reliability results under the recommended cut-off value (.70). Although the problems with the dimension of risk taking were also present in the original psychometric study with Spanish high school students (Oliver & Galiana, 2015), the low result in professional ethics is surprising. Future research should delve into the invariance of the conceptualization of professional ethics in both cultures, Spanish and Dominican.

To conclude, the gender invariance of the scale was demonstrated. Testing the invariance of the scale is a prerequisite in order to be able to develop comparisons of means between men and women. These studies are of interest given that the international

literature has sometimes shown the existence of gender differences in entrepreneurial intention (e.g., Haus et al., 2013; Nowiński et al., 2019) and entrepreneurial self-efficacy (Chowdhury et al., 2019; Dempsey & Jennings, 2014), with women's levels being lower. In the context of the Dominican Republic, according to the results of the GEM Dominican Republic (2022), it is the men who present a higher average total entrepreneurial activity in the initial stage. Surprisingly, although the males present a higher entrepreneurial activity, in our sample the females presented a higher entrepreneurial intention. This apparent contradiction may be related to differences in subjective norm. Those females with high entrepreneurial intentions will not proceed with an entrepreneurial career unless they feel social and environmental support for developing them successfully.

This research has some limitations to consider. The study was carried out on with students from the Dominican Republic, so the generalization of the results to other countries in Latin America and the Caribbean should be studied. In addition, this is a cross-sectional study, so it does not allow studying the relationship between the antecedents of entrepreneurial intention and entrepreneurial intention at different points in time in order to study its predictive capacity.

Conclusion

By way of conclusion, from **Study 6**, it can be stated that this work covers the needs raised in previous literature (Brüne & Lutz, 2020; Carlo Martínez, 2017) by offering a psychometrically adequate measurement instrument that boosts research on promoting entrepreneurial intention in secondary education in a rigorous manner. The implications of our work are twofold: theoretical and practical. Our results pointed outindicate that the conceptualization of entrepreneurship is comparable

between males and females and gender differences are a consequence of real differences in the constructs. Additionally, the practical implications could be twofold: (1) Future research in adolescent Dominican Republic contexts having an adequate scale for entrepreneurial intention measurement and (2) Institutional effort should focus on removing the gap that prevents girls from developing entrepreneurial projects. If they have more entrepreneurial intention than boys at pre-university levels, what is stopping them? This work opens the door to possible gender studies in the context of Dominican secondary education, exploring what causes these differences beyond entrepreneurial intention and when they appear.

Development and assessment of an entrepreneurship exposure activity

Previous reviews and meta-analyses have noticed that the results of effectiveness studies have not always been as positive as expected (Bae et al., 2014; Brüne & Lutz, 2020; Martin et al., 2013). Some reasons for the disparity among the results have been related to the low methodological quality of the studies, being the methodologically rigorous studies the ones that showed the lowest results (Martin et al., 2013). To clarify this aspect, **Study 1** just included effectiveness studies that had pre-post-intervention measurements and a control group, as a quality standard (Lorz et al., 2013). The results indicated a positive impact on entrepreneurial intention and self-efficacy. However, the magnitude of the impacts was small-moderate and some of the included studies still did not show a statistically significant impact on the desired variables. Additionally, just six studies had been developed at pre-university levels.

To understand the disparity among the effectiveness results different authors have pointed out several possible causes. All of them could be classified into two categories: methodological and substantial reasons. Until now, talking about the lack of methodological rigor, it has been related to the design of the experiment and the quality of the

assessment instruments (**Studies 2 - 6**). These aspects have been the methodological aspects that have received the most attention in entrepreneurship literature (Duval-Couetil, 2013; Longva & Foss, 2018; Lorz et al., 2013). However, another methodological phenomenon related to how we are analyzing the data deserves further attention.

Traditionally, effectiveness studies are based on measuring the change in the mean of the intervention group over time. These types of evaluations are based on the idea that the desired outcome is that the variable of interest, usually entrepreneurial intention, should increase in all the students as a result of the intervention. Fayolle and Gailly (2009) were the first to warn that, by studying the change in the group mean, we could be masking changes in the student body that, by going in different directions, would cancel out the change in the group mean. In particular, Fayolle and Gailly (2009) noted that prior entrepreneurial intention moderated the impact of the intervention. Thus, those students with lower prior entrepreneurial intention increased it during the intervention. And those with a higher prior entrepreneurial intention decreased it. This phenomenon is known as the alignment effect. Complementarily, von Graevenitz et al. (2010) proposed that the group increase in the mean score is not necessarily the desirable outcome, being the increase of information to make the decision for or against entrepreneurship, the real objective of the intervention. Consequently, the outcome to be evaluated is whether students who showed an undecided attitude, with entrepreneurial intention scores close to the mean, see an increase in their decision, either for or against. This phenomenon is known as the sorting effect. Both phenomena could occur simultaneously, demonstrating the effectiveness of the program, and not causing a change in the group mean. Although these effects have been tested in the adult population, their generalizability to the

adolescent population has never been proven. In this context, **Study 7** is proposed.

Although the methodological aspects have received a lot of attention, substantial reasons for non-effects deserve to also be considered (Nabi et al., 2017; Nájera-Sánchez et al., 2022). Many studies have tried to assess whether or not entrepreneurship education interventions work, but little research has tried to unravel how they work (Baggen et al., 2022). That is, what is the learning mechanism underlying participation in such programs? After all, it is only by understanding what variables are involved and how they are related that we can identify points on which to act to improve the effectiveness of the programs (Loi, 2018). In this sense, it is necessary to integrate the knowledge generated in other fields into the literature of entrepreneurship education (Santana-Domínguez et al., 2022). Only in this way will we be able to provide the field with robust theoretical frameworks that favor the cumulative growth of knowledge (Donaldson, 2019). To this end, **Study 8** presents the usefulness of the Transfer of Training Model and tests empirically its applicability in the entrepreneurship education literature.

To carry out **Studies 7** and **8**, an experience of exposure to entrepreneurship was developed and applied in high schools. For the design of the activity, the best practices identified in the literature were followed, maintaining a program similar to those traditionally used during this educational stage. For greater clarity on the activity, the program is described in this section before the studies, under the title “Design of the entrepreneurship exposure activity”. The psychometric instruments used in **Studies 7** and **8** are the ones that have been presented in **Studies 2 - 4**.

Design of the entrepreneurship exposure activity

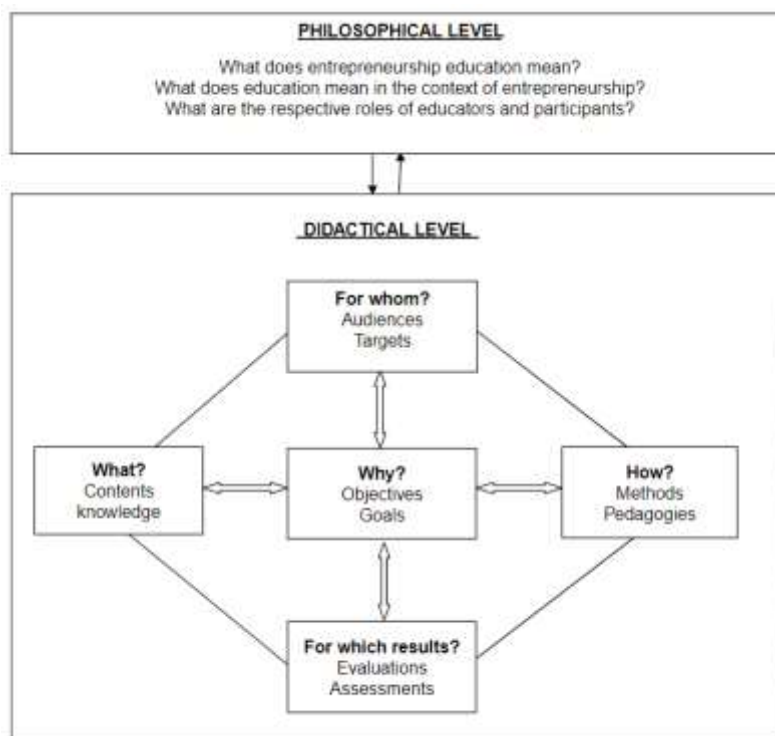
While developing an activity for exposure to entrepreneurship, some philosophical and didactical approaches should be considered, discussed, and explicitly included. One of the main problems to understand why (or why not) an entrepreneurship program achieves the desired outcomes is that the effectiveness studies do not report a full description of the exact characteristics and pedagogical approaches of the evaluated activities (Martínez-Gregorio et al., 2021; Nabi et al., 2017). Fayolle (2013) presented a generic teaching model for entrepreneurship education summarizing their main aspects that are implied and helping researchers and practitioners to locate their initiatives. Figure 20 shows that teaching model. Following such guidelines, in this section, we aim to present the entrepreneurial exposure activity that has been developed and applied to attend the **Objective 3** of this doctoral dissertation.

From a philosophical level, some reflections about what is understood as entrepreneurship education were stated in the Introduction section. As has been reviewed, the term has been defined in multiple ways and a lack of consensus is prevalent in the literature. For this reason, some umbrella definitions could be the best approach to deal with the diversity of conceptualizations. We have referred to some definitions as the one stated by Bae et al. (2014): “By entrepreneurship education, we are referring to education for entrepreneurial attitudes and skills” (p. 218); or the approximation offered by Mwasalwiba (2010): “some kind of educational (or training) process that is aimed at influencing individual’ attitudes, behavior, values or intentions towards entrepreneurship either as a possible career or to enhance among them an appreciation of its role in the community” (p. 25). Although these conceptualizations are born based

on programs developed in higher education, the approach in the pre-university stages is similar. Brüne and Lutz (2020) contextualize entrepreneurship education in schools as an “educational processed designed to develop entrepreneurial knowledge and a variety of cognitive and non-cognitive entrepreneurial skills” (p. 3). Additionally, these initiatives would be designed “to help adolescents explore their interest in enterprise as a career option” (Schröder & Schmitt-Rodermund, 2006, p. 494). The last two approaches accurately defined what was understood as entrepreneurship education in a high school context for the development of entrepreneurial exposure activity.

Figure 20

A generic teaching model for entrepreneurship education (from Fayolle, 2013)



From these theoretical positions, we land on the didactical level to clarify some key aspects of the activity conceptualization: Why, For whom, What, How, and For which results (see Figure 20). Directly related to our approach to entrepreneurship education, the entrepreneurship exposure activity was conceptualized as a brief introduction to the entrepreneurial process to allow the students to reflect on their career interests and develop some entrepreneurial competences transferable to their daily academic and personal life. Aligned with the European Commission recommendations (Bacigalupo et al., 2016) and educational laws in the Spain context (LOMCE, 2013; LOMLOE, 2020), the activity aims to promote the “sense of initiative and entrepreneurial spirit” in the high school students.

Contrarily to some entrepreneurial experiences that are usually developed as extracurricular activities or as optative subjects, we aimed to propose an activity that could be integrated into the ordinary academic timetable. For this reason, the activity was planned as a “quick exposure” to entrepreneurship that combines theoretical and practical experience in a class context (Zaring et al., 2021). The activity was designed for the stage of compulsory secondary education, which usually takes four courses from 12 years to 16.

Regarding the methodologies and pedagogical approaches, Béchar and Grégoire (2005) presented a typology of teaching models. The authors proposed three possible categories: supply model, demand model, and competence model. The supply model is mainly based on the transmission of theoretical content from the teacher to passive students. From this approach, some of its pedagogical methods are lectures, seminars, or case studies. The demand model presents an active methodology where the main objective is the development of entrepreneurial competences into an interactive class. Some paradigmatic activities of this approach may be simulations, elevator

pitches, or business planning. The competence model goes a step further by promoting the development of know-how in the context of real-life projects. The students are guided by a mentor who accompanied the students in authentic entrepreneurial situations.

The possibility or advantage of each model could vary across different contexts and moments. However, recent studies in higher education have shown a greater impact of those activities and programs that are based on active learning or a more student-centered approach (Cascavilla & Hahn, 2022; Gielniket al., 2017; Ismail et al., 2018; Padilla et al., 2021; Sansone et al., 2021; Varamäki et al., 2015). Some theories such as Kolb's experiential learning are cited in the literature to emphasize the crucial role that plays the direct contact with authentic problems while learning (Kolb & Kolb, 2005). Those ideas have been enriched with social constructivism theory to identify some basic design aspects (Baggen et al., 2022). Based on those theories, Baggen et al., (2022) stated three pre-requisites for wide EE programs that should be always present: "(1) The entrepreneurial process of (i) opportunity identification, (ii) opportunity evaluation, and (iii) opportunity exploration; (2) Authentic, actual tasks with several solutions; (3) The creation of new value for others" (p. 13). Additionally, the authors list eleven principles to guide the design of activities (Baggen et al., 2022). However, this list could vary across educational settings.

The aforementioned methodological principles are characteristics of previous programs and entrepreneurial activities that have been developed in secondary education. One of the most spread and studied entrepreneurial program for pre-university students is the "Young Enterprise Company Program". During one academic year, the students run their enterprise, learning from all the entrepreneurial phases. Keeping in mind the categorization of Béchard and Grégoire (2005), it may be based on a competence model, which could be

generally understood as an active learning approach. This program has received a lot of attention from the scholar and could be considered the entrepreneurial initiative for pre-university studies with more effectiveness studies across cultures (e.g. Athayde, 2012; Bergman et al., 2011; do Paço & Palinhas, 2011; Peterman & Kennedy, 2003). However, the development of a mini-company or enterprise, with different degrees of realism, is the pivotal activity of the majority of entrepreneurial exposure activities in pre-university students (Cárcamo-Solís et al., 2017; Cheung, 2008; Huber et al., 2014; Johansen & Schanke, 2014; Kourilsky & Esfandiari, 1997).

Based on previous programs and recommended design principles, the entrepreneurial exposure activity was designed as an experiential learning activity to be developed in teams. Each team was asked to come up with an entrepreneurial proposal that solves a social problem in their community. Following Schröder and Schmitt-Rodermund (2006), each session begins with a brief introduction to the content, continues with a group autonomous activity, and ends with a reflection phase where each team shares with the rest of the class the work they have advanced during the session. The teams are guided through the entrepreneurial process during six sessions. Figure 21 presents the main content of each of them. An overview of the content of each session is included in Table 20. The last session concludes with a debriefing where each team presents its idea as an elevator pitch in front of its teacher, programs facilitator, and the rest of the class.

Figure 21

Content of the sessions of the entrepreneurial exposure activity



Table 20

Overview of the entrepreneurial exposure program (continues on the next page)

Session	Content	Structure and activities	Materials
1	Entrepreneurship concept	15 min. Program presentation and structure with PowerPoint support. We form teams of 4-6 students that will remain together throughout the program. Classroom restructuring and naming of the teams.	- PowerPoint (Appendix 4)
		10 min. Presentation on what entrepreneurship is. Definition of entrepreneur and empowerment.	- Cards (Appendix 5)
	Opportunity recognition	15 min. Opportunity recognition. Students as agents of change in their environment. Activity to detect needs in the environment. We distribute cards where teams will fill in with problems in their context. We share them out loud.	
		15 min. Brainstorming. Proposal of possible solutions. On the same card, we will write down possible solutions that we could carry out. Solutions that can be through associations or development of products or services. Each team chooses one of their ideas.	
2	Idea analysis	15 min. The team finishes choosing the idea and starts to concretize it. Questions will be offered as a guide for development. E.g. How would you develop it? What parts does it consist of? What does it offer? What does it need?	- PowerPoint (Appendix 6)
		10 min. Explanation of SWOT analysis.	- SWOT cards (Appendix 7)
		15 min. Teams fill out the SWOT model based on the idea developed. Identification of strengths and difficulties, study of competitors.	
		15 min. We share some project ideas and SWOT analyses. Colleagues provide ideas and comments for the growth of the ideas.	
3	Entrepreneurial competences	10 min. Post-it activity. What skills or characteristics do you think an entrepreneur should have? Write it on the post-it and stick them all on the board. Discussion.	- PowerPoint (Appendix 8)
		15 min. Following the previous activity, presentation of the competencies and skills considered as the "entrepreneurial mindset". How to enhance them?	- Post-its
		20 min. Team building dynamic to reflect about own competences	- Cards (Appendix 9)
		5 min. Explanation of the next session for them to bring necessary materials.	

Table 20*Overview of the entrepreneurial exposure program (cont.)*

Session	Content	Structure and activities	-	Materials
4	Prototyping	15 min. Explanation of prototyping and the activity to be carried out.	-	PowerPoint
		30 min. We make a small prototype or visual sample of our idea. E.g. Screenshots, model construction...	-	(Appendix 10) Video
		10 min. We share the prototypes with the class.	-	(Appendix 11)
5	Business plan	15 min. Introduction to the lean business model canvas.	-	PowerPoint
		20 min. Teams fill out their LBMC model. The facilitator answers questions during the activity.	-	(Appendix 12) LBMC cards
		10 min. We share the project.	-	(Appendix 13)
6	Elevator pitch	10 min. Explanation of the closing session for them to start preparing it at home.	-	PowerPoint
		10 min. Introduction to what an elevator pitch is.	-	(Appendix 14)
		25 min. Teams prepare the elevator pitch that will be the program's closing.	-	Video
		15 min. Presentation of the elevator pitches.	-	(Appendix 15)
		5 min. Closing of the program.		

The entrepreneurship exposure activity received the approval of the Valencian Department of Education and the Ethical Committee of the University of Valencia (UV INV_ETICA 1806947). The approval certificates are included in Appendix 16 and Appendix 17, respectively. Once we received both certificates, we send invitations to participate in the activity. Finally, three high schools agreed to participate with an effective sample of 158 students in the intervention group and 67 students in the control group. The informed consent sends to the families and the protocol are included as appendices (Appendix 18 and Appendix 19, respectively).

Regarding the assessment of the entrepreneurial exposure activity, the activity was not academically assessed and the students did not receive marks. However, students fulfilled a questionnaire before the start of the program and one week after their participation to evaluate their attitudinal change and satisfaction with the program.

Although the questionnaire characteristics and relevant data analyses are presented in **Studies 7** and **8**, some descriptive results are not reported there. After the activity, the satisfaction with it of the intervention group was assessed through the indicator: "Show your degree of satisfaction with the entrepreneurship course". The students respond with a Likert scale from 1-Not satisfied at all, to 7- Totally satisfied. Additionally, their perceived learning was assessed through the 5-item scale presented by Souitaris et al. (2007). With a 7-point Likert scale, the students are asked "to what extent did the entrepreneurship activity" increase their understanding of the entrepreneurial process. These questions were only included in the assessment protocol of the intervention group. The descriptive results are included in Table 21.

Table 21*Entrepreneurial exposure activity descriptive results*

Item	Min.	Max.	M	SD
<i>Satisfaction</i>				
(1) Show your degree of satisfaction with the entrepreneurship course.	3	7	5.74	1.15
<i>Perceived learning</i> - To what extent did the entrepreneurship activity...				
(1) increase your understanding of the attitudes, values and motivation of entrepreneurs (i.e. why do entrepreneurs act?)?	1	7	5.17	1.31
(2) increase your understanding of the actions someone has to take in order to start a business (i.e. what needs to be done?)?	1	7	5.35	1.28
(3) enhance your practical management skills in order to start a business (i.e. how do I start the venture?)?	1	7	5.26	1.39
(4) enhance your ability to develop networks (i.e. who do I need to know?)	1	7	4.99	1.47
(5) enhance your ability to identify an opportunity (i.e. when do I need to act?)?	1	7	5.74	1.15

Note: Min. = Minimum; Max. = Maximum; M = Mean; SD = Standard Deviation

Study 7. Generalizability of alignment and sorting effects in secondary education: Evaluation of the effectiveness of an entrepreneurship exposure activity

Martínez-Gregorio, S., & Oliver, A. Generalizability of alignment and sorting effects in secondary education: Evaluation of the effectiveness of an entrepreneurship exposure activity. *Psicodidáctica*. In press.

Abstract

The entrepreneurial initiative is considered a key competence to be developed in secondary education. However, research on the effectiveness of entrepreneurial exposure activities in adolescence still being scarce. The results can be misinterpreted if hidden effects such as sorting and alignment are not considered. The aim of this study is twofold. First, to test for the effectiveness of an entrepreneurial exposure activity developed in a Spanish secondary school. Second, to study the presence of sorting and alignment effects on adolescent population. A quasi-experimental design with a control group is conducted on 225 participant students, 158 were randomly assigned according to a cluster sampling to the intervention group ($M = 13.19 \pm 0.91$ years old, ranging between 11 and 15; 57.6% boys) and 67 to the control ($M = 13.33 \pm 0.88$ years old, ranging between 11 to 15; 59.7% boys). Relevant variables such as entrepreneurial intention, entrepreneurial self-efficacy, attitude toward entrepreneurship, subjective norm, psychological capital, prosocial behavior, and certainty about future studies choices were assessed pre and post-intervention. The entrepreneurship exposure

activity involved six sessions where the students in teams were asked to develop an entrepreneurial idea that helps to solve a social problem. The results considering the group means only show statistically significant differences in attitudes toward entrepreneurship. The intervention acts as a buffer for the decline in this variable in the intervention group. Additionally, the analysis verified the generalizability of alignment and sorting effects while assessing entrepreneurial intention in entrepreneurship exposure activities with adolescents. Implications for other vocational orientation activities are discussed.

Keywords: entrepreneurship education; entrepreneurial intention; vocational training; psychological capital; prosocial behavior

Introduction

The sense of initiative and entrepreneurship is one of the eight competencies for lifelong learning defined by the European Commission (2016). It is the transversal ability to identify and seize opportunities, move from ideas to action, and plan and direct processes to achieve objectives. This competence is present in the Spanish educational law for secondary education and should be promoted through all the subjects (LOMLOE, 2020). This has led to the implementation in the secondary schools of activities and programs for the promotion of entrepreneurship. It should be borne in mind that part of the responsibility in the management of education has been transferred to the different Autonomous Communities, so the implementation of entrepreneurship education in each region varies (Bernal-Guerrero & Cárdenas-Gutiérrez, 2021; Sánchez-García et al., 2013). For a detailed review of the different initiatives that have been carried out in each of them at pre-university levels in Spain, see Sánchez-García et al. (2013). The authors recorded a total of 423 entrepreneurship education initiatives, 45.8% of them being inserted in the educational curriculum of the schools (Sánchez-García et al., 2013). In contrast, more than half of them are carried out in parallel to the educational context as extracurricular activities. Despite the complexity to introduce the promotion of entrepreneurship into secondary schools, it is recommended to intentionally promote entrepreneurial competencies through concrete actions that could be evaluated (González-Tejerina & Vieira, 2021).

These entrepreneurship education initiatives go beyond the mere promotion of enterprises and focus on the development of attitudes and competencies applicable to the student's personal and professional future (Baggen et al., 2022; European Commission/EACEA/Eurydice, 2016; A. Gibb, 2002). Thus, when we

talk about promoting entrepreneurship, we include the development of a whole series of competencies such as creativity, social orientation, or self-efficacy (Bacigalupo et al., 2016; Huber et al., 2014). Notwithstanding the widespread implementation of entrepreneurial promotion activities in secondary and high schools, some aspects of its effectiveness and differential impact on students remain unstudied.

Despite the relevance of these programs in the early stages (Elert et al., 2015; Huber et al., 2014), most studies of their effectiveness focus on higher education (Longva & Foss, 2018; Martínez-Gregorio et al., 2021). Longva and Foss (2018) carried out a systematic literature review for effectiveness studies of entrepreneurship education. Among the 17 rigorous experimental studies identified, just 4 were conducted in secondary education and 1 in primary school (Longva & Foss, 2018). An equivalent proportion can be found in a recent meta-analysis (Martínez-Gregorio et al., 2021), where only five of the 35 articles included were developed in secondary school.

Although previous meta-analyses show a positive impact of entrepreneurship education on some variables such as entrepreneurial self-efficacy or entrepreneurial intention (Bae et al., 2014; Martin et al., 2013; Martínez-Gregorio et al., 2021), these results are mostly based on samples of university students. If we explore the studies carried out in primary, secondary and high schools, we can see a positive trend (Brüne & Lutz, 2020), although there are interventions with no impact (e.g. Volery et al., 2013) or negative impact (e.g. Huber et al., 2014) on some of their dependent variables.

The dependent variables considered in these studies can be very diverse including (Brüne & Lutz, 2020): (1) non-cognitive skills, such as self-efficacy or teamwork (e.g. Barba-Sánchez & Atienza-Sahuquillo, 2016; Bergman et al., 2011); (2) cognitive skills, such as

entrepreneurial knowledge (e.g. Volery et al., 2013); (3) beliefs and attitudes, such as attitude toward entrepreneurship (e.g. Athayde, 2009); (4) entrepreneurial intention (e.g. Gielnik et al., 2015); or (5) entrepreneurial performance (e.g. Gielnik et al., 2017). Among these variables, the most frequently used to assess the effectiveness is the entrepreneurial intention (Martínez-Gregorio et al., 2021). In addition to the entrepreneurial intention, Fayolle et al. (2006) recommended the use of the Theory of Planned Behavior (Ajzen, 1991), including the measurement of the attitudes toward entrepreneurship, subjective norm and perceived behavioral control (which is sometimes replaced by entrepreneurial self-efficacy (Moriano et al., 2012)). From a wider perspective of the entrepreneurship education (Baggen et al., 2022), these variables might not be enough. Effectiveness evaluation should consider its impact on those lifelong competencies that are intended to be promoted in secondary schools through this type of interventions. Within these competencies, previous studies have shown its effect on variables such as teamwork (Barba-Sánchez & Atienza-Sahuquillo, 2016; Cárcamo-Solís et al., 2017) or general self-efficacy (e.g. Huber et al., 2014).

Previous systematic literature reviews and meta-analyses have evaluated the methodological rigor of these impact studies by checking the presence of pre- and post-test measurements of the dependent variable/s and an equivalent control group (Lorz et al., 2013). The rigorous studies in secondary education identified by Longva and Foss (2018) and Martínez-Gregorio et al. (2021) meet this standard. In the Spanish context, we have only one study that explores the impact of an entrepreneurial initiative in secondary schools including pre- and post-intervention measurements and a control group (Sánchez, 2013). Sánchez (2013) measures the effectiveness of an optative subject taught over eight months in various secondary schools. In this case, the

effectiveness of the initiative is evaluated on the self-efficacy, proactivity, risk-taking, and entrepreneurial intention of the students. The intervention group showed a statistically significant increase in all variables compared to the control group (Sánchez, 2013).

Nevertheless, some aspects remain understudied. Alongside the traditional entrepreneurial competencies, the programs developed in pre-university stages aim to contribute to the vocational orientation of students (Schröder & Schmitt-Rodermund, 2006; von Graevenitz et al., 2010). Likewise, from the broad perspective of entrepreneurship, the promotion of entrepreneurship in secondary education is related to the development of competencies beyond business creation (Baggen et al., 2022; Bernal-Guerrero & Cárdenas-Gutiérrez, 2021). Within these competencies, it would be worth studying what impact the activities for the promotion of entrepreneurship have on the students' Psychological Capital (Chevalier et al., 2022; Cui, 2021), a global variable that represents a state of positive development of the individual characterized by self-efficacy, hope, resilience, and optimism (F. Luthans et al., 2015). Finally, as mentioned above, teamwork and social orientation are competencies that usually accompany the justification for the early introduction of entrepreneurship experiences (Cárcamo-Solís et al., 2017), so an increase in prosocial behavior would be expected after them. The relationship of entrepreneurship education with each of these variables is not new in the literature, but the empirical evidence is mostly limited to samples of university students and, in no case, to Spanish secondary school students (Martínez-Gregorio et al., 2021). Consequently, we propose that students who participate in an entrepreneurship exposure activity, compared to their pre-intervention level, will show:

Hypothesis 1 (H1). A greater increase in their entrepreneurial intention, attitudes toward entrepreneurship, subjective norm and entrepreneurial self-efficacy, than a control group.

Hypothesis 2 (H2). A greater increase in their psychological capital, than a control group.

Hypothesis 3 (H3). A greater increase in their prosocial behavior, than a control group.

Hypothesis 4 (H4). A greater increase in their certainty about the future studies choice, than a control group.

So far, all the effectiveness studies cited above evaluate the impact of entrepreneur exposure activities based on the existence of a change in the mean score of the intervention group over, with or without a control group. Although it is the most common procedure to assess the effectiveness of intervention in entrepreneurship education (e.g. Huber et al., 2014; Sánchez, 2013) and other fields (e.g. Moreno-Gómez et al., 2020; Navarro-Pérez et al., 2019; Tapia-Serrano et al., 2022), what if the effect of the program varies as a function of the participant's initial characteristics? These types of studies would not capture these variations.

Fayolle and Gailly (2009) were the first to point out the “alignment effect” in the field of entrepreneurship education. The authors found that the non-effect of an intervention program applied to non-business university students was due to counteracting effects within the group that masked change when studied as a group. The alignment effect consists in the fact that students with higher entrepreneurial intention at the beginning of the program see their intention reduced as a result of their participation because of previous unrealistic expectations. Contrarily, students with lower entrepreneurial intention

pre-intervention increase it because they discover aspects of entrepreneurship they would like (Fretschner & Lampe, 2019).

This effect would co-occur together with the sorting effect (Fretschner & Lampe, 2019). The sorting effect explains how students who presented a lower degree of certainty about their entrepreneurial intention, showing results close to the mean, after the program increase their decision and their response shifts towards one extreme or the other, increasing the variance of their scores. This effect would be the true objective of this type of early-stage interventions, which, far from promoting the creation of businesses, would try to offer information to students so that they can make an informed decision about their future (Schröder & Schmitt-Rodermund, 2006; von Graevenitz et al., 2010). The two effects were tested simultaneously for the first time by Fretschner and Lampe (2019). The authors found support for the co-existence of both in a sample of university students. This result indicates that, even though the intervention causes changes in the students, the group mean may not vary.

Likewise, the lesser existence of empirical evidence in secondary education means that some of the phenomena explored in higher stages have not been studied in earlier stages. In this case, we do not have studies that explore how entrepreneurial intention prior to the intervention moderates the impact of entrepreneurial exposure experiences. That is, the generalizability of alignment and sorting effects has not yet been empirically demonstrated. Consequently, we will test the generalizability of the alignment and sorting effects in secondary education, following the methods proposed by Fayolle and Gailly (2009) or Fretschner and Lampe (2019):

Hypothesis 5 (H5). Within the intervention group, students with a low pre-intervention level of entrepreneurial intention will show a positive

impact of the program, while students with a high pre-intervention level of entrepreneurial intention will see it decrease after the entrepreneurship exposure activity.

Hypothesis 6 (H6). Within the intervention group, those students who were undecided about their entrepreneurial intention pre-intervention increased their decision by showing responses closer to the extremes, either for or against.

Method

Participants

The total effective sample were 225 students from different secondary schools of Valencia. The mean age of the participants was 13.23 ($SD = 0.90$), ranging between 11 and 15 years old. 41.8% ($n = 94$) were female, 53.3% male ($n = 120$), 3.6% ($n = 8$) were self-identified as “other”, and 1.3% ($n = 3$) did not declare their gender. As there few students self-identified as “other”, the gender variable was dichotomized in female/male for the analyses. Regarding the ownership of the secondary schools, three secondary schools participated in the research; two public high schools and one semi-private. 159 students attended public secondary schools (77.7%), whereas 66 attended at semi-private ones (29.3%). In the first public secondary school participated a total of 124 students, with a mean age of 12.80 ($SD = 0.90$), being 42.9% girls. The sample in the second public secondary school was 33 students with a mean age of 13.70 ($SD = 0.64$), 42.4% girls. Finally, the mean age of the 66 students from the semi-private secondary school was 13.83 ($SD = 0.42$), being 39.4% females. As data were recruited in class, the lack of response from the participants was negligible (less than 1%).

Although 172 students took part in the competence development exposure activity and none rejected their participation during the intervention, only 158 fulfilled the questionnaire after the intervention and effectively constituted the “intervention group” across the manuscript. Similarly, 73 students were evaluated pre-intervention to take part in the “control group” and did not participate in any similar activity during the research. However, six students did not fulfill the second questionnaire, and they were excluded from the effective control group ($n = 67$). Consequently, the experimental mortality rate was 8.13% for the intervention group and 8.22% for the control group. In both groups, the only reason why the students did not complete the post-intervention questionnaire was that they did not attend class on the day of the evaluation.

There were not statistically significant differences between the intervention and control group ($p < .05$), supporting the equivalence between groups. Table 22 presents the socio-demographic information for both groups and equivalence statistical tests results. Students were asked for their previous participation in an activity or program for the promotion of similar competencies, both groups showed a similar percentage of students with previous experience, but they were a minority in both groups (7.2% in intervention and 10.4% in control group). Additionally, they were asked about the degree of *certainty* they had about their future studies choice using a Likert format question with five anchors. To test *age* and *certainty* equivalence, *t* tests were carried out without statistically significant differences. In *gender* and *previous participation*, chi-square tests also did not show statistically significant differences.

Table 22*Sociodemographic characteristics for intervention and control group*

		Intervention (<i>n</i> = 158)	Control (<i>n</i> = 67)	Statistical test
Mean Age (<i>SD</i>)		13.19(0.91)	13.33(0.88)	$t(220) = -1.028; p = .31; d = -0.15$ 90%CI [-0.39, 0.09]
Gender				$\chi^2(1) = 0.039; p = .84; V = 0.01$
	Female	67(43.5%)	27(45.0%)	
	Male	87(56.5%)	33(55.0%)	
Previous participation				$\chi^2(1) = 0.636; p = .43; V = 0.05$
	Yes	11(7.2%)	7(10.4%)	
	No	141(92.8%)	60(89.6%)	
Mean Certainty (<i>SD</i>)		2.43(0.77)	2.61(0.82)	$t(201) = -1.416; p = .16; d = -0.22$ 90%CI [-0.47, 0.01]

Note. *SD* = Standard Deviation

Instruments

Along with some socio-demographic questions (age, gender, high school, course, and previous participation), the following instruments were administered:

Entrepreneurial Intention. This variable, as well as its antecedents (attitude toward entrepreneurship, subjective norm, and entrepreneurial self-efficacy), was assessed using the Entrepreneurial Intention Questionnaire (EIQ; Rueda et al., 2015) adapted to Spanish secondary school students by Martínez-Gregorio and Oliver (2022). The instrument evaluates four dimensions: entrepreneurial intention (five items), attitude toward entrepreneurship (six composite items), subjective norm (three composite items), and entrepreneurial self-efficacy (nine items). The answers are rated on a seven-point Likert scale. The reliability coefficients for pre-intervention were: entrepreneurial intention ($\alpha = .86$, $\omega = .90$, AVE = .63), attitudes toward entrepreneurship ($\alpha = .78$, $\omega = .78$, AVE = .37), subjective norm ($\alpha = .74$, $\omega = .75$, AVE = .50), and entrepreneurial self-efficacy ($\alpha = .80$, $\omega = .85$, AVE = .40). At post-intervention measurement, the reliability coefficients were: entrepreneurial intention ($\alpha = .87$, $\omega = .90$, AVE = .65), attitudes toward entrepreneurship ($\alpha = .82$, $\omega = .83$, AVE = .45), subjective norm ($\alpha = .65$, $\omega = .66$, AVE = .40) and entrepreneurial self-efficacy ($\alpha = .82$, $\omega = .87$, AVE = .45).

Psychological Capital. It was measured using the 12-item Psychological Capital Questionnaire (PCQ-12; Avey et al., 2011), using its adaptation to academic contexts (Tomás et al., 2022). The scale includes the four dimensions of the Psychological Capital: self-efficacy (three items), hope (four items), resilience (three items), and optimism (two items). It uses a five-point Likert scale. The reliability results for pre-intervention were $\alpha = .78$, $\omega = .84$, AVE = .33. At post-intervention measurement the reliability coefficients were $\alpha = .84$, $\omega = .88$, AVE = .39.

Prosocial Behavior. This variable was measured using the Prosocial Behavior Scale (Caprara & Pastorelli, 1993), whose psychometric properties for the Spanish form for adolescents were reported by Martínez-Gregorio et al. (2023). This scale is unidimensional and consists of a set of 15 items, containing five control items that are not considered for Prosocial Behavior measurement. It uses a three-point Likert scale asking for the frequency of some prosocial behaviors. The reliability coefficients for pre-intervention were $\alpha = .70$, $\omega = .81$; AVE = 31. At post-intervention measurement the reliability results were $\alpha = .75$, $\omega = .85$, AVE = 37.

Certainty about the future studies choice. It was assessed through one indicator: “To what extent have you decided on your future studies?”. The question was answered with a five-point Likert scale being 1-Nothing decided, 2-Somewhat decided but with a lot of doubts, 3-Pretty much decided, 4-Totally decided, and 5-I don’t know. The variable was recoded, codifying the 5 as a missing value.

Procedure

This study used a quasi-experimental design with two measurement times (pre- and post-intervention) and a control group. Control and intervention groups were created by natural grouping in the secondary schools.

The study met the ethical standards of the American Psychological Association (APA) and the Declaration of Helsinki. Additionally, the Research Ethics Committee of the University of Valencia, as well as the Education Government of Valencia, approved the research (Appendix 16 and Appendix 17). The educational authorities of the secondary schools were contacted to propose their participation in the study. Once they accepted to participate, they chose the groups that would participate effectively in the study. Although the

activity was voluntary, only four students (0.02%) refused participation. Consequently, the sample did not present a self-selection bias, and the students may be representative of the average entrepreneurial education interest.

There was a random assignment of the participants to intervention or control group, nevertheless, the groups that were initially assigned as control groups were offered to receive the intervention after the research is done. The control group did not participate in any similar activity throughout the program's implementation with the intervention group. Both groups were asked in the post-intervention measurement about their engagement in any entrepreneurship promotion program or activity in the last few weeks. The control group's participants declared not to have done so.

Within the classes invited to participate in the study, each student's participation was voluntary. Prior to the pre-intervention assessment, the legal guardians of the students and the participants signed an informed consent document. They were informed that the data derived from their participation were completely anonymous and confidential, and their participation was not rewarded.

The intervention group participated in an entrepreneurship exposure activity with 6 sessions of 55 minutes. During the activity, the students were asked to come up with an entrepreneurial proposal that solves a social problem in their community. In doing so, they worked in teams and received a brief content explanation at the beginning of each session about (1) opportunity recognition, (2) idea analysis, (3) entrepreneurial competencies, (4) prototyping, (5) business plan, and (6) elevator pitch. Before the post-intervention measurement, each team presents its project in front of its class, teachers, and program facilitator.

The sessions were held in the students' classrooms during their regular school hours. The school chose the timetable for student participation in the activity. 41.8% ($n = 66$) attended the activity during the classes of science subjects, 35.5% ($n = 56$) attended the activity during their elective timetable, and the remaining 22.8% ($n = 36$) attended the activity during their tutoring timetable. The sessions were guided by a member of the research group, the program facilitator, accompanied at all times by a teacher in the classroom. The teacher encouraged student participation in the activity but it was not academically evaluated.

Data analysis

The statistical analyses were carried out using IBM SPSS Statistics (version 28.0.1.1). Before carrying out the inferential analyses, univariate outlier analyses were performed for each variable. Additionally, outliers were searched for within each of the parametric analysis performed. Box-plots, standardized residuals analyses, and Cook's distances were used to search for outliers. No problems due to outliers were detected, so the parametric analyses were performed with complete data. The reliability of the instruments was assessed through Cronbach's Alpha (α), McDonald's Omega (ω), also known as "Composite Reliability" (Moral de la Rubia, 2019; Viladrich et al., 2017), and the Average Variance Extracted (AVE). The cut-off criteria to achieve adequate reliability was an α and ω above .7 (Hair et al., 2014). The rationale for interpreting AVE has traditionally been .50 (Hair et al., 2014). However, some authors have considered that it could be excessively restrictive, and, when ω is above .70, it should vary considering the number of items included, ranging from .25, when there are seven or more, to .44 for two items (Moral de la Rubia, 2019). Descriptive statistics (mean and standard deviation) were reported for each group and measurement time. The pre-intervention comparability

was verified using t-test for the continuous variables (age, certainty, entrepreneurial intention, attitudes toward entrepreneurship, subjective norm, entrepreneurial self-efficacy, psychological capital, and prosocial behavior). For categorical variables, we conducted chi-square tests (gender and previous participation). Effect sizes are reported, Cohen's *d* for t-tests and Cramer's *V* for chi-square tests. The effect size was considered small, medium, and large if it was above 0.2, 0.5, and 0.8, respectively (Cohen, 1988).

To test Hypotheses 1-4, we carried out a multivariate analysis of variance (MANOVA) exploring if the differences between pre and post-intervention vary across groups. Pillai Trace was used as the most robust criterion to evaluate the effect (Tabachnick & Fidell, 2012). We continued with ANOVAs to explore the effect of each considered variable. We estimated the effect size considering partial eta-square (η^2). Agreeing with Tabachnick and Fidell (2012), effect size would be considered small if $.01 < \eta^2 \leq .089$, medium if $.09 \leq \eta^2 \leq .249$, and large if $\eta^2 \geq .25$.

To capture the alignment effect in entrepreneurial intention (Hypothesis 5), the procedure reported by Fayolle and Gailly (2009) was followed. The intervention group was split into four groups considering their pre-intervention entrepreneurial intention level: Q1- First quartile, Q2- Second quartile, Q3- Third quartile, and Q4- Forth quartile. An ANOVA was carried out to measure if the intervention effect varies depending on students' pre-intervention entrepreneurial intention. Following Paired t-tests were conducted to explore the gain by group, computing its corresponding effect sizes.

Finally, to simultaneously assess the alignment and sorting effects on entrepreneurial intention (Hypothesis 6), Fretschner and Lampe's analyses (2019) were replicated by carrying out a sequence of

regression analyses. Accordingly, a new dependent variable for the analyses was calculated. The dependent variable ($\Delta \overline{EI}_i$) of the regression analyses refers to the change of the absolute deviation from the mean between pre-intervention ($t = 1$) and post-intervention ($t = 2$) (see Equation 1). Positive results on the variable mean that the participant's relative distance from the mean has improved after they participated in the activity. Contrarily a negative result indicates that their distance from the mean has decreased. The sorting and alignment effect would be captured through the effect of the relative position pre-intervention ($\overline{EI}_{t=1}$) on the $\Delta \overline{EI}_i$.

$$\Delta \overline{EI}_i = |EI_{i,t=2} - \text{mean}(EI_{t=2})| - |EI_{i,t=1} - \text{mean}(EI_{t=1})|$$

The first regression model set the baseline (Model 1) and included the effect of some control variables (subjective norm, age, and gender). Model 2 captured the sorting and alignment effects, including the relative position pre-intervention ($\overline{EI}_{t=1}$) as a predictor. Model 3 included the effect of the change in attitudes toward entrepreneurship (ΔATE) and entrepreneurial self-efficacy (ΔESE) on the dependent variable.

Results

Pre-intervention comparability assessment

Table 23 shows the descriptive statistics of the studied variables for both groups, pre and post intervention. The socio-demographic comparability assessment was reported at Method section (see Table 1). Previously to the intervention, both groups showed similar levels of all the considered variables. T-tests showed no statistically significant differences in entrepreneurial intention ($t(219) = -1.310$; $p = .19$; $d = -0.19$, 90%CI [-0.43, 0.05]), attitudes toward entrepreneurship ($t(222) = -$

1.081; $p = .28$; $d = -0.16$, 90%CI [-0.40, 0.08]), subjective norm ($t(217) = -0.396$; $p = .69$; $d = -0.06$, 90%CI [-0.30, 0.18]), entrepreneurial self-efficacy ($t(217) = -0.535$; $p = .29$; $d = 0.08$, 90%CI [-0.15, 0.33]), psychological capital ($t(223) = 0.326$; $p = .75$; $d = 0.05$, 90%CI [-0.17, 0.31]), prosocial behavior ($t(218) = -0.684$; $p = .50$; $d = -0.10$, 90%CI [-0.33, 0.15]) or certainty ($t(201) = -1.416$; $p = .16$; $d = -0.22$, 90%CI [-0.46, 0.02]).

Table 23

Descriptive statistics pre and post intervention for intervention and control group

	Intervention		Control	
	(n = 158)		(n = 67)	
	Pre	Post	Pre	Post
	M(SD)	M(SD)	M(SD)	M(SD)
EI	4.26(1.49)	4.33(1.48)	4.56(1.68)	4.69(1.45)
ATE	4.25(1.22)	4.20(1.30)	4.45(1.31)	4.02(1.35)
SN	4.41(1.43)	4.40(1.35)	4.50(1.62)	4.38(1.40)
ESE	5.14(0.86)	5.12(0.89)	5.06(1.03)	4.98(0.93)
PC	3.64(0.58)	3.64(0.63)	3.60(0.54)	3.53(0.65)
PSB	2.47(0.31)	2.48(0.33)	2.50(0.33)	2.52(0.35)
Certainty	2.44(0.76)	2.52(0.81)	2.61(0.82)	2.65(0.69)

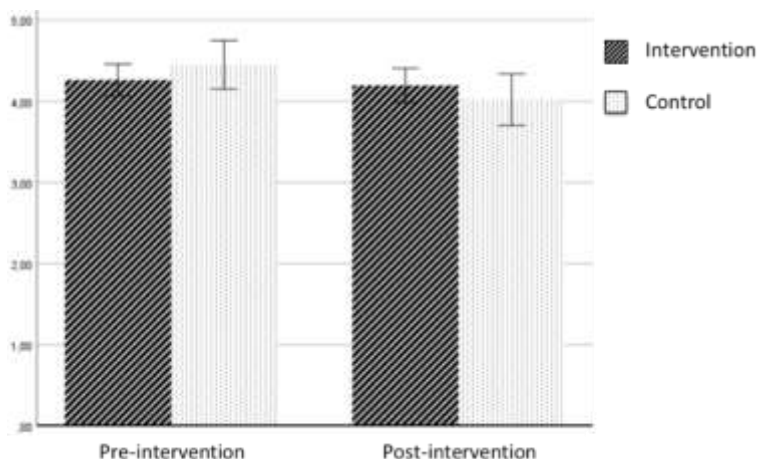
Note. M= Mean; SD= Standard Deviation; EI=Entrepreneurial Intention; ATE= Attitudes toward Entrepreneurship; SN= Subjective Norm; ESE=Entrepreneurial Self-Efficacy; PC=Psychological Capital; PSB= Prosocial Behavior

Results for the Effectiveness of the Activity

Once the pre-intervention equivalence was verified, a MANOVA yielded the following results: Pillai's trace 0.032, associated with $F(7,169) = 0.786$, $p = .60$, $\eta^2 = .032$. In any case, follow-up ANOVAs were carried out for each variable. The results for entrepreneurial intention, $F(1,216) = 0.134$, $p = .71$, $\eta^2 = .001$, demonstrated no interaction effect between time and group. In the same line, results for subjective norm ($F(1,213) = 0.300$, $p = .59$, $\eta^2 = .001$), entrepreneurial self-efficacy ($F(1,213) = 0.053$, $p = .82$, $\eta^2 < .001$), psychological capital ($F(1,223) = 1.184$, $p = .28$, $\eta^2 = .005$), prosocial behavior ($F(1,213) = 0.119$, $p = .73$, $\eta^2 = .001$) and certainty ($F(1,190) = 0.214$, $p = .64$, $\eta^2 = .001$) were not statistically significant. The only variable whose change was affected by the participation in the activity was attitude toward entrepreneurship ($F(1,219) = 4.267$, $p = .04$, $\eta^2 = .019$). Figure 22 shows its change through the measurement times. Although both groups reduced their attitude toward entrepreneurship, the entrepreneurship promotion activity buffered the decrease in the intervention group.

Figure 22

Results for attitudes toward entrepreneurship



Alignment effect

According with the alignment effect, intervention effect depends on the baseline or initial status in the variable of interest: those students with a lower level in pre-intervention increased after their participation, whereas the ones with a higher level pre-intervention, decreased their results (Fayolle & Gailly, 2009). Following Fayolle and Gailly (2009), in order to test Hypothesis 5, the intervention group was split in four groups according with their pre-intervention level of entrepreneurial intention: Q1- First quartile, Q2- Second quartile, Q3- Third quartile, Q4- Forth quartile. An ANOVA showed the following results: Pillai's Trace 0.124, associated with $F(3, 148) = 6.070$, $p < .001$, $\eta^2 = .124$. These results indicated that the intervention effect varied depending on students' entrepreneurial intention at the beginning of the activity. As Table 24 shows, follow-up Paired T-tests showed a statistically significant moderate increase in entrepreneurial intention for those students who presented the lowest entrepreneurial intention pre-intervention (Figure 23). Contrarily, those students with the highest entrepreneurial intention pre-intervention presented a statistically significant moderate decrease because of their participation in the activity (Figure 23).

Table 24

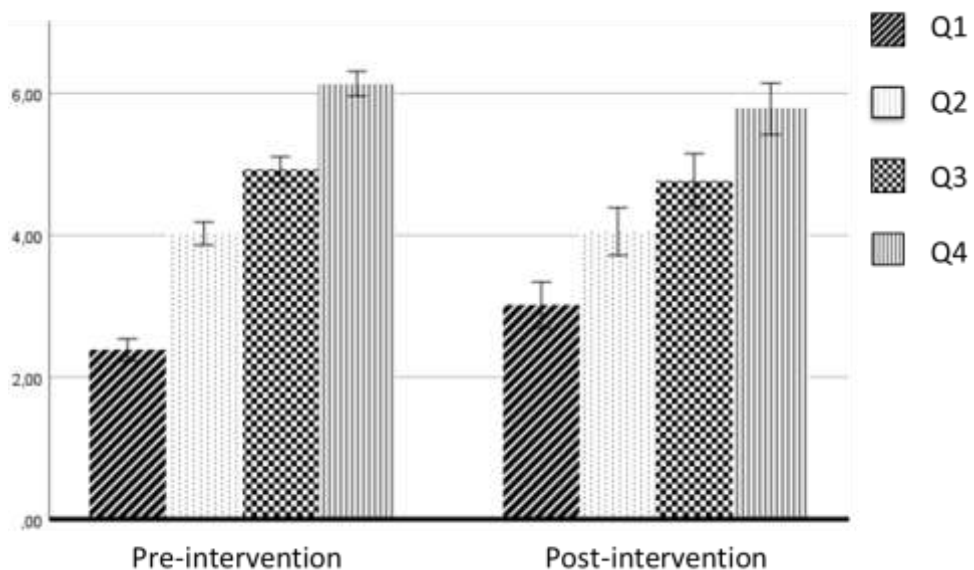
Entrepreneurial Intention changes depending on Entrepreneurial Intention pre-intervention

	Pre-intervention <i>M(SD)</i>	Post-intervention <i>M(SD)</i>	Statistical test
Q1	2.39(0.82)	3.02(1.33)	$t(42) = -3.449, p = .001^{**}; d = -0.53$ 90%CI [-0.87, -0.38]
Q2	4.02(0.29)	4.05(1.05)	$t(40) = -0.189, p = .851; d = -0.03$ 90%CI [-0.29, 0.19]
Q3	4.93(0.24)	4.77(1.03)	$t(33) = -0.507, p = .399; d = 0.15$ 90%CI [0.03, 0.51]
Q4	6.14(0.45)	5.78(0.79)	$t(34) = 2.745, p = .01^{*}; d = 0.46$ 90%CI [0.38, 0.87]

Note. *M* = Mean; *SD* = Standard Deviation

Figure 23

Changes in entrepreneurial intention considering levels of entrepreneurial intention pre-intervention



Sorting and alignment effect

Previous analyses did not allow us to capture sorting effects. Consequently, Fretschner and Lampe's (2019) procedure was replicated to evaluate simultaneously the sorting and alignment effects (Hypothesis 6). Table 25 shows the results for all the models tested.

Model 2 tested the impact of $\overline{EI}_{t=1}$ on $\Delta\overline{EI}_i$. It showed a negative and high regression coefficient, which means that those students with extreme positions (favorable or unfavorable) on entrepreneurial intention pre-intervention, reduced their distance from the mean after the program (alignment effect), and those who were near to the mean, incremented their distance after the program (sorting effect) (see Figure 24).

Model 3 explored the effect of the ΔATE and ΔESE on the sorting and alignment effect. Table 25 shows a non-statistically significant effect in both cases. Model 4 shows how the ΔATE did not increase the impact of $\overline{EI}_{t=1}$ on $\Delta\overline{EI}_i$. However, ΔESE increment amplified the impact of $\overline{EI}_{t=1}$ on $\Delta\overline{EI}_i$. Model 5 showed no effect for the triple-interaction between $\overline{EI}_{t=1}$, ΔATE , and ΔESE .

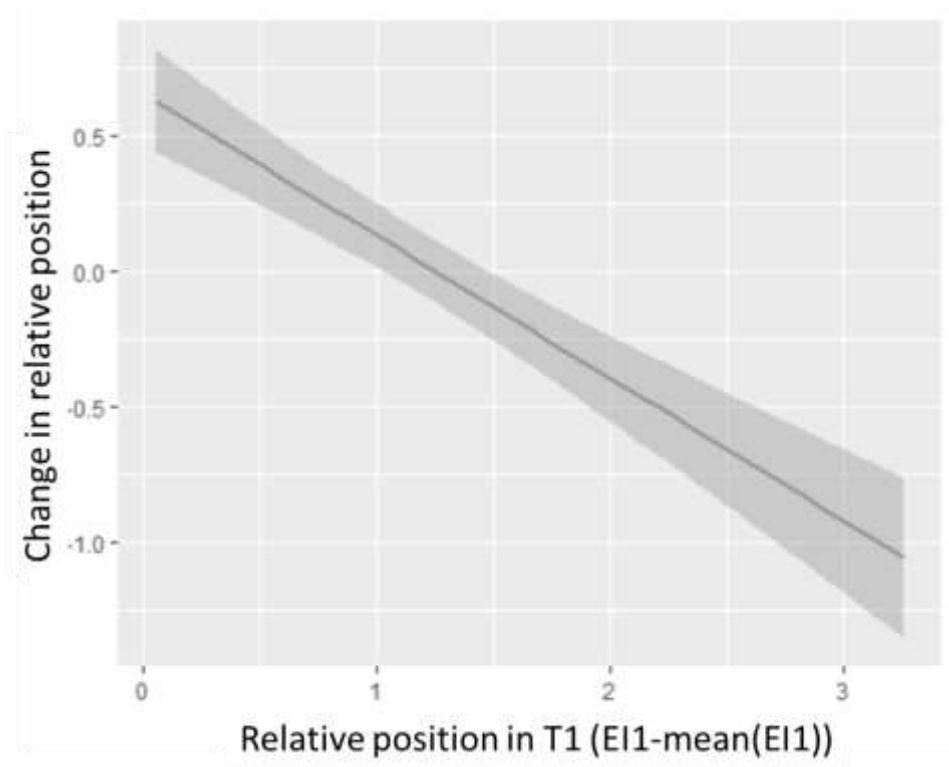
Table 25*Results for regression*

	Model 1	Model 2	Model 3
Constant	0.026	1.224	1.193
Controls			
SN	-.069	.004	.007
Gender	-.103	-.057	-.061
Age	.039	-.030	-.035
Main effects			
$\overline{EI}_{t=1}$		-.552***	-.553***
ΔATE			.014
ΔESE			.094
R ²	.016	.309	.313
Adjusted R ²	-.005	.289	.282

Note. EI=Entrepreneurial Intention; ATE= Attitudes toward Entrepreneurship; SN= Subjective Norm; ESE=Entrepreneurial Self-Efficacy

Figure 24

Effect plot



Discussion

Studies of the effectiveness of interventions for attitudinal change or the promotion of competencies in secondary schools are traditionally based on the use of pre-post intervention measurements and control group (e.g. Sánchez, 2013; Tapia-Serrano et al., 2022). In these studies, the desired outcome is a change in the group mean of the intervention group, as opposed to no change in the control group. Previous studies in the field of undergraduate entrepreneurship education show how this type of assessment may not capture relevant effects such as the sorting and alignment effects (Fayolle & Gailly, 2009; Fretschner & Lampe, 2019). Despite institutional support for entrepreneurship promotion activities in secondary and high schools, research on their effectiveness is limited (Bohlayer & Gielnik, 2023; Brüne & Lutz, 2020; Longva & Foss, 2018; Martínez-Gregorio et al., 2021). To fill this gap, the present research evaluates the effectiveness of such an activity in a secondary school (Hypotheses 1-4), testing the generalizability of the sorting and alignment effects for the first time in this audience (Hypotheses 5 and 6).

After participation in the entrepreneurship exposure activity, the intervention group did not show a greater increase in almost any of the variables considered versus the control group. These results reject Hypotheses 1-4. These results, although a priori undesirable, are similar to those found in this same population after similar activities by Bergman et al. (2011) who did not find a statistically significant effect on entrepreneurial self-efficacy, and Huber et al. (2014) who failed to achieve an impact on social orientation. The only variable in which a change was observed compared to the control group was in attitudes toward entrepreneurship, which partially supports Hypothesis 1. Although both groups showed a reduction in their attitudes toward entrepreneurship, participation in the activity seems to have benefited

the intervention group by acting as a buffer. Consequently, we could say that the activity had a positive effect on the attitudes toward entrepreneurship of the participants. This effect is to be expected considering the impact of interventions with similar characteristics (Shahin et al., 2021). The absence of change in the subjective norm may be expected, given that it evaluates the support received by teachers, family, and friends, and the activity does not act on these groups (Fretschner & Lampe, 2019). Likewise, we could consider that the change in attitude toward entrepreneurship is a first step towards increasing entrepreneurial intention, a more complex variable since it would be affected by other contextual factors not modified by the activity. This would have been our conclusion in the absence of further analysis.

This first impression of no change in entrepreneurial intention has turned out to be misleading. By replicating the analyses of Fayolle and Gailly (2009) and Fretschner and Lampe (2019) we have been able to verify that the program has indeed produced changes in the entrepreneurial intention of the students. But these changes have been different depending on the initial entrepreneurial intention of the participants. Thus, changes in opposite directions mask the change when studying the group average. Specifically, we have found that those students who started the program with a lower entrepreneurial intention have seen it increase. On the other hand, those students who started with a higher entrepreneurial intention have decreased their interest after the program. In this way, we provide empirical support for the transfer of the alignment effect (Hypothesis 5) (Fayolle & Gailly, 2009; Fretschner & Lampe, 2019) to other non-university groups. In the same way, our results also support the presence of the sorting effect (Hypothesis 6), given that those students who initially showed a position in entrepreneurial intention closer to the group mean, have increased their distance from it (Fretschner & Lampe, 2019; von Graevenitz et al.,

2010). This is evidence that the program has helped students who were undecided about their entrepreneurial intention to take sides either for or against it.

These results show that the entrepreneurship exposure activity, despite not promoting other desirable collateral competencies such as psychological capital or prosocial behaviors, would be effective as vocational training. The lack of a generalized impact on the student body may be related to the duration of the exposure activity to entrepreneurship. As described, the intervention had a duration of 6 sessions of 55 minutes, one session per week. Previous evidence seems to suggest that the results would be more positive with more intense interventions with longer duration (Martínez-Gregorio et al., 2021). This type of intervention in entrepreneurship education may have sense at later stages when students have clearly chosen entrepreneurship as their career path. However, does it make sense to introduce competencies such as the entrepreneurship in secondary school (LOMLOE, 2020) by using such demanding interventions? This reflection exceeds the pretensions of this paper, although it highlights future research directions in the field. The present research has shown that, despite not provoking changes in all the desired variables, the proposed brief activity has had vocational orientation effects on the students. The proposed activity is presented as a realistic initiative, feasible to be incorporated into the students' school timetable without being detrimental to the teaching of the basic curricular contents of the regular subjects. Future research should delve deeper into the cost-benefit balance to define whether this intervention model produces better or worse results than other alternatives of realistic application in secondary education.

Additionally, some practical implications for stakeholders as educational authorities and professionals are derived. First, this study

supports government initiatives that advocate the introduction of this type of activity in secondary schools. However, if these activities are well thought out, their purpose is not to promote the creation of businesses, but to provide students with information about this professional alternative (Schröder & Schmitt-Rodermund, 2006; von Graevenitz et al., 2010). In this way, they encourage the lowering of unrealistic expectations and exposure to experimental environments in which to test their aptitude and interests (von Graevenitz et al., 2010). As previous studies have shown, these experiences are especially relevant for groups that do not have experience with entrepreneurship in their daily lives through family members or people close to them (Lyons & Zhang, 2018), and for groups that have traditionally seen entrepreneurship as an idea far removed from their reality, such as girls in some specific cultures (Shahin et al., 2021).

Our **Study 7** presents some limitations. First, the sample size is not very large. Despite this, the sample presents a clear strength and that is that the risk of self-selection, characteristic in studies of the effectiveness of entrepreneurship education initiatives, is minimal in our case. It should be emphasized that all the students in the classes assigned to the intervention group participated in this activity of exposure to entrepreneurship. This is relevant given that, although the educational law contemplates the promotion of the entrepreneurial attitude in all students, many of the entrepreneurship initiatives developed are carried out within the framework of the optional subject of Business Creation included in the fourth year of secondary education or as extracurricular activities (Sánchez-García et al., 2013). This means that students with a greater interest and entrepreneurial attitude are the ones who effectively access the training courses. Additionally, the active participation of each student during the activity was not

registered. Future research could further analyze how commitment and participation impact intervention success.

Although another of the study's strengths is the use of a quasi-experimental design with pre- and post-intervention measurements and a control group, one limitation is the absence of a follow-up to study the long-term impact of the initiative on the students. Consequently, future studies should also include follow-ups to guarantee the stability of the results.

Although this study was conducted within the framework of an intervention for exposure to entrepreneurship, it raises relevant conclusions for the evaluation of vocational interventions in general. In particular, it sends a clear message: in cases where changes in intention, self-efficacy, or attitudes are expected, effectiveness studies should consider the initial level of the participants in these variables. Otherwise, possible hidden effects of alignment or sorting could go unnoticed. The present research has demonstrated for the first time the presence of these effects in the case of entrepreneurship education in adolescents but their transferability to other vocational interventions should be tested in future research.

Study 8. Entering the black-box of entrepreneurship education, using the Transfer of Training Model: The key role of psychological capital and outcome expectations, as trainee antecedents, to understand the learning process of high school students

Martínez-Gregorio, S., Loi, M., Fayolle, A., & Oliver, A. Entering the black-box of entrepreneurship education: The key role of psychological capital and outcome expectations to understand the learning process of high school students. *(Under review)*

Abstract

Although vocational training and entrepreneurship exposure activities are implemented in high schools, little attention has been paid to the learning process involved. Present research empirically tests the fit of the Transfer of Training Model to understand how trainee antecedents affect learning outcomes and entrepreneurial intention. Overall, 158 high school students (mean age 13.19 years and 42.7% girls) were surveyed before and after participating in an entrepreneurship promotion activity. Structural equation modeling based on the Transfer of Training Model showed an adequate fit to the data ($\chi^2(37) = 64.885$, $p=.003$; CFI= .959, RMSEA= .069 [.041, .096], SRMR= .036). The effect of trainee antecedents on post-training entrepreneurial intention is fully mediated by knowledge acquisition and entrepreneurial self-efficacy development. Psychological capital and outcome expectations were the trainee antecedents with the greatest impact on their learning process. Therefore, the focus of the research should be on understanding how to improve students' learning through these experiences, because their interest depends on their perception of learning and competence. The findings support the proposed theoretical model's applicability in the

context of entrepreneurship education and pave the way for future research based on it to investigate the influence of course design and environmental factors.

Keywords: entrepreneurial learning; Social Cognitive Career Theory; Psychological Capital; vocational training; entrepreneurial intention

Introduction

International organisms and academics highly encourage the promotion of entrepreneurship in early stages (Bacigalupo et al., 2016; Donaldson, 2019). The support of entrepreneurship during the adolescence could be part of the characteristic “vocational trainings” or career interventions usually developed in high schools. The main objective of the interventions on primary and secondary education is offering the possibility to explore the entrepreneurship as a career option to allow the students to make an informed decision (Schröder & Schmitt-Rodermund, 2006; von Graevenitz et al., 2010), as well as to develop lifelong skills for their professional and personal future (Bacigalupo et al., 2016; Baggen et al., 2022; Raposo & do Paço, 2011).

The inclusion of entrepreneurship experiences in early education takes advantage of the easier promotion of entrepreneurial skills at younger ages (Huber et al., 2014). Although students could be considered timely far from the possibility to successfully develop their own enterprise, previous studies support the stability of the vocational interest at early stages (Stoll et al., 2017) and the transferability of the entrepreneurial interest (Elert et al., 2015) and competences (Obschonka et al., 2011) into entrepreneurial performance in the adulthood.

Despite the importance of the so-called “entrepreneurship experience”, which includes the participation in an entrepreneurship program or the attendance to short entrepreneurship exposure activities at school (Brüne & Lutz, 2020), little attention has been paid to investigating what students recognize to have learned from these experiences and how this learning has been achieved. Even in the growing literature focused on evaluating the effectiveness of the entrepreneurship programs (e.g., Bae et al., 2014; Martin et al., 2013;

Nabi et al., 2017), slight consideration has been given to investigating the learning mechanisms underlying the participation in entrepreneurship promotion activities. Specially, there is a lack of studies analyzing these activities in the adolescence (Brüne & Lutz, 2020; Martínez-Gregorio et al., 2021; Nájera-Sánchez et al., 2022). Understanding the learning mechanism and the relevant factors in it helps us to understand how the desired learning outcomes are achieved thereby entering the black-box of entrepreneurship education interventions and expanding the focus of current research beyond its relationship with entrepreneurial intention (Nájera-Sánchez et al., 2022). Emphasizing the study of the learning process in itself allows us to identify those stages and points on which to intervene to improve the acquisition of those outcomes, and thus allows us to improve the effectiveness of entrepreneurship programs (Loi, 2018).

A theoretical model that could help us understanding the learning process may be the Transfer of Training Model (Baldwin & Ford, 1988). This theoretical framework states that to understand why a training programs is effective, it is fundamental to take into account those mechanisms connecting the trainee characteristics, the training design and the environmental factors to learning transfer by the mediation of the learning results achieved at the end of a training program. As we could understand the entrepreneurial intention as a proxy for the learning transfer in an entrepreneurship experience, Baldwin and Ford's model could easily integrate some previous research based on the theoretical proposals of the Theory of Planned Behavior (Ajzen, 1991), the Social Cognitive Career Theory (Lent et al., 1994) and corroborate empirical results (e.g., Fayolle & Gailly, 2015) from a theoretical point of view.

To sum up, in this paper, we aim to understand the learning process underlying the participation in an activity for the promotion of

entrepreneurship in high schools. Our research is framed in the Transfer of Training Model to recognize how trainee antecedents are affecting the learning results and the relationship of this learning with the transfer conditions. By providing a thorough explanation of the surrounding mechanisms that lead to specific results in entrepreneurship education and highlighting the importance of pretraining conditions and learning outcomes for an understudied target of students, this work allows us to extend previous studies on entrepreneurship education effectiveness, which have primarily focused their attention on measuring changes on the participants' intentions (e.g., Nájera-Sánchez et al., 2022).

Theory and hypothesis

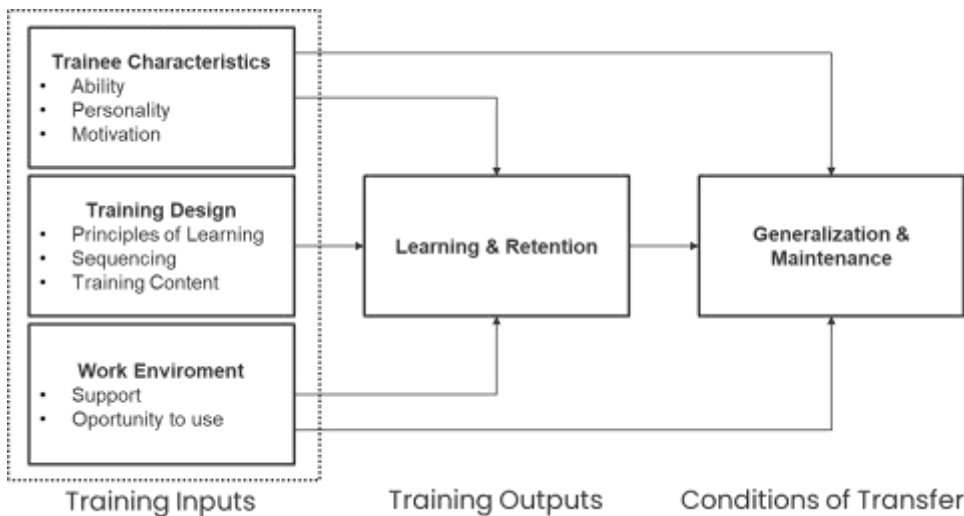
From a theoretical point of view, the literature has pointed out some limitations of entrepreneurship education research. Mainly, studies in this area often lack theoretical models that allow for the cumulative development of knowledge (e.g. Donaldson, 2019; Hägg & Gabrielsson, 2020; Mwasalwiba, 2010). Santana-Domínguez et al. (2022) relate this lack to the fact that the permeability between accumulated knowledge in the area of training transfer and entrepreneurship education has been scarce. These authors are not the first to focus on the Transfer of Training Model as an alternative to conceptualize entrepreneurship education and provide it with a robust theoretical body that integrates the accumulated knowledge (Gielnik, Uy, Funken, & Bischoff, 2017; Loi, 2018). In addition, the knowledge generated in the area is mostly based on studies carried out with samples of university students, while the effect of these interventions and their mechanisms of action has been under-studied in earlier educational stages (Brüne & Lutz, 2020; Martínez-Gregorio et al., 2021; Nabi et al., 2017; Nájera-Sánchez et al., 2022).

The Transfer of Training Model

The Transfer of Training Model (Baldwin & Ford, 1988), which is reproduced in Figure 25, offers a framework to understand the process of transferability of learning, placing the learning achieved as a central element to understand future behaviors once training activities are completed. The model hypothesizes that the training outcomes, the learning results, have a direct impact on the conditions of transfer, namely maintenance of the learning outcomes and/or their generalization to other contexts/situations different from those experimented during the training. Additionally, the model asserts that the learning outcomes, as well as the transfer conditions themselves, are affected by some antecedents. These antecedents may be related to the characteristics of the learners, the characteristics of the design of the activity, or environmental factors of the context in which it is framed (Bell et al., 2017).

Figure 25

Transfer of Training Model (Baldwind & Ford, 1988)



Blume et al. (2010) carried out one of the most comprehensive and recent meta-analyses about the published evidence regarding the Transfer of Training Model. Regarding the trainee characteristics, some of the variables that have been previously considered were the age, gender, previous education or experiences, goal orientation, motivation, personality traits and pretraining self-efficacy. Those which presented a higher effect on training transfer were cognitive ability, conscientiousness, voluntary participation, pretraining self-efficacy and motivation (Blume et al., 2010). As learning results, the outputs considered were post training knowledge and post training self-efficacy.

Although the hypotheses claimed by Baldwin and Ford (1988) in their model are not new in the entrepreneurship education literature, they have not been integrated in a comprehensive theoretical framework. For example, the effect of trainee preconditions on learning results have been previously evidenced on entrepreneurship literature (Fayolle & Gailly, 2015) as well as the entrepreneurial self-efficacy has been frequently considered a mediating learning result on transfer achievement (Wilson et al., 2007). Consequently, previous studies have been generating pieces of knowledge that need to be putted together “into a cohesive whole useful to our research consumers” (Baldwin et al., 2017, p. 25).

Antecedents of Entrepreneurial Learning Results

Previous literature on entrepreneurship education have demonstrated how some environmental and individual antecedents could increase or decrease the effectiveness of the entrepreneurship education program. Although program characteristics such as the training design or duration have been evidenced as relevant factors affecting learning results (Ismail et al., 2018; Martínez-Gregorio et al., 2021; Padilla et al., 2023), our paper would be focused on the effect of the individual characteristics. Specifically, our study considers psychological capital,

entrepreneurial intention and its antecedents, gender and age as antecedents. The relevance of these variables and the reasons for their inclusion are detailed below.

Psychological capital. The study of the effect of personal variables on the development of the entrepreneurial process has a long history, aiming to identify the impact of different personality traits (Kerr et al., 2018; Zhao et al., 2010; Zhao & Seibert, 2006), as well as those attributes considered characteristic of entrepreneurs such as internal locus of control, risk taking or achievement orientation (McClelland, 1987; Stewart, Wayne H. & Roth, 2001). General research on the Transfer of Training Model supports that those personality traits with a higher relationship with positive learning results are conscientiousness and neuroticism (Blume et al., 2010). Schröder and Schmitt-Rodermund (2006) found that it was precisely those students with more personality attributes that we consider to be “entrepreneurial”, who obtained better results after participation in an entrepreneurship program for adolescents.

Although the literature in the field has been prolific, personality traits are attributes considered stable and difficult to modify through intervention. Therefore, Luthans, Youssef, et al. (2007) stresses the need to study personal attributes that, although relatively stable, may be susceptible to change through experience. This interest has also been evident in the entrepreneurship literature (Chevalier et al., 2022; Cui, 2021). Consequently, the concept of psychological capital has emerged in the organizational literature and in the field of entrepreneurship as an alternative personal construct to the stable personality traits.

Psychological capital is a concept introduced by Luthans, Avolio, et al. (2007) to designate a positive psychological state formed by four dimensions: self-efficacy, hope, optimism and resilience. Self-efficacy

would be understood in its traditional sense, as the confidence one feels about one's ability to succeed in demanding tasks. Hope would refer both to the capacity to imagine different ways to achieve success and to the capacity to persevere in achieving it. Optimism is understood as the presence of positive attributions about one's present and future. To conclude, the last dimension would be resilience, which refers to the ability to persist and become stronger through the experience of complicated situations (Luthans et al., 2015).

The latest literature reviews in entrepreneurship show psychological capital as an emerging concept in the field that is receiving increasing interest in recent years (Tang et al., 2021; Welter & Scrimshire, 2021). Specifically, it has been shown how the high psychological capital is a promoter of entrepreneurial intention (e.g., Baluku et al., 2021; Ephrem et al., 2021; Maslakci et al., 2021; Villanueva-Flores et al., 2021). Additionally, it could play a relevant role in the adherence to entrepreneurship programs by showing itself as an antecedent of commitment to learning (Zhang et al., 2020). In this line, the work of Chevalier et al. (2022) suggests that those students with higher psychological capital would obtain greater learning from participation in activities for the promotion of entrepreneurship. Consequently, the psychological capital could be integrated on the Transfer of Training Model as a relevant trainee characteristic with learning implications (Santana-Domínguez et al., 2022).

Although previous literature could point to a positive effect of psychological capital on learning outcomes and development of entrepreneurial intention, there is a lack of studies that effectively integrate it into relevant theories in the area to make sense of it in relation to other constructs in a grounded way. Therefore, attending to the Transfer of Training Model, we hypothesize that:

Hypothesis 1 (H1). Psychological capital has a positive effect on entrepreneurial learning outcomes.

Hypothesis 2 (H2). Psychological capital has a positive, indirect, and direct, effect on post-training entrepreneurial intention.

Entrepreneurial intention and its antecedents. Fayolle and Gailly (2015) demonstrated that previous entrepreneurial intention and prior exposition to entrepreneurship had an impact on the entrepreneurial program result. Their study, as well as most studies conceptualizing entrepreneurial intention, was based on the Theory of Planned Behavior (TPB; Ajzen, 1991). This theory, together with the Entrepreneurial Event Model (EEM; Shapero & Sokol, 1982), have been the predominant theories in the field. However, some authors have shown some criticism for these theories (Donaldson, 2019; Kautonen et al., 2015). For instance, as Liñán and Fayolle (2015) argue, 'more complex configurations of motivational antecedents deserve further attention to better understand the cognitive process leading up to the start-up decision' (p. 916). Alternatives are found in the field of vocational development, as the Socio-Cognitive Career Theory (SCCT; Lent et al., 1994), that has received recent attention.

Following, Bandura's work (1986), SCCT considers that the career decisions and performance is affected by (a) personal attributes, (b) external environmental factors, and (c) overt behavior (Lent et al., 1994). The model conceptualizes two main predictors of career behaviors: outcome expectations and self-efficacy. Outcomes expectations refer as the consequences to develop a particular career. Some authors consider this construct similar to personal attitude or perceived desirability (Lanero et al., 2016). Self-efficacy would be the perception of capability to perform a behavior, which could be related with concepts as perceived feasibility and perceived behavioral control

(Lanero et al., 2016; Moriano et al., 2012). They affect career behaviors directly, and indirectly through the personal goals. SCCT agree other relevant theories in the entrepreneurial field, as the EEM (Shapero & Sokol, 1982) and the TPB (Ajzen, 1991), by considering the goals or intentions as the main direct predictor of future performance.

In line with this theoretical model, lot of studies have found a significant positive link between entrepreneurial self-efficacy and intentions at secondary school (e.g., (Dinis et al., 2013; Martínez-Gregorio & Oliver, 2022; Newman et al., 2019; Wilson et al., 2007). Newman et al. (2019) carried out a literature review about entrepreneurial self-efficacy finding that further research in the promotion of entrepreneurial self-efficacy before the beginning of the individual occupational career is needed, specifically, exploring other theoretical frameworks such as the SCCT (Lent et al., 1994).

Recently, some authors have referred to the SCCT to explore the entrepreneurial process as a process of vocational development (Lanero et al., 2016; E. Liguori et al., 2020; Pérez-López et al., 2019). For example, Lanero et al. (2016) show how the entrepreneurial self-efficacy presents a direct impact on entrepreneurial interests and entrepreneurial career choice, whereas the effect of outcome expectations was lower. These results were supported by Pérez-López et al. (2019) , who considered the SCCT a useful theoretical framework for studying the entrepreneurial career.

The SCCT may be integrated into the Transfer of Training Model as a trainee's entrepreneurial intention and its antecedents could be understood as a motivational antecedent of learning (Baldwin & Ford, 1988; Santana-Domínguez et al., 2022). Those students with higher confidence in themselves and higher motivation would obtain better training outputs and transfer outcomes (Baldwin & Ford, 1988; Blume et

al., 2010). Although psychological capital includes self-efficacy in its measurement, in our study the psychological capital was not entrepreneurial-specific, whereas the self-efficacy in this section refers to entrepreneurial self-efficacy.

Based on the Training Transfer Model, which hypothesizes a direct and indirect effect of motivational antecedents, the SCCT, and previous literature, the following hypotheses are stated:

Hypothesis 3 (H3). Outcome expectations (H3a) and self-efficacy (H3b) will promote entrepreneurial intention.

Hypothesis 4 (H4). Outcome expectations (H4a), self-efficacy (H4b) and entrepreneurial intention (H4c) have a positive effect on learning outcomes.

Hypothesis 5 (H5). Outcome expectations (H5a), self-efficacy (H5b) and entrepreneurial intention (H5c) have a positive, indirect and direct, effect on post-training entrepreneurial intention.

Gender and age. Additionally, sociodemographic variables should be considered as relevant factors affecting learning results. Previous literature seems to point to women showing lower levels of entrepreneurial intention (Haus et al., 2013; Nowiński et al., 2019; Wilson et al., 2007) and entrepreneurial self-efficacy (Chowdhury et al., 2019; Dempsey & Jennings, 2014; Kickul et al., 2008; Wilson et al., 2007). Although these results continue to be controversial and we can find studies that show no differences or even opposite effects (Agarwal & Satsangi, 2018; Coleman & Kariv, 2014; Das & Jaiswal, 2018), the trend in favor of men predominates in the literature. It is worth highlighting the meta-analysis carried out by Haus et al. (2013), which provided evidence of gender differences in entrepreneurial intention, despite its small effect. Regarding the interaction of gender with entrepreneurship education outcomes, the results are controversial. In

the literature we can find both studies that point to a greater benefit for men (Kickul et al., 2008; Shinnar et al., 2014) and authors stating that it would be precisely women who would benefit more from these activities (Barakat et al., 2014; Maritz & Brown, 2013; Nowiński et al., 2019). Cadenas et al. (2020) found that gender did not play a moderator role in the effectiveness of their entrepreneurship program, the *Poder* program¹. In a previous meta-analysis, the conclusion was that there were not statistically significant differences between the effectiveness in males and females (Bae et al., 2014), in terms of entrepreneurial intention improvement.

Relative to the literature on transfer of learning not focused on entrepreneurship, both gender, benefiting males, and age have shown small correlations with transfer (Blume et al., 2010). Consequently, due to the previous controversial results in the entrepreneurship field, the gender, as well as the age, are considered relevant control variables in the model.

Hypothesis 6 (H6). Gender has an effect on learning outcomes.

Hypothesis 7 (H7). Gender has a, indirect and direct, effect on post-training entrepreneurial intention.

Hypothesis 8 (H8). Age has a positive effect on learning outcomes.

Hypothesis 9 (H9). Age has a positive, indirect and direct, effect on post-training entrepreneurial intention.

Effect of learning on intention. In their meta-analysis Blume et al., (2010) considered two different learning outcomes: trainee learning and self-efficacy. Learning assessment refers to the measurement of what the

¹ The Poder program was a five-week program implemented in some U.S. community college campuses in order to promote social entrepreneurship. It consisted in 15h of training in person and 15h of online formation. Further information could be found in Cadenas et al. (2020).

participant has learned in terms of knowledge and skills (Kirkpatrick, 1996). Both variables considered would refer to Kirkpatrick's (1996) second level of training impact measurement and have shown small to moderate effects on transfer (Blume et al., 2010).

One of the most relevant articles in the field of entrepreneurship education that included learning as an outcome to be evaluated was published by Souitaris et al. (2007). These authors considered that the learning acquired during the program could increase entrepreneurial attitudes and intention. Souitaris et al. (2007) conceptualized learning following the classification proposed by Johannisson (1991), who established that there are five levels of learning derived from entrepreneurship education: "Why entrepreneurs act (values, motivation), what needs to be done (knowledge), how to do it (abilities, skills), who should we know (social skills, networks) and finally when to act (experience and intuition)" (Souitaris et al., 2007, p. 572). Although in their study the acquired learning did not have an impact on the increase in intention, it sparked interest in the consideration of this variable.

Subsequent studies have demonstrated the increase in entrepreneurial learning after participation in activities for its promotion (Nabi et al., 2018), and its positive effect on the development of entrepreneurial intention (Beliaeva et al., 2017; Zhang et al., 2019), or its antecedents (Ahmed et al., 2020; Shahin et al., 2021).

Regarding self-efficacy, self-efficacy and career choice have a well-established association in the literature on career theory (Wilson et al., 2007). It has been one of the most widely studied variables as an indicator of the success of an activity for the promotion of entrepreneurship (Cadenas et al., 2020; Martínez-Gregorio et al., 2021), and its effect as antecedent of entrepreneurial intention has been widely

studied (Moriano et al., 2012). SSCT considers self-efficacy as one of the main antecedents of interest and career behavior (Lent et al., 1994). A later meta-analysis provided evidences that self-efficacy, in fact, could be the most important precursor of interest (Lent et al., 2018). Consequently, based on the Transfer of Training Model and previous literature in the field of entrepreneurship education, the following hypotheses are put forward:

Hypothesis 10 (H10). Learning objectives have a positive impact on post-training entrepreneurial intention.

Hypothesis 11 (H11). Post-training entrepreneurial self-efficacy has a positive impact on post-training entrepreneurial intention.

Methods

Participants and procedure

There were 158 high school students from Valencia, Spain. Students were 13.19 years old on average ($SD = 0.90$, range 11-15). 42.7% were female ($n = 67$), 55.4 % were male ($n = 87$), and 3 students self-identified themselves as “other” (1.9%). 92 participants were enrolled in public high schools (58.2%), whereas the rest studied in private ones ($n = 66$, 41.8%). The research was approved by the Research Ethics Committee of the University of Valencia (Appendix 17) and the Education Government of Valencia (Appendix 16). This study meets the ethical standards of the American Psychological Association (APA). After educational authorities approved the research, the informed consent was administered to be signed by families and participants. Participation was voluntary and non-rewarded, and anonymity and confidentiality were guaranteed.

Students filled out a questionnaire before they participated in an “entrepreneurship exposure activity” (Time 1). The “entrepreneurship exposure activity” consisted of a total of 6 sessions of 55 minutes each, where students in teams were challenged to develop an entrepreneurial idea that would help to improve a social problem in their environment. The activity was developed in their regular classroom during their school time as a voluntary school activity.

Each session was structured as follows: 15-20 minutes for the presentation of the content, 20-25 minutes for teamwork, and 5-10 minutes for group debriefing. The contents covered in the sessions were an introduction to (1) opportunity recognition, (2) idea analysis, (3) entrepreneurial competencies, (4) prototyping, (5) business plan, and (6) elevator pitch. Students developed their projects during the sessions and presented their work as an elevator pitch in front of their teachers and program facilitators during the last one.

A second questionnaire was administered to them after they attended the activity (Time 2). The questionnaire took approximately 25 minutes to be filled out and it was administered on paper in the classroom on both occasions. Participants were asked to generate a numerical code to keep their anonymity and to be able to match time 1 (T1) and time 2 (T2) data.

Measures

In addition to a battery of scales, the measurement protocol included a series of sociodemographic variables such as age, gender, or grade. At T1, the protocol included instruments to assess psychological capital, entrepreneurial self-efficacy, entrepreneurial intention, and outcome expectations. At T2, entrepreneurial self-efficacy, learning results, and entrepreneurial intention were measured.

Psychological Capital. Psychological capital was measured at T1 by the 12-item version of the Psychological Capital Questionnaire (Avey et al., 2011) adapted to the academic context (see Tomás et al., 2022). This scale assesses the dimensions of self-efficacy (three items), hope (four items), resilience (three items), and optimism (two items). An example item is “I usually take stressful things at school in stride”. All items were rated on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Although some previous validations employed a 6-point format, the alternative 5-point format has been previously used in the literature (e.g., Baron et al., 2016; Roberts et al., 2011) and allows us to avoid the “forced choice” (Allen & Seaman, 2007; Raaijmakers et al., 2000). Cronbach’s alpha and omega were both .79.

Entrepreneurial self-efficacy, entrepreneurial intention, and outcomes expectations. The constructs included in the SCCT theory were measured by the Entrepreneurial Intention Questionnaire (Rueda et al., 2015) in its adaptation for secondary students (Martínez-Gregorio & Oliver, 2022). All items were rated on a 7-point Likert scale. This scale originally included the dimensions of entrepreneurial intention (five items), entrepreneurial self-efficacy (nine items), attitudes toward entrepreneurship (six items), and subjective norm (three items). Attitudes toward entrepreneurship are assessed as a composite measure. Consequently, it is measured with two groups of items. The first group asks about the outcome expectations (i.e., “Creating a new company or becoming an entrepreneur would mean for you... 1. Facing new challenges”) and the second one about the value (i.e., “Indicate how desirable they are for you in your everyday life... 1. Facing new challenges”). Both sets of items are supposed to be multiplied, and a higher score means a more positive attitude toward entrepreneurship.

In T1, the dimensions of entrepreneurial intention, entrepreneurial self-efficacy, and outcome expectations (the set of items

originally included as part of the attitudes dimensions) were administered. Reliability results were adequate for all of them (entrepreneurial intention: $\alpha = .85$ and $\omega = .86$; entrepreneurial self-efficacy: $\alpha = .78$ and $\omega = .78$; outcome expectations: $\alpha = .75$ and $\omega = .76$).

In T2 only the dimensions of entrepreneurial intention and entrepreneurial self-efficacy were assessed. Cronbach's alpha and omega were .87 in both cases for entrepreneurial intention. Entrepreneurial self-efficacy showed a Cronbach's alpha of .83 and an omega of .82.

Learning objectives. The learning from the activity was measured by Souitaris et al. (2007) on a 5-item scale (T2). Based on Johannisson's (1991) classification of entrepreneurship program learning, each item asked "to what extent did the entrepreneurship activity" increased their understanding of different aspects related to the entrepreneurial process. For example, the first item is "To what extent did the entrepreneurship program... 1. Increase your understanding of the attitudes, values, and motivation of entrepreneurs (i.e., why do entrepreneurs act?)". Students are asked to answer on a 7-point Likert scale (1= not at all to 7= to a large extent). Cronbach's alpha and omega were equal, .87.

Analysis

Descriptive statistics, reliability, and correlation among variables were estimated in JASP 0.16. To perform the analyses, the gender variable was dichotomized into "female" (0) and "male" (1), due to the small sample of participants who self-identified as others ($n = 3$). The Structural Equation Model (SEM) was performed in the R package "lavaan" (Rosseel, 2012). Figure 25 showed the partial mediation model that was tested. It included several trainee characteristics as

background variables that impact learning outcomes and, in turn, impact the Entrepreneurial Intention, included as a latent variable. The model was estimated with Maximum Likelihood with Robust standard errors (MLR), and missing data was estimated using Maximum Likelihood. Several goodness-of-fit indexes were employed to analyze data-model fit (Kline, 2015): (a) the chi-square test; (b) the Comparative Fit Index (CFI); (c) the Root Mean Square Error of Approximation (RMSEA), and (d) the Standardized Root Mean Residual (SRMR). An adequate model fit is evidenced by a CFI above .90 (better above .95), and an RMSEA and SRMR below .08 (Marsh et al., 2004).

Results

Preliminary analysis

Table 26 shows the means, standard deviations, and correlations among the studied variables. As can be seen, age did not have a statistically significant bivariate correlation with any of the study variables. In contrast, gender showed a relationship with the psychological capital at T1 and entrepreneurial self-efficacy, and entrepreneurial intention in both measurements, being males who showed higher results in all of them. As expected, the psychological capital had a relationship with most of the studied variables and the constructs included in the SCCT theory were highly correlated with each other.

Table 26*Means, Standard Deviations, and Correlations for key study variables*

Variable	Mean	SD	1	2	3	4	5	6	7	8
1. Gender										
2. Age	13.19	0.91	.02							
3. Psychological capital (T1)	3.65	0.57	.34***	-.02						
4. Entrepreneurial intention (T1)	4.26	1.49	.19*	-.04	.15					
5. Entrepreneurial self-efficacy (T1)	5.14	0.86	.19*	.11	.31***	.38***				
6. Outcome expectations (T1)	5.34	0.94	.00	.06	.28***	.33***	.47***			
7. Learning objectives (T2)	5.21	1.11	.12	-.09	.40***	.33***	.33***	.46***		
8. Entrepreneurial self-efficacy (T2)	5.12	0.89	.24***	-.02	.38***	.40***	.43***	.44***	.65**	
9. Entrepreneurial intention (T2)	4.33	1.48	.20*	-.11	.13	.74***	.27***	.29***	.47**	.51**

Note. Gender coded 0=Female, 1=Male; * $p < .05$; ** $p < .01$; *** $p < .001$.

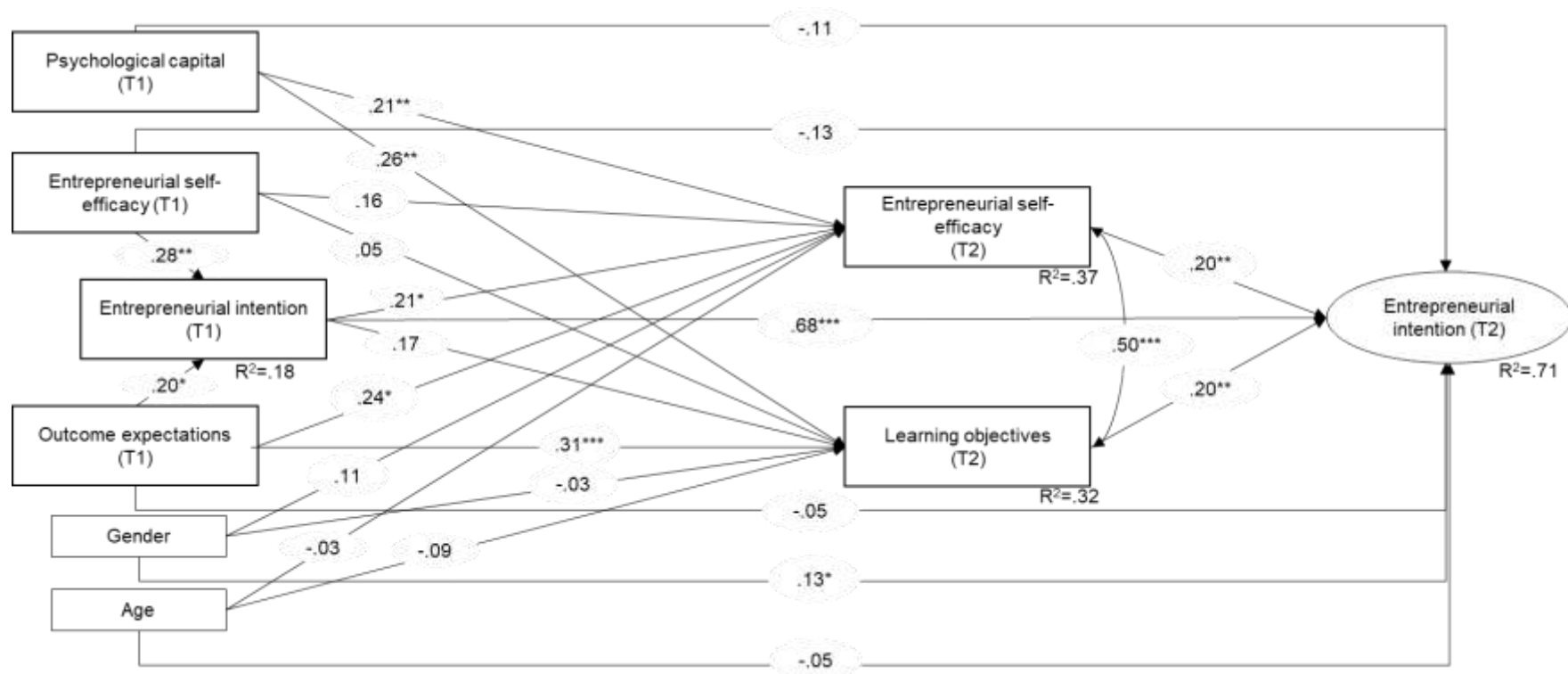
Hypothesis testing

According to Baldwin and Ford (1991), a partial mediation structural equation model, where some trainee characteristics (psychological capital, entrepreneurial self-efficacy, entrepreneurial intention, outcomes expectations, gender, and age) affect the learning results (entrepreneurial self-efficacy and learning objectives) and this, in turn, the intention to generalize (entrepreneurial intention), was tested. Figure 26 shows the results for the estimated model. The model fit was adequate: $\chi^2(37) = 64.885$, $p = .003$; CFI = .959, RMSEA = .069 [.041, .096], SRMR = .036.

As can be seen, entrepreneurial intention at T2 was introduced in the model as a latent variable with its five items as indicators. All of them show adequate factor loadings ranging between .72 and .87. For clarity's sake the correlations among the exogenous variables are not included in Figure 26, but presented in Table 27.

Hypothesis 1 predicted that psychological capital would be a relevant antecedent in the learning process. Figure 26 indicates that it had a significant role in the achievement of learning outcomes in terms of entrepreneurial self-efficacy development ($\beta = .22$, $p < .01$), but also learning objectives ($\beta = .26$, $p < .01$). Although its direct effect on entrepreneurial intention at T2 was not statistically significant, it presented a statistically significant indirect effect of .10 ($p < .01$).

Regarding Hypothesis 2, each included variable performed in a different way. Previous entrepreneurial self-efficacy had just a direct impact on entrepreneurial intention (T1), and not an impact on the learning outcomes, not in entrepreneurial self-efficacy (T2) and neither in learning objectives. Its direct and indirect ($\beta = .07$, $p > .05$) impacts on entrepreneurial intention (T2) were not statistically significant. Consequently, Hypothesis 2.1 was rejected.

Figure 26*Structural equation model*

Note. * $p < .05$; ** $p < .01$; *** $p < .001$. For sake of clarity, correlation among background variables not shown

Table 27

Correlations among background variables included in the structural equation model

Variable	1	2	3	4	5
1. Gender					
2. Age	.01				
3. Psychological capital (T1)	.34***	-.02			
4. Entrepreneurial intention (T1)	.13	-.11	.00		
5. Entrepreneurial self-efficacy (T1)	.16*	-.10	.31***	-	
6. Outcome expectations (T1)	-.01	.05	.28**	-	.47***

Note. Correlations among Entrepreneurial Intention (T1) with Entrepreneurial Self-Efficacy (T1) and Outcome expectations (T1) were not included in the theoretical model, the regression coefficients were included in Figure 26; * $p < .05$; ** $p < .01$; *** $p < .001$.

Hypothesis 2.2 was supported. outcomes expectations showed statistically significant effects on entrepreneurial intention (T1) ($\beta = .20$, $p < .05$), entrepreneurial self-efficacy (T2) ($\beta = .33$, $p < .01$), and learning objectives (T2) ($\beta = .24$, $p < .05$). Although it had no statistically significant direct effect on entrepreneurial intention (T2), it did have a significant indirect effect ($\beta = .13$, $p < .01$). Hypothesis 2.3 stated the positive effect of entrepreneurial intention (T1) on learning outcomes. This hypothesis was partially supported. Entrepreneurial intention (T1) had a direct effect on entrepreneurial self-efficacy (T2) ($\beta = .21$, $p < .05$), but had no effect on learning objectives ($\beta = .17$, $p > .05$). Its indirect effect on entrepreneurial intention, on the other hand, was statistically significant ($\beta = .08$, $p < .05$). Entrepreneurial intention at T1 had a .68 ($p < .001$) direct effect on entrepreneurial intention at T2.

Regarding the sociodemographic variables included in the model, age had no statistically significant relationship, whereas gender had a direct effect on entrepreneurial intention (T2) ($\beta = .13$, $p < .05$).

Hypotheses 3 and 4 were supported. Both learning results showed a statistically significant effect on entrepreneurial intention (T2): .20 for entrepreneurial self-efficacy (T2) ($p < .01$).and .20 for learning objectives ($p < .01$). And both variables presented a correlation of .50 ($p < .001$). The total model explained 71% of entrepreneurial intention (T2) variance.

Discussion

We will present in the next sub-sections the theoretical contribution, the practical contribution and the limitations of our study.

Theoretical contribution

The present article contributes by shedding light on some gaps in the literature identified in previous reviews and works in the field of entrepreneurship education. First, it sheds light on the underlying mechanisms of entrepreneurship education, an in-demand aspect in previous literature (Nabi et al., 2017). Secondly, it focuses on adolescents, an audience that, despite continuous calls for the introduction of entrepreneurship education at this educational stage (Donaldson, 2019; Raposo & do Paço, 2011), remains understudied (Martínez-Gregorio et al., 2021; Nájera-Sánchez et al., 2022; Shahin et al., 2021). Lastly, it offers empirical evidence in favor of using the Transfer of Training Model as a robust theoretical framework for improving research in the area (Santana-Domínguez et al., 2022). In doing so, the current study applies the Transfer of Training Model to evaluate the learning process of a group of high-school students during their participation in an entrepreneurship exposure activity.

Transfer of Training Model hypothesizes that the impact of trainee characteristics (personality, ability, and motivation) impacts on transfer of knowledge directly, but also indirectly through their impact on learning results (learning or self-efficacy) (Baldwin & Ford, 1988; Bell et al., 2017). Our results highlight the relevance of some trainee characteristics on learning and transfer promotion, but this effect may be mainly indirectly and mediated by the acquisition of knowledge and entrepreneurial self-efficacy development. Thus, although empirical evidence of the fit of the Transfer of Training Model has been found, the present study shows how learning results are even more crucial since they are the ones that are effectively affected by the trainee antecedents.

Our study considers three kinds of trainee antecedents: Psychological capital (as a personality-related antecedent),

entrepreneurial intention and its antecedents (as motivational antecedents), and sociodemographic characteristics (gender and age). Regarding hypotheses 1 and 2, H1 was verified as the psychological capital presented a clear positive impact on self-efficacy and learning objectives achievement after the intervention. However, H2 was partially supported. The impact of psychological capital on entrepreneurial intention was fully mediated by the learning results, and it has not a direct impact on transfer conditions. Following previous studies that pointed to the relevance of personality-related variables in the development of entrepreneurial interest (Pérez-López et al., 2019; Schröder & Schmitt-Rodermund, 2006), our study introduces the need to consider the psychological capital among them. Consequently, our study agrees with recent studies that highlight the relevance of considering this emerging concept in entrepreneurship education literature (Chevalier et al., 2022; Zhang et al., 2020).

The SCCT model has been extensively tested in the STEM literature and the authors recently call for its application in other areas (Lent et al., 1994; Lent & Brown, 2019). Although recent studies have shown its generalizability in the field of entrepreneurship (e.g., Belchior & Lyons, 2021; Liguori et al., 2018; Pérez-López et al., 2019), our study goes a step further by effectively integrating part of it into the Transfer of Training Model. Regarding the SCCT hypothesis (H3), outcome expectations and entrepreneurial self-efficacy promote entrepreneurial intention pre-intervention. The contribution of this work lies in demonstrating that when considering the combined impact of these variables on learning, outcome expectations is the variable with a higher impact on the learning process (H4a). In contrast, our study does not support H4b and shows only partial support for H4c, as entrepreneurial intention shows only an impact on entrepreneurial self-efficacy (T2) and not on the acquisition of learning objectives. These results point to the

fact that the importance of pre-intervention entrepreneurial self-efficacy in learning development is not supported when considering other related variables such as outcome expectations. Regarding their effect on entrepreneurial intention (T2), we have shown that entrepreneurial intention presents high stability, and those students with a higher intention pre-intervention, still present a high intention after the program (H5c). However, H5a y H5b were just partially supported, as the impact of outcome expectations and entrepreneurial self-efficacy was fully mediated.

The sociodemographic variables in the model had a limited impact on the learning process. Neither age nor gender showed an effect on learning results, and only gender showed a positive impact on entrepreneurial intention after the intervention (T2). Consequently, hypotheses H6, H8, and H9 do not hold, and we find partial support for H7. These results highlight that girls benefit as much as their male peers from the activity, but their learning results do not translate equally into an increase in entrepreneurial intention (T2). Although these results would be expected considering previous research on the topic (Shinnar et al., 2014), it is also intriguing as it emphasizes the need to adapt entrepreneurial exposure activity to remove remaining gender-related barriers.

Finally, our results support the impact of learning results on conditions of transfer. Both entrepreneurial self-efficacy after the intervention (T2) and learning objectives showed an impact on the development of entrepreneurial intention after the intervention (T2). Thus, the Transfer of Training Model can explain 71% of entrepreneurial intention.

Practical implications

Our research offers some practical implications. First, educators and entrepreneurship education facilitators should consider the characteristics of their audience to adapt their programs. Interventions with students with lower levels of psychological capital or outcome expectations will lead to worse learning results if these preconditions are not reinforced during the program. Consequently, we recommend including a student's pre-test before the beginning of the program just to target the sessions. Second, we encourage practitioners to pay attention to learning objectives acquisition and self-efficacy development as they might promote entrepreneurial intention. Third, although females do not present different levels of learning results, they have less entrepreneurial intention after the program. We encourage educational leaders to enrich entrepreneurship promotion activities for girls with exposure to positive role models (Kickul et al., 2008) or mentoring (Kuschel et al., 2020). Receiving support from role models may be especially positive for women, as their entrepreneurial intention may be more influenced by the subjective norm (Entrialgo & Iglesias, 2016).

Limitations and future research

Although the Transfer of Training Models is proposed as a comprehensive framework to evaluate and conduct research in entrepreneurship education, our study only includes those antecedents related to trainee characteristics. Our sample participates in the same entrepreneurial exposure activity; they do not differ in training design. Consequently, future research should jointly consider a broader range of antecedents impacting learning results and transfer. The previous reviews pointed out that research is mainly focused on trainee characteristics and less is known about the pedagogical principles

involved (Hägg & Gabrielsson, 2020). There is room for improvement in that area.

Another concern about entrepreneurship education research is the design of the studies. The presence of longitudinal studies is scarce compared with those studies including just one-time measurement (Martínez-Gregorio et al., 2021). Although our study includes two-time measurements, we lack a follow-up to verify the impact of learning results on future career development. This fact limits our conditions of transfer measurement, and we were forced to use a proxy, the entrepreneurial intention. Despite the complexity to carry out this kind of longitudinal studies during adolescence, we encourage future researchers to apply the Transfer of Training Model with larger time lapses.

Conclusion

Our **Study 8** provides empirical evidence that the Transfer of Training Model is a comprehensive and useful theoretical model with which to theoretically strengthen future research in entrepreneurship education. By focusing on how learning takes place in entrepreneurial exposure activities during the adolescence, our results show that trainee characteristics have an impact on training outcomes as stated in the Transfer of Training Model. However, their impact on transfer conditions might be fully mediated by those learning results. Consequently, educators must ensure the development of learners' perception of learning and acquisition of competencies if they are to increase their interest and motivations for entrepreneurship. Those trainee characteristics with higher impact are the psychological capital, an emerging construct in the field, and the outcome expectations.

General conclusions

The following few pages aim to highlight the main contributions from this thesis also pointing some remarks to stimulate further research and debate. We should consider that, by the time of drawing the first lines of this granted doctoral research, about 4 years back, the research on entrepreneurship education did not achieve the same degree of scholarship as general entrepreneurship literature (Liguori et al., 2019). Some methodological problems and substantial key aspects were understudied (Duval-Couetil, 2013; Lorz et al., 2013; Nabi et al., 2017). These gaps were even greater when we focused on entrepreneurship education in the pre-university stages (Brüne & Lutz, 2020; Martínez-Gregorio et al., 2021; Nájera-Sánchez et al., 2022). Although policy guidelines promote the implementation of activities for the promotion of entrepreneurship from primary school (Bacigalupo et al., 2016; LOMCE, 2013; LOMLOE, 2020), we currently still have little research to support and guide them.

Thus, the principal objective of this doctoral dissertation has been to strengthen the research in the field of entrepreneurship education by focusing on some recent methodological developments. Specifically, when it takes place at high schools. In doing so, the contributions have been integrated into three main objectives or thematic sections: (1) Updating knowledge, (2) Adaptation and psychometric studies of measurement instruments, and (3)

Development and assessment of an entrepreneurship exposure activity. Consequently, the conclusions follow the same structure.

Updating knowledge

When only methodologically rigorous studies are considered, entrepreneurship education shows a positive effect (of small to medium magnitude) on entrepreneurial intention and entrepreneurial self-efficacy. This result is encouraging and supports policies that seek to introduce entrepreneurship exposure activities even to populations that show no prior interest in entrepreneurship. However, the studies still being mainly focused on university samples, jeopardize the generalizability to pre-university samples. Consequently, there is still room for research on primary and secondary education levels.

The description of the implemented programs in the effectiveness studies is limited and some recommendations for future studies are stated: “(1) a representative sampling of participants (for example, probabilistic sampling with diverse recruiting methods), (2) samples selected from secondary level and in vocational schools; (3) detailed information about the intervention program (for example, duration, pedagogical methods, so on); (4) validity and reliability tests to assess outcome measures; (5) detailed information about descriptive statistics for outcome measures (for example, means and standard deviations) for both intervention and control group, separately, in pretest and posttest phases, (6) detailed information about potential moderators to advance theoretical understanding (for example, sociodemographic characteristics of the participants)” (**Study 1**).

The length of the programs shows an impact on achieved outcomes, being the programs with the greater duration the ones with a

greater impact. This information should be taken into account when developing activities oriented toward secondary education.

Adaptation and psychometric studies of measurement instruments

To strengthen the methodological quality of effectiveness studies, it is necessary to have adequate tools for the evaluation of indicators (Duval-Couetil, 2013). In this context, evaluation is generally based on the study of entrepreneurial intention and other cognitive and non-cognitive skills (Brüne & Lutz, 2020; Mwasalwiba, 2010). Therefore, this doctoral thesis offers psychometric evidence in favor of the use of four scales, which in addition to enabling their use in the field of entrepreneurship education, contributes to the specific area of knowledge of each construct. For doing so, some new and/or advanced developments in methodological knowledge in statistics has been activated, such as Bayesian model estimation.

First, we present an adaptation of the EIQ (Rueda et al., 2015) for the measurement of Entrepreneurial Intention, and its antecedents, in high schools in Spain and the Dominican Republic. The scale presents adequate psychometric properties and has shown its gender invariance.

For the measurement of the psychological capital in high school students, the adaptation of the PCQ-12 has been previously studied with some controversy regarding its factor structure. Our study supports the second-order structure as the one that better represents its dimensionality. Additionally, the results highlight some reliability problems in the dimensions of Reliability and Optimism.

The psychometric properties of one of the most widely used scales in Spanish samples for the measurement of prosocial behavior

have been reported. Our study presents the PBS as a scale suitable for assessment in adolescents and guarantees the absence of gender bias in its results.

The interest in guaranteeing the absence of gender bias in measurements has been a constant throughout the studies, and in this line, we offer adequate instruments for the development of studies with a gender perspective. In the case of prosocial behavior, this aspect is crucial when choosing the indicators that make up the scale to avoid the use of instruments that systematically benefit men or women.

Development and assessment of an entrepreneurship exposure activity

The entrepreneurship exposure activity presented is proposed as a short initiative likely to be implemented during school hours. Although the activity has been positively evaluated by the students, its impact on the promotion of entrepreneurial intention, psychological capital, and prosocial behavior has been limited, showing an amortizing effect on the loss of attitude toward entrepreneurship observed in the control group.

This absence of effect, in the case of entrepreneurial intention, is due to the presence of alignment and classification effects. So we could consider that the activity has shown an adequate functioning as vocational training, helping students to calibrate their opinion on entrepreneurship as a professional career.

From a methodological point of view, the doctoral dissertation shows how some evidence obtained in adult samples is generalizable to adolescents and an assessment of intervention effectiveness based on the study of change in group average may not adequately capture the presence of some relevant effects.

Transcending the methodological plane, to be able to put forward better initiatives for the promotion of entrepreneurship it is necessary to understand how learning is produced through them. In this line, the study tests for the first time empirically the adjustment of the Transfer of Training Model in entrepreneurship education. So then, based on this theoretical framework, it is evidenced how the previous characteristics of the students have a clear impact on the results of the program. In particular, psychological capital and outcome expectations have a great impact on the learning process. Also, it has been shown how the entrepreneurial intention presented by the students after the performance of the activity is very related to the degree of learning and competence, they perceive that they have developed. Consequently, the initiatives developed in secondary education must have as their main objective the student's learning, not merely motivation or exposure to role models.

In conclusion, it should not be lost sight of the fact that the only way to guarantee equal access to entrepreneurship exposure activities is to integrate them as part of the student's school schedule. Therefore, we should keep in mind the fact that the introduction of these initiatives should not be detrimental to the hours designated for the acquisition of curricular content. Thus, future research should delve into the different possible approaches to land the key competence of a "sense of initiative and entrepreneurship" in the classroom. This doctoral dissertation offers guidelines for the development of entrepreneurial exposure activities, instruments with good psychometric properties for their evaluation, and an example of an activity whose application can be viable as a brief activity in the classroom. In this way, tools are offered for the development of future studies, which could address both (1) quantitative studies to compare the comparative effectiveness of different initiatives

and (2) qualitative studies to reflect with the relevant stakeholders on their materialization in the day-to-day life of high schools.

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Appendix 1. - Checklist for assessing the methodological quality of the studies

Item	Description
1	Expected effect was theoretical founded (Yes: 1; No: 0)
2	Detailed description of entrepreneurship intervention 1. It includes learning objectives. (Yes: 1; No: 0)
3	Detailed description of entrepreneurship intervention 2. It includes duration. (Yes: 1; No: 0)
4	Detailed description of entrepreneurship intervention 3. It includes pedagogical methods. (Yes: 1; No: 0)
5	Randomized control and treatment group (Yes: 1; No: 0)
6	Groups were similar at baseline regarding important indicators (Yes: 1; No: 0; Unable to determine: 0)
7	Adequate sample size in the post-test (Yes: 1; No: 0)
8	The assessment of dependent variables was not dichotomized (Yes: 1; No: 0)
9	The measurement instrument used to assess dependent variables shows good psychometrics properties (validity and reliability) (Yes: 1; No: 0; Unable to determine: 0)
10	The statistical test used to assess the effect was appropriated to the data (non-parametric vs. parametric) (Yes: 1; No: 0)
11	Results of between groups statistical comparison are reported for at least one key outcome (Yes: 1; No: 0)
12	Absence of private financial support (Yes: 1; No: 0)

Note: The methodological quality checklist is based on 12 dichotomous criteria. The presence of the criterion is given a 1 point and its absence 0. The maximum possible score is 1

Appendix 2. General characteristics of the studies (continues on the next pages)

	Study	Country	Sample size	Mean Age	Sex Distribution (% female)	Education level	Duration	Teaching methods	Outcome measured
1.	Athayde (2012)	UK	200 intervention 76 control	-	44.92	Secondary	1 year	AM	A
2.	Bergman et al. (2011)	Israel+1	122 intervention 144 control	14.26	54.96	Secondary	1 year	AM	SE
3.	Cera et al. (2020)	Albania	200 intervention 328 control	-	60.4	Tertiary	-	-	EI
4.	Costa et al. (2018)	Portugal and Germany	181 intervention 102 control	21	55	Tertiary	4 weeks	PM	F
5.	DeTienne & Chandler (2004)	United States	71 intervention 59 control	24	45.9	Tertiary	4 months	PM	-
6.	Dickel et al. (2019)	Germany and Bangladesh	164 intervention 81 control	22.48	40.82	Tertiary	4 months	AM	D, EI, F
7.	Drishti et al. (2016)	Albania	106 intervention 80 control	-	52	Tertiary	4 months	AM	A, C, EI
8.	Fernández-Pérez et al. (2019)	Spain	640 intervention 111 control	22	62.3	Tertiary	4 months	-	C, EI, SE, SN
9.	García-Rodríguez et al. (2016)	Spain	22 intervention 52 control	-	63.43	Tertiary	4 months	AM	D, EI, F
10.	Gielnik et al. (2015)	Uganda	184 intervention 153 control	24.6	40	Tertiary	3 months	AM	EI, SE
11.	Gielnik et al. (2017)	Kenya	125 intervention 102 control	24.6	22.5	Tertiary	3 months	AM	EI, SE
12.	González-López et al. (2019)	Spain	310 intervention 264 control	20.9	55	Tertiary	8 months	AM	A, C, EI, SN

Note. AM: Active method; PM: Passive method; A: Attitude toward entrepreneurship; C: Control or Perceived Behavioral Control; D: Desirability; EI: Entrepreneurship intention; F: Feasibility; NA: Need for achievement; SE: Self-efficacy; SN: Subjective Norm; RT: Risk-taking

General characteristics of the studies (cont.)

Study	Country	Sample size	Mean Age	Sex Distribution (% female)	Education level	Duration	Teaching methods	Outcome measured
13. Hahn et al. (2020)	Austria, Estonia, Germany, Hungary, Italy, Poland, Spain, Switzerland	101 intervention 324 control	25.57	59.5	Tertiary	-	-	-
14. Hanke et al. (2005)	USA	70 intervention 70 control	-	-	Tertiary	4 months	AM	D, EI, F, SE
15. Hansemark (1998)	USA	19 intervention 50 control	21.92	44.9	Tertiary	1 year	AM	C, NA
16. Huber et al. (2014)	Netherlands	1729 intervention 684 control	11.63	50.3	Primary	2-4 weeks	AM	NA, SE, RT
17. Ismail et al. (2018)	Malaysia	203 intervention 105 control	20.13	70	Tertiary	4 months	Both	EI
18. Karlsson & Moberg (2013)	Denmark	51 intervention 21 control	26	28.78	Tertiary	-	AM	A, SE
19. Lorz et al., (2011)	Switzerland	119 intervention 153 control	22.1	-	Tertiary	4 months	AM	A, C, EI, SN
20. McStay, 2008)	Australia	190 intervention 239 control	21	43.2	Tertiary	4 months	AM	D, EI, SE
21. Mentoor & Friedrich (2007)	South Africa	418 intervention 45 control	-	-	Tertiary	4 months	PM	C, NA

Note. AM: Active method; PM: Passive method; A: Attitude toward entrepreneurship; C: Control or Perceived Behavioral Control; D: Desirability; EI: Entrepreneurship intention; F: Feasibility; NA: Need for achievement; SE: Self-efficacy; SN: Subjective Norm; RT: Risk-taking

General characteristics of the studies (cont.)

	Study	Country	Sample size	Mean Age	Sex Distribution (% female)	Education level	Duration	Teaching methods	Outcome measured
22.	Nabi et al. (2018)	UK	89 intervention 61 control	18-25	55	Tertiary	-	AM	C, EI
23.	Oosterbeek et al. (2010)	Netherlands	104 intervention 146 control	-	45	Tertiary	1 year	AM	NA, SE, RT
24.	Peterman & Kennedy (2003)	Australia	109 intervention 111 control	16.18	61.9	Secondary	5 months	AM	D, F
25.	Rauch & Hulsink, (2015)	Netherlands	88 intervention 54 control	23.54	21	Tertiary	1 year	AM	A, C
26.	Sánchez (2011)	Spain	404 intervention 460 control	22.5	64.2	Tertiary	8 months	AM	EI, SE, RT
27.	Sánchez (2013)	Spain	347 intervention 363 control	15.7	57.46	Secondary	8 months	AM	EI, SE, RT
28.	Schröder & Schmitt-Rodermund (2006)	Germany	321 intervention 302 control	16.4	53.08	Secondary	-	PM	C, EI
29.	Souitaris et al. (2007)	UK and France	124 intervention 126 control	-	-	Tertiary	5 months	AM	A, C, EI, SN
30.	Sukavejworakit et al. (2018)	Thailand	30 intervention 30 control	-	-	Tertiary	-	AM	EI
31.	Thursby et al. (2009)	USA	71 intervention 15 control	-	-	Tertiary	2 years	AM	-
32.	van Ewijk & Belghiti-Mahut (2019)	Arab Emirates	132 intervention 114 control	22.47	68.7	Tertiary	4 months	-	EI

Note. AM: Active method; PM: Passive method; A: Attitude toward entrepreneurship; C: Control or Perceived Behavioral Control; D: Desirability; EI: Entrepreneurship intention; F: Feasibility; NA: Need for achievement; SE: Self-efficacy; SN: Subjective Norm; RT: Risk-taking

General characteristics of the studies (cont.)

	Study	Country	Sample size	Mean Age	Sex Distribution (% female)	Education level	Duration	Teaching methods	Outcome measured
33.	Varamäki et al. (2015)	Finland	66 intervention 131 control	23	61	Tertiary	-	Both	A, C, EI, SN
34.	Volery et al. (2013)	Switzerland	189 intervention 102 control	19.3	46	Tertiary	6-12 months	AM	D, NA, SE, RT
35.	Zampetakis et al. (2015)	Greece	60 intervention 51 control	25.3	66.8	Tertiary	3 months	-	A, C, EI, SN

Note. AM: Active method; PM: Passive method; A: Attitude toward entrepreneurship; C: Control or Perceived Behavioral Control; D: Desirability; EI: Entrepreneurship intention; F: Feasibility; NA: Need for achievement; SE: Self-efficacy; SN: Subjective Norm; RT: Risk-taking

Appendix 3. Approval of the Ethics Committee of University of Valencia (for **Studies 2 – 6**)

El comité Ético de Investigación en Humanos de la Comisión de Ética en Investigación Experimental de la Universitat de València,

CERTIFICA:

Que el Comité d'Ètica d'Investigació en Humans, en la reunió celebrada el dia 03 de Diciembre de 2020, una vez estudiado el proyecto de tesis doctoral: *"Programas de intervención en emprendimiento y competencias prosociales en ESO: Diseño, aplicación y evaluación longitudinal de su eficacia"*,

Cuyo/a responsable es D/Dña.

MARIA AMPARO OLIVER GERMES, dirigida por D/Dña. MARIA AMPARO OLIVER GERMES

ha acordado informar favorablemente el mismo.

Y para que conste, se firma el presente certificado

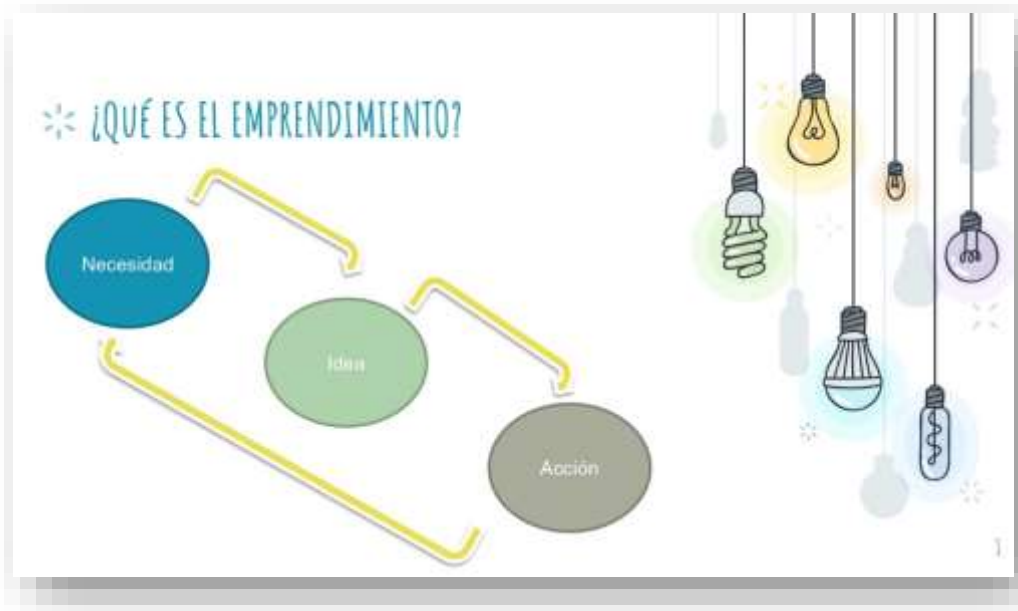
Av. Blasco Ibáñez, 13 tel: 963864109 vicerec.investigacio@uv.es
València 46010 fax: 963983221 www.uv.es/serinves

Firmado digitalmente por
PEDRO JESUS PEREZ ZAFRILLA
Cargo: Presidente del Comité de Ética de la Investigación en Humanos
Fecha: 04/12/2020 12:58:28 CEST



Appendix 4. Session 1: PowerPoint





EJEMPLOS:

https://www.youtube.com/watch?v=XTE7dx8sGIE&ab_channel=Technovation

https://www.youtube.com/watch?v=f60QjItI2RI&ab_channel=AdrianReinaMillan

The slide has a green background. On the right side, there are several lightbulbs hanging from strings, some glowing yellow and others blue, symbolizing ideas and innovation. The text 'EJEMPLOS:' is centered in a large, white, sans-serif font. Below it are two YouTube links in a smaller, white, sans-serif font.







Appendix 5. Session 1: Cards

IDENTIFICANDO NECESIDADES	
NOMBRE DEL GRUPO: CURSO: Necesidad: ¿A quién afecta? ¿Qué provoca?	
Necesidad: ¿A quién afecta? ¿Qué provoca?	
Necesidad: ¿A quién afecta? ¿Qué provoca?	

Appendix 6. Session 2: PowerPoint





ANÁLISIS DAFO

Debilidades

Aspectos en los que otras ideas son mejores que la nuestra

D

F

Fortalezas

Aspectos en los que mejoramos lo que existe ya

Situaciones del entorno que nos perjudican

A

O

Amenazas

Situaciones del entorno que nos benefician

Oportunidades

EJEMPLO

hosly

✧ PASO 1: DEFINIR EL OBJETIVO

DAFO para reflexionar sobre nuestras ideas:

- ¿Qué hace a nuestra idea diferente?
- ¿Cuál es el mayor atractivo de nuestra idea?
- ¿Qué podríamos mejorar aún antes de su puesta en marcha?



7

✧ PASO 2: DEFINIMOS CATEGORÍAS

INTERNO:

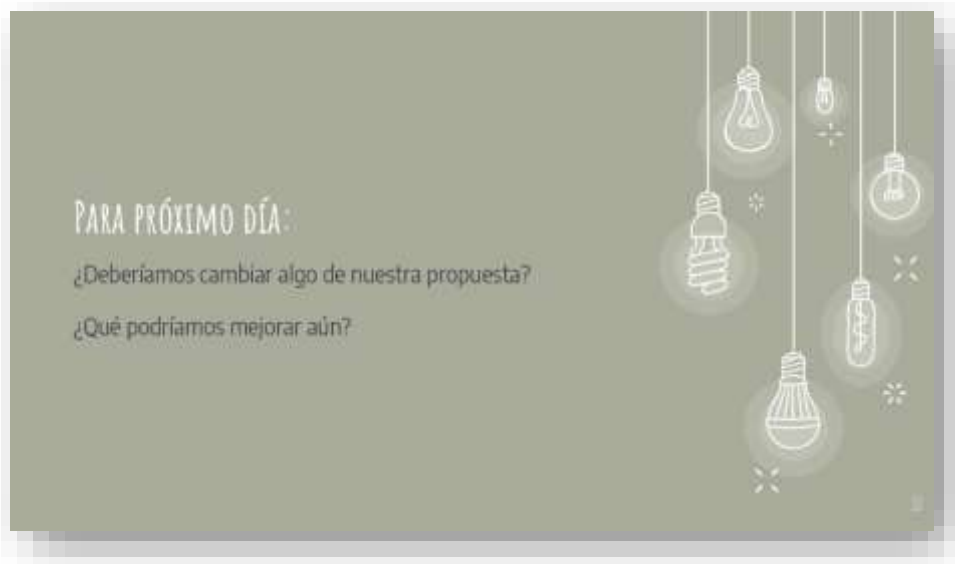
- Recurso educativo
- Recurso familiar
- Recurso lúdico
- Usabilidad

EXTERNO:

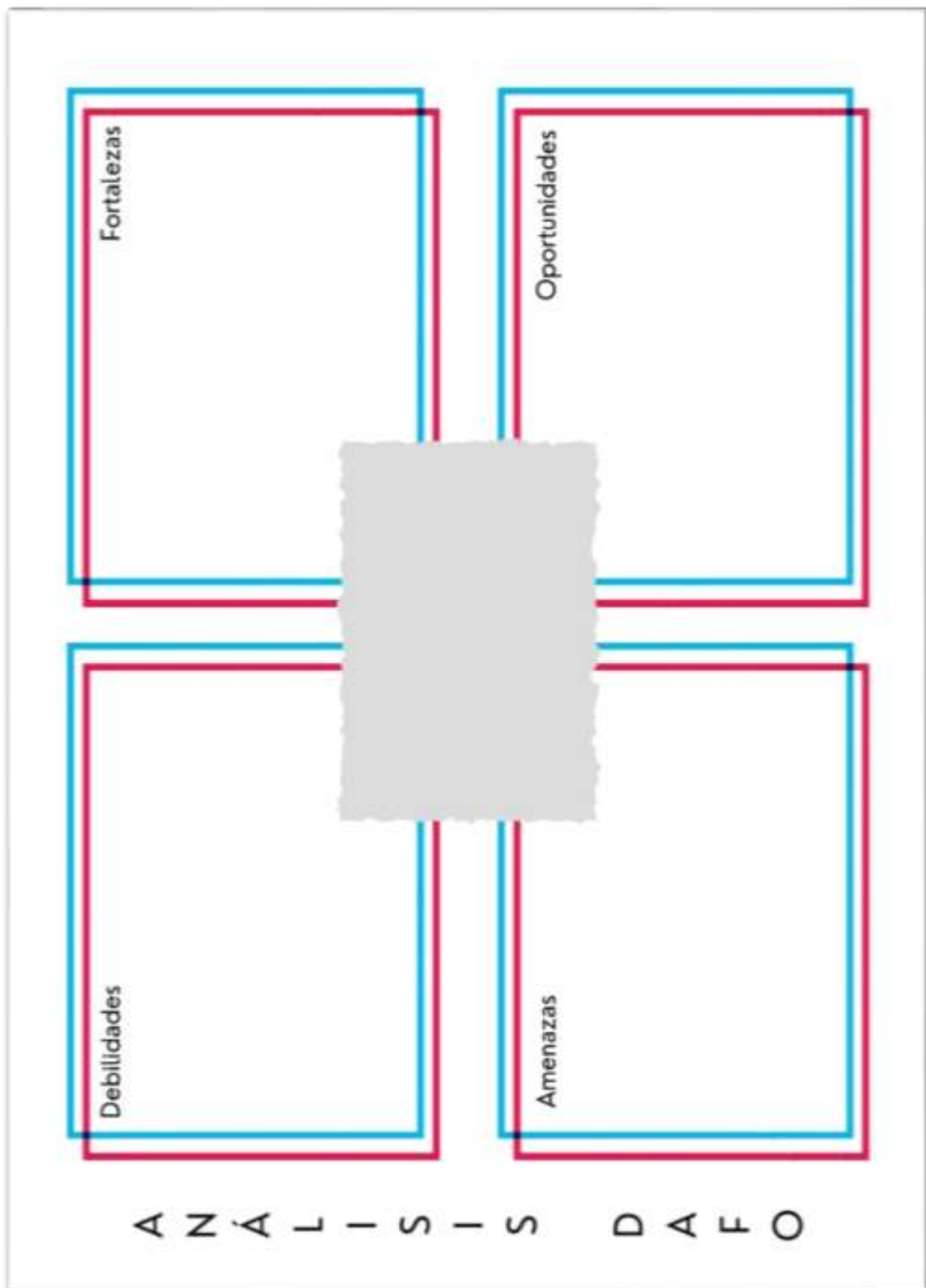
- Familias
- Hospitales
- Contexto



8



Appendix 7. Session 2: SWOT Cards



Appendix 8. Session 3: PowerPoint

















¿QUÉ CUALIDAD ES LA MÁS IMPORTANTE PARA TI
EN UN GRUPO?



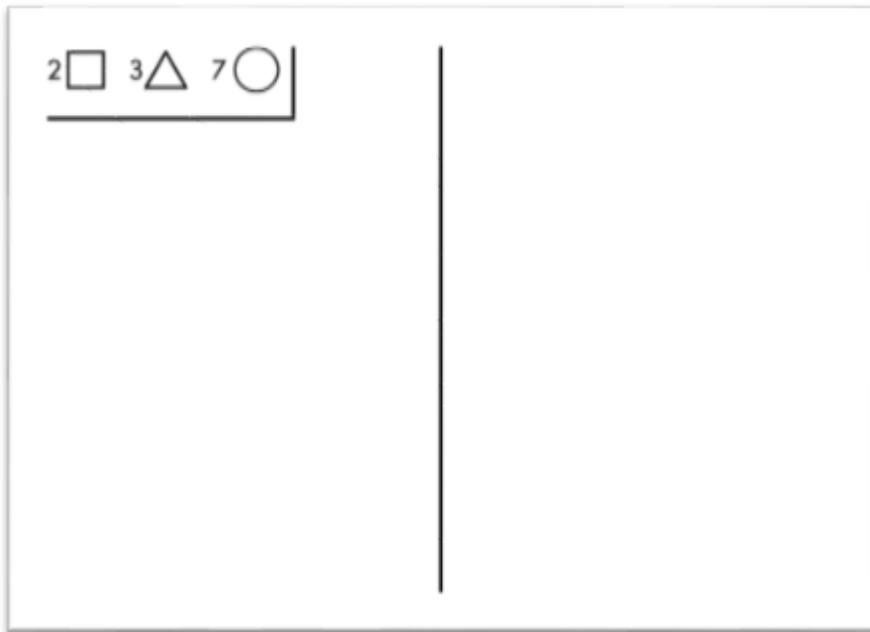
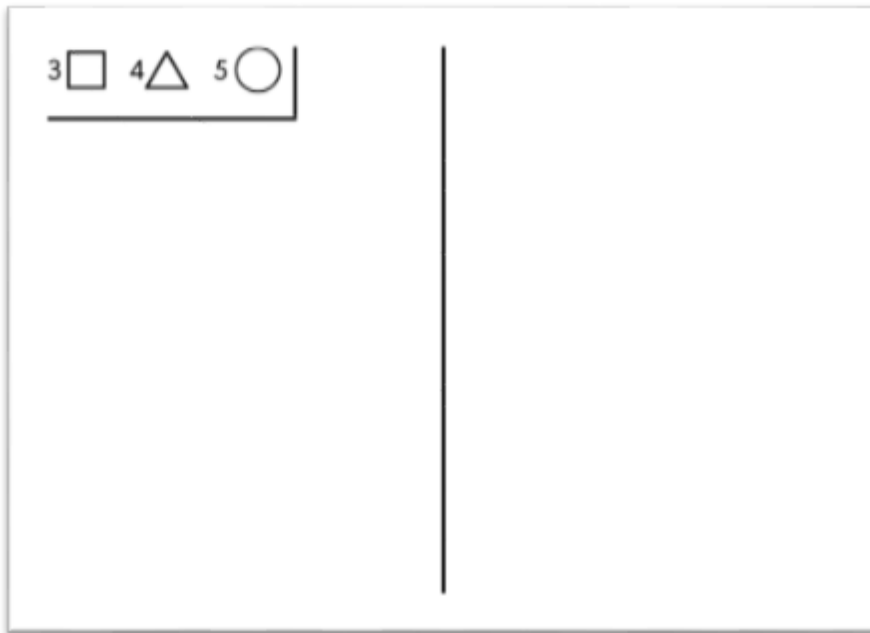
17

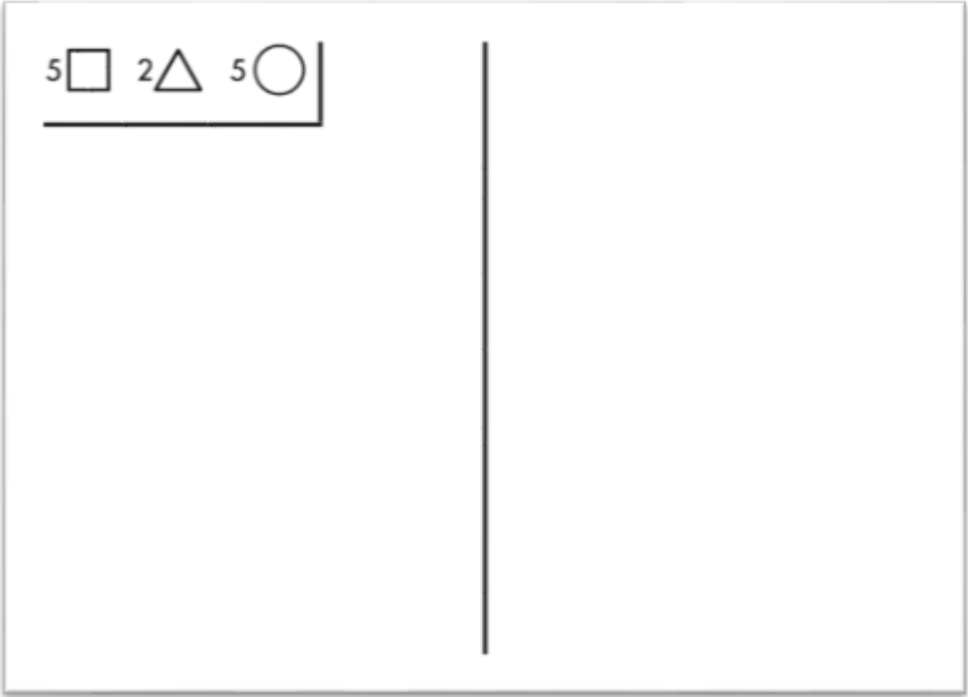
¿QUÉ COMPETENCIA CREES QUE PODRÍAS APORTAR
TÚ A TU EQUIPO?



18



Appendix 9. Session 3: Cards



Appendix 10. Session 4: PowerPoint

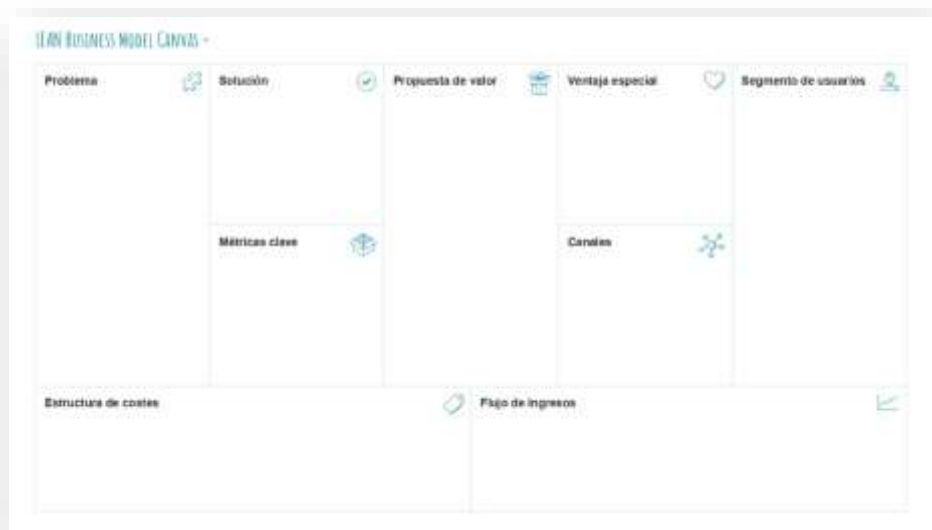


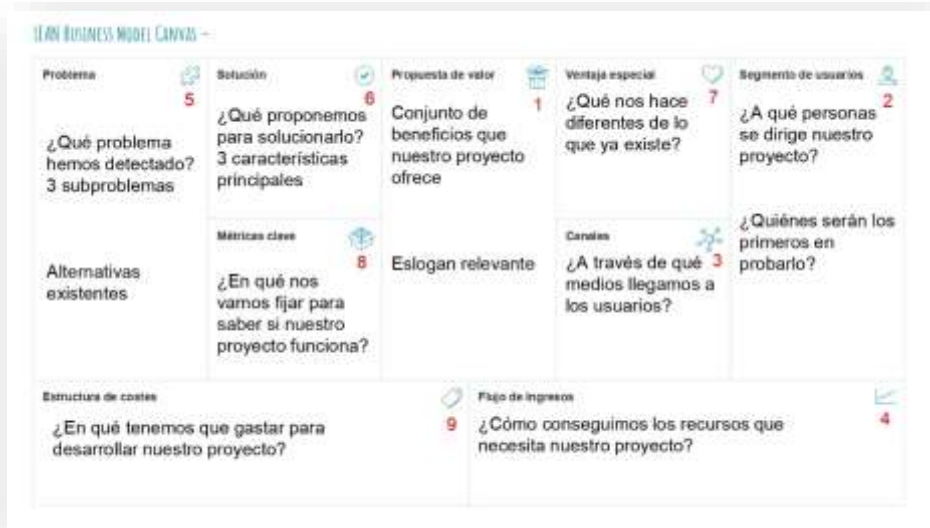


Appendix 11. Session 4: Video

https://www.youtube.com/watch?v=UbCOXN7672I&ab_channel=EduCaixaTV

Appendix 12. Session 5: PowerPoint



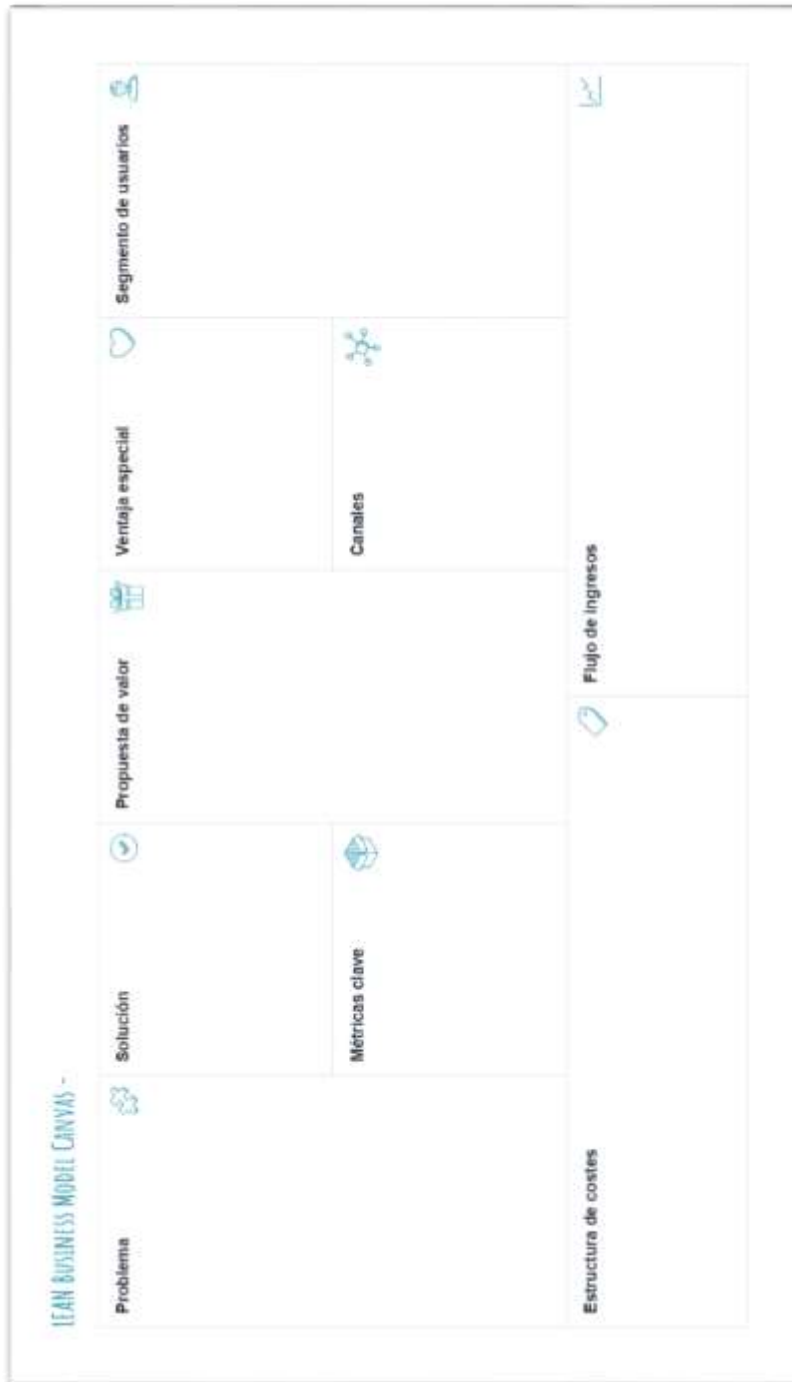


PARA PRÓXIMO DÍA:

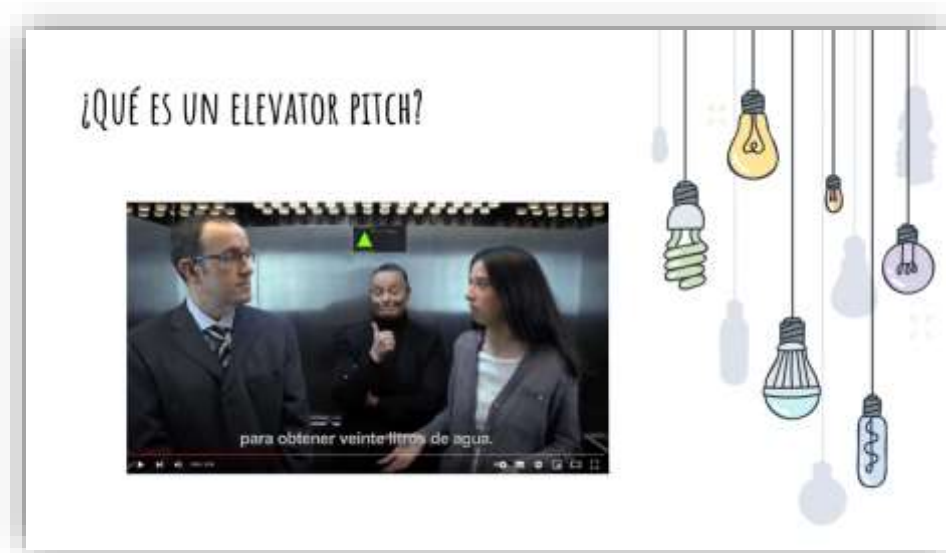
Empezamos a pensar en cómo vamos a estructurar el Elevator Pitch y qué queremos contar



Appendix 13. Session 5: LBMC cards



Appendix 14. Session 6: PowerPoint



5 PASOS PARA PRESENTAR UN PROYECTO

(1-2 MIN)

1. EL ENTORNO QUE QUIERES MEJORAR

- Historia personal
- Problema
- Datos y Hechos impactantes

2. EXPLICA TU SOLUCIÓN

**Descripción de la idea de manera sencilla y clara.
Para personas que no conocen nuestro proyecto.**

Mostramos nuestros prototipos.



3. ¿POR QUÉ TU SOLUCIÓN ES BUENA?

- ¿Cuál es su punto fuerte?
- ¿En qué mejora a lo que ya hay?



4. ¿POR QUÉ YO?

- Es importante demostrar por qué el proyecto es importante para nosotros



5. LLAMADA A LA ACCIÓN

- Nos dirigimos al público para pedir colaboración
- Implicamos al oyente



Appendix 15. Session 6: Video

https://www.youtube.com/watch?v=2b3xG_Yjgvl&ab_channel=iurisdocTV

Notificación de la resolución que autoriza el acceso al alumnado de centros educativos para recoger datos enmarcados en el estudio "Programas de intervención en emprendimiento y competencias prosociales en ESO: Diseño, aplicación y evaluación longitudinal de su eficacia"

Le informamos que puede encontrar información respecto a los protocolos de actuación y medidas frente a la Covid-19 en <http://www.ceice.gva.es/es/covid-19>; concretamente, el protocolo al que se refiere el punto 4º de la resolución adjunta se encuentra en la entrada de fecha 1 de septiembre de 2020, que puede encontrar también en la siguiente URL:

Asimismo, ponemos el proyecto de investigación y la autorización en conocimiento de la o las direcciones territoriales competentes para que informen a los centros incluidos en la resolución.

Lo que le comunico para su conocimiento y a los efectos oportunos.

Firmat per Jeronim Jusep Moragues i
Senavent el 19/10/2021 14:15:40

DOI: 10.1002/for



RESOLUCIÓ DEL SECRETARI AUTONÒMIC D'EDUCACIÓ I FORMACIÓ PROFESSIONAL DE LA CONSELLERIA D'EDUCACIÓ, CULTURA I ESPORT PER LA QUAL S'AUTORITZA EL PROJECTE D'INVESTIGACIÓ EDUCATIVA: "PROGRAMAS DE INTERVENCIÓN EN EMPRENDIMIENTO Y COMPETENCIAS PROSOCIALES EN ESO: DISEÑO, APLICACIÓN Y EVALUACIÓN LONGITUDINAL DE SU EFICACIA", DIRIGIT PER NA AMPARO OLIVER, CATEDRÀTICA DE LA FACULTAT DE PSICOLOGIA I LO GOPEDIA DE LA UNIVERSITAT DE VALÈNCIA.

Vista la sol·licitud, de Na Sara Martínez Gregorio, mitjançant la qual demana autorització d'accés a l'alumnat de centres educatius per a l'emplenament de qüestionaris emmarcats en un projecte d'investigació educativa.

Vist l'informe favorable, amb data 16 d'octubre de 2021 de la Inspecció General d'Educació, i segons les competències que em confereix el Decret 173/2020, de 30 d'octubre, del Consell, d'aprovació del Reglament orgànic i funcional de la Conselleria d'Educació, Cultura i Esport.

RESOLC

1. Autoritzar l'emplenament de qüestionaris per part de l'alumnat emmarcats en el projecte d'investigació educativa anteriorment citat als centres educatius, en l'àmbit de competències d'aquesta Secretaria autonòmica, relacionats en l'Annex I de la present resolució.
2. L'ompliment de qüestionaris per part de l'alumnat s'autoritza en tots els nivells educatius de l'etapa d'Educació secundària del centre/s esmentat/s al punt primer d'aquesta resolució (Annex I).
3. La Secretaria Autonòmica d'Educació i Formació Professional comunicarà, aquesta autorització, juntament amb la documentació del projecte, al Directoria Territorial que correspon als centres docents que participen en el projecte per a ser notificats. Una vegada rebuda la documentació, el director/a del centre sol·licitarà al Consell Escolar autorització perquè es puga emplenar total o parcialment el qüestionari per part de l'alumnat seleccionat.
4. Davant la situació actual derivada de la crisi sanitària ocasionada per la COVID-19, cas que el Consell Escolar del centre autoritze l'emplenament total o parcial del qüestionari o qüestionaris, s'hauran de prendre les mesures de protecció i prevenció enfront de la COVID establides tant al "Protocol de protecció i prevenció front a la transmissió i contagi del SARS-CoV-2 per a centres educatius que impartisquen ensenyaments no universitaris en el curs 2021-2022" de la Conselleria de Sanitat Universal i Salut Pública i el conseller d'Educació, Cultura i Esport, com al Pla de Contingència elaborat pel centre educatiu.

Secretaria Autonòmica d'Educació i Formació Professional
Avda. Campanar, 32
46015 València

Vista la sol·licitud, de D^a Sara Martínez Gregorio, mediante la cual pide autorización de acceso al alumnado de centros educativos para la cumplimentación de cuestionarios emmarcados en un proyecto de investigación educativa.

Visto el informe favorable, con fecha 16 de octubre de 2021 de la Inspección General de Educación, y según las competencias que me confiere el Decreto 173/2020, de 30 de octubre, del Consejo, de aprobación del Reglamento orgánico y funcional de la Conselleria de Educación, Cultura y Deporte.

RESUELVO

1. Autorizar la cumplimentación de cuestionarios por parte del alumnado enmarcados en el proyecto de investigación educativa anteriormente citado en los centros educativos, en el ámbito de competencias de esta secretaría autonómica, relacionados en el Anexo I de la presente resolución.
2. La cumplimentación de cuestionarios por parte del alumnado se autoriza en todos los niveles educativos de la etapa de Educación secundaria de los centros mencionados en el punto primero de esta resolución (Anexo I).
3. La secretaría Autonómica de Educación y Formación Profesional comunicará, esta autorización, junto con la documentación del proyecto, al Director/a Territorial que corresponde a los centros docentes que participan en el proyecto para ser notificados. Una vez recibida la documentación, el director/a del centro solicitará al Consejo Escolar la autorización para que se pueda cumplimentar total o parcialmente el o los cuestionarios por parte del alumnado seleccionado.
4. Ante la situación actual derivada de la crisis sanitaria ocasionada por la COVID-19, caso que el Consejo Escolar del centro autorice la cumplimentación total o parcial del cuestionario o cuestionarios, se tendrán que tomar las medidas de protección y prevención frente a la COVID establecidas tanto en el "Protocolo de protección y prevención frente a la transmisión y contagio del SARS-CoV-2 para centros educativos que impartan enseñanzas no universitarias en el curso 2021-2022" de la Conselleria de Sanidad Universal y Salud Pública y el consejero de Educación, Cultura y Deporte, como en el Plan de Contingencia elaborado por el centro educativo.

Pàgina 1 de 3

8. Contra la presente resolución, que no agota la vía administrativa, se podrá interponer un recurso de alzada ante el Conseller de Educación, Cultura y Deporte en el plazo de un mes a contar desde el día siguiente al de su notificación, de conformidad con los artículos 121 y 122 de la Ley 39/2015, de 1 de octubre, del procedimiento administrativo común de las administraciones públicas.

Appendix 17. Approval of the Ethics Committee of University of Valencia (for **Studies 7 - 8**)

El comité Ético de Investigación en Humanos de la Comisión de Ética en Investigación Experimental de la Universitat de València,

CERTIFICA:

Que el Comité d'Ètica d'Investigació en Humans , en la reunió celebrada el dia 04 de Novembre de 2021 , una vez estudiado el proyecto de tesis doctoral : *"Programas de intervención en emprendimiento y competencias prosociales en ESO: Diseño, aplicación y evaluación longitudinal de su eficacia (II). "* , con número de registro 1806947 .

Cuyo/a responsable es D/Dña.

SARA MARTINEZ GREGORIO , dirigida por D/Dña. SARA

MARTINEZ GREGORIO

ha acordado informar favorablemente el mismo.

Y para que conste, se firma el presente certificado

Ay. Blasco Ibáñez, 13 tel: 963864109 vicerec.investigacio@uv.es
València 46010 fax: 963983221 www.uv.es/serimes

Firmado digitalmente por
PEDRO JESUS PEREZ ZAFILLA
Cargo: Presidente del Comité de Ética de la Investigación en Humanos
Fecha: 09/12/2021 22:57:14 CE



Appendix 18. Informed consent for the participation in the entrepreneurship exposure activity

DOCUMENTO DE CONSENTIMIENTO INFORMADO

1.- INFORMACIÓN AL PARTICIPANTE.

El proyecto de investigación para el cual le pedimos su participación se titula:

"Programas de intervención en emprendimiento y competencias prosociales en ESO: Diseño, aplicación y evaluación longitudinal de su eficacia (II)".

Para que su hijo/a pueda participar en este estudio es necesario contar con su consentimiento, y que conozca la información básica necesaria para que dicho consentimiento pueda considerarse informado. Por ello, le ruego que lea detenidamente la siguiente información. Si tuviera alguna duda exprese la, antes de firmar este documento, al investigador principal del proyecto, bien personalmente, bien a través del teléfono o por correo electrónico. Este es el formato estándar de consentimiento, en lugar de devolverlo firmado, de acuerdo con el centro, **basta con que conteste al correo electrónico dando su conformidad**.

La información básica que debe conocer es la siguiente:

- a) *Objetivo del estudio:* Aplicación y estudio de la eficacia de un programa de emprendimiento en educación secundaria.
- b) *Metodología a utilizar para el estudio, tipo de colaboración que se espera de usted y duración de dicha colaboración:* **El alumnado va a participar en un programa voluntario de promoción de las actitudes emprendedoras** en el contexto académico. Este programa se va a llevar a cabo en el horario de clase, **bajo la supervisión del profesorado del centro**. La duración del programa es de **6 sesiones**. Para evaluar la eficacia de la intervención, el alumnado rellenará unos **cuestionarios anónimos** sobre actitudes emprendedoras y comportamiento prosocial una semana antes de empezar el programa y la semana siguiente a haberlo acabado.
- c) *Posibles molestias y riesgos de su participación en el estudio:* La participación en el programa y en el estudio no comporta ningún riesgo para el alumnado ya que sus datos serán tratados de manera **anónima**.
- d) *Beneficios que se espera obtener con la investigación:* Se espera que el alumnado adquiera un mayor conocimiento sobre el proceso emprendedor y **mejore competencias como la iniciativa, proactividad o trabajo en equipo**. Con esta investigación se colabora en el estudio de la eficacia de este tipo de intervenciones.
- e) *Consecuencias de la no participación:* La **participación es voluntaria** y si decide no hacerlo esto no afectará a ningún aspecto de la vida académica, ni supondrá una desventaja frente al alumnado que ha decidido participar.
- f) *Posibilidad de retirada en cualquier momento y consecuencias:* Usted puede retirarse del proyecto en cualquier momento contactando con el grupo de investigación.
- g) *¿Quién ha financiado el estudio?:* Este estudio no cuenta con financiación externa.
- h) *¿Qué institución lo realiza?:* Se realiza en la **Universitat de València**.
- i) *Previsión de uso posterior de los resultados:* Los resultados obtenidos se utilizarán exclusivamente para fines de investigación, salvaguardando el anonimato de los mismos.
- j) *Equipo investigador:* Amparo Oliver Germes y Sara Martínez Gregorio.

k) *Datos de contacto del investigador principal para aclaraciones o consultas:* Amparo Oliver Germes.
Email: amparo.oliver@uv.es

l) El proyecto se realizará siguiendo los criterios éticos internacionales recogidos en la Declaración de Helsinki.

2.- COMPROMISO DE CONFIDENCIALIDAD.

- a) *Medidas para asegurar el respeto a la vida privada y a la confidencialidad de los datos personales:* Se han adoptado las medidas oportunas para garantizar la completa confidencialidad de los datos personales de los sujetos de experimentación que participen en este estudio, de acuerdo con la Ley De Protección de Datos de Carácter Personal (LOPD) 3/2018, de 5 de diciembre.
- b) *Medidas para acceder a la información relevante para usted que surjan de la investigación o de los resultados totales:* Sepa que tiene derecho a acceder a la información generada sobre usted en el estudio contactando con el equipo investigador.
- c) *Medidas tomadas por tratarse de un estudio anonimizado:* Se ha establecido un sistema de anonimización efectivo que no permite la identificación posterior del sujeto. En ningún caso se juntarán los consentimientos otorgados, donde si se identifica al sujeto, con los cuestionarios utilizados en el estudio.

3.- CONSENTIMIENTO.

Don/Doña _____,

mayor de edad, titular del DNI : _____,

☐ padre, ☐ madre, ☐ tutor legal de _____

por el presente documento manifiesto que:

He sido informado/a de las características del Proyecto de Investigación titulado: "Programas de intervención en emprendimiento y competencias prosociales en ESO: Diseño, aplicación y evaluación longitudinal de su eficacia"

He leído tanto el apartado 1 como el apartado 2 y he podido formular las dudas que me han surgido al respecto. Considero que he entendido dicha información.

Estoy informado/a de la posibilidad de retirarme en cualquier momento del estudio.

En virtud de tales condiciones, consiento participar en este estudio.

Y en prueba de conformidad, firmo el presente documento en el lugar y fecha que se indican a continuación.

Valencia, _____ de _____ de 20 ____.

<i>Nombre y apellidos del / de la participante:</i>	<i>Nombre y apellidos del padre, madre o tutor (en el caso de menores o incapaces):</i>	<i>Nombre y apellidos del investigador principal:</i>
Firma:	Firma:	Firma:

Si el sujeto del estudio es un adolescente capaz intelectual y emocionalmente de entre 12 y 16 años debe de ser oída su opinión y autorizar su participación en el estudio firmando también este consentimiento. (Ley 41/2002).

Appendix 19. Protocol for post-intervention assessment*

Código

CUESTIONARIO EMPRENDIMIENTO

A continuación, se te plantean una serie de cuestiones relativas al emprendimiento. Recuerda que las respuestas son anónimas y confidenciales, y no hay una respuesta correcta, se pregunta por tu opinión o preferencia.

¡¡Agradecemos mucho tu participación!!

En ningún momento se utilizarán los datos para la identificación, ya que el cuestionario es totalmente anónimo y confidencial. A los datos tendrá acceso únicamente el equipo investigador.

1. Edad: _____ 2. Género: ☐ Femenino ☐ Masculino ☐ Otro

3. Curso: _____ 4. Centro de estudios: _____

5. ¿Durante las últimas semanas has participado en un programa de emprendimiento en el aula? ☐ Sí ☐ No

6. ¿En qué medida tienes decidida la elección de tus futuros estudios?

Nada decidido	Algo decidido pero con bastantes dudas	Bastante decidido	Totalmente decidido, es vocacional	No sé
☐	☐	☐	☐	☐

7. ¿Qué rama piensas escoger o ya has escogido si estás en bachiller?

☐ Humanidades y Ciencias sociales ☐ Científico-tecnológico ☐ Artístico

8. Marca la respuesta que mejor te represente:

Rodea con un círculo la opción que mejor te represente:

(1) Muy en desacuerdo (2) En desacuerdo (3) Ni de acuerdo ni desacuerdo (4) De acuerdo (5) Muy de acuerdo

Me siento confiado representando a mi grupo de trabajo delante del profesor.....	1	2	3	4	5
Me siento seguro presentando y debatiendo el trabajo de mi grupo delante de los compañeros..	1	2	3	4	5
Me siento seguro presentando información delante de mis compañeros.....	1	2	3	4	5
Si me encontrara atascado en una tarea, podría pensar en muchas maneras de superarla.....	1	2	3	4	5
Ahora mismo me veo bastante exitoso en la escuela.....	1	2	3	4	5
Puedo pensar en muchas formas de alcanzar mis metas académicas actuales.....	1	2	3	4	5
En este momento, estoy cumpliendo con los objetivos académicos que me he fijado.....	1	2	3	4	5
Si es necesario, puedo funcionar de forma independiente en la escuela.....	1	2	3	4	5
Normalmente me tomo las cosas estresantes de la escuela con calma.....	1	2	3	4	5
Como he experimentado dificultades antes, puedo pasar por momentos difíciles en la escuela.....	1	2	3	4	5
Con respecto a la escuela, siempre veo el lado bueno de las cosas.....	1	2	3	4	5
Soy optimista sobre lo que me sucederá en el futuro en lo que respecta a la escuela.....	1	2	3	4	5

9.

Señala tu acuerdo con estas frases

(1) Muy en desacuerdo (2) En desacuerdo (3) Ni de acuerdo ni desacuerdo (4) De acuerdo (5) Muy de acuerdo

1 No cambiaría nada de mi vida actual.....	1	2	3	4	5
2 Estoy satisfecho con mi vida actual.....	1	2	3	4	5
3 Mi vida actual es ideal para mí.....	1	2	3	4	5
4 Las condiciones actuales de mi vida son excelentes.....	1	2	3	4	5
5 Tengo las cosas importantes que quiero ahora mismo.....	1	2	3	4	5

* Protocol pre-intervention or protocol for control groups included a sub-group of the scales presented in this appendix

10.

(1) Muy en desacuerdo (2) En desacuerdo (3) Ni de acuerdo ni desacuerdo (4) De acuerdo (5) Muy de acuerdo

Me considero lo suficientemente capacitado para enfrentarme con éxito a cualquier tarea académica.....	1	2	3	4	5
Pienso que tengo bastante capacidad para comprender bien y con rapidez una materia.....	1	2	3	4	5
Me siento con confianza para abordar situaciones que ponen a prueba mi capacidad académica.....	1	2	3	4	5
Tengo la convicción de que puedo hacer exámenes excelentes.....	1	2	3	4	5
No me preocupa que los profesores sean exigentes y duros, pues confío mucho en mi propia capacidad académica.....	1	2	3	4	5
Creo que soy una persona bastante capacitada y competente en mi vida académica.....	1	2	3	4	5
Si me lo propongo, creo que tengo la suficiente capacidad para obtener un buen resultado académico.....	1	2	3	4	5
Pienso que puedo pasar los cursos con bastante facilidad, e incluso, sacar buenas notas.....	1	2	3	4	5
Soy de esas personas que no necesitan estudiar para sacar una asignatura o pasar un curso completo.....	1	2	3	4	5
Creo que estoy preparado y bastante capacitado para conseguir muchos éxitos académicos.....	1	2	3	4	5

11. Señala tu acuerdo con estas frases PENSANDO EN TU FUTURO, imaginando que ya estás acabando estudios, a punto de trabajar o empezando a trabajar:

(1) Muy en desacuerdo (2) En desacuerdo (3) Ni de acuerdo ni desacuerdo (4) De acuerdo (5) Muy de acuerdo

1	Planear oportunidades futuras tras la graduación ha sido, será una parte importante de mi formación universitaria.....	1	2	3	4	5
2	Sabiendo que las condiciones en mi profesión están cambiando, intento buscar activamente nuevas oportunidades.....	1	2	3	4	5
3	Quiero tener lo necesario para avanzar o ser pionero en mi campo profesional.....	1	2	3	4	5
4	Imagino que seré muy ambicioso en mi trabajo.....	1	2	3	4	5
5	Me gusta la idea de tener retos en mi práctica profesional.....	1	2	3	4	5
6	Me considero alguien con alta motivación en el trabajo.....	1	2	3	4	5
7	Tengo un gran deseo de ayudar a los demás.....	1	2	3	4	5
8	Creo que hacer una contribución a la sociedad es importante.....	1	2	3	4	5
9	Seré bueno empatizando con mis clientes, pacientes o usuarios de servicios porque soy receptivo a sus problemas.....	1	2	3	4	5
10	Me puedo imaginar haciendo algo innovador como profesional.....	1	2	3	4	5
11	Creo que un día tendré las habilidades necesarias para desarrollar un nuevo servicio o producto en mi ámbito laboral.....	1	2	3	4	5
12	Me puedo ver a mi mismo empezando algo innovador en el trabajo.....	1	2	3	4	5
13	Como profesional, quiero animarme a desarrollar nuevas ideas en el trabajo.....	1	2	3	4	5
14	Quiero trabajar donde las nuevas oportunidades importen a todos los empleados.....	1	2	3	4	5
15	Quiero trabajar donde pueda sugerir nuevas ideas a los que toman las decisiones.....	1	2	3	4	5
16	Creo que soy arriesgado comparado con otros que conozco.....	1	2	3	4	5
17	Creo que para ser un profesional de éxito tendré que tomar riesgos en mi carrera.....	1	2	3	4	5
18	Prefiero arriesgarme y perder, que darme cuenta más adelante que desperdicié una gran oportunidad.....	1	2	3	4	5

12. En las siguientes oraciones verás que aparece la palabra STEM. Con esta palabra se hace referencia a las áreas de ciencias, tecnología, ingeniería y matemáticas por sus siglas en inglés de Sciences, Technology, Engineering & Mathematics.

	(1) Muy en desacuerdo	(2) En desacuerdo	(3) Ni de acuerdo ni desacuerdo de acuerdo	(4) De acuerdo	(5) Muy de acuerdo
1 Tengo interés en seguir cursos que me ayuden a aprender más sobre STEM.....	1	2	3	4	5
2 Tengo interés en trabajar en una carrera que permita usar conocimiento y habilidades basadas en STEM.....	1	2	3	4	5
3 Me gustaría aprender conocimientos y competencias relacionadas con STEM porque pueden ser útiles para ayudarme a estar preparado para la universidad.....	1	2	3	4	5

13. Crear una empresa (ser emprendedor/a) para ti supondría...

	(1) Nada probable	(2) Muy poco probable	(3) Poco probable	(4) Moderadamente probable	(5) Bastante probable	(6) Muy probable	(7) Totalmente probable
1 Enfrentarme a nuevos retos.....	1	2	3	4	5	6	7
2 Crear empleo para otras personas.....	1	2	3	4	5	6	7
3 Ser creativo e innovar.....	1	2	3	4	5	6	7
4 Tener altos ingresos económicos.....	1	2	3	4	5	6	7
5 Asumir riesgos calculados.....	1	2	3	4	5	6	7
6 Ser mi propio jefe (independencia).....	1	2	3	4	5	6	7

14. Ahora debes señalar hasta qué punto son deseables para ti en tu vida general:

	(1) Nada deseable	(2) Muy poco deseable	(3) Poco deseable	(4) Moderadamente deseable	(5) Bastante deseable	(6) Muy deseable	(7) Totalmente deseable
1 Enfrentarme a nuevos retos.....	1	2	3	4	5	6	7
2 Crear empleo para otras personas.....	1	2	3	4	5	6	7
3 Ser creativo e innovar.....	1	2	3	4	5	6	7
4 Tener altos ingresos económicos.....	1	2	3	4	5	6	7
5 Asumir riesgos calculados.....	1	2	3	4	5	6	7
6 Ser mi propio jefe (independencia).....	1	2	3	4	5	6	7

15. ¿En qué grado se mostrarían de acuerdo si decides emprender y crear tu propia empresa?

	(1) Nada de acuerdo	(2) Muy poco de acuerdo	(3) Poco de acuerdo	(4) Moderadamente de acuerdo	(5) Bastante de acuerdo	(6) Muy de acuerdo	(7) Totalmente de acuerdo
1 Mi familia directa (padres y hermanos).....	1	2	3	4	5	6	7
2 Mis amigos.....	1	2	3	4	5	6	7
3 Mis profesores.....	1	2	3	4	5	6	7

16. ¿Y cómo valoras la opinión de estas personas al respecto?

	(1) Nada importante	(2) Muy poco importante	(3) Poco importante	(4) Medio importante	(5) Bastante importante	(6) Muy importante	(7) Totalmente importante
1 Mi familia directa (padres y hermanos).....	1	2	3	4	5	6	7
2 Mis amigos.....	1	2	3	4	5	6	7
3 Mis profesores.....	1	2	3	4	5	6	7

17. Si crearas tu propia empresa, ¿en qué grado crees que serías capaz de realizar eficazmente cada una de las siguientes tareas?

(1) Nada eficaz --- (7) Totalmente eficaz								
1	Definir tu idea de negocio y la estrategia de tu empresa.....	1	2	3	4	5	6	7
2	Escribir tu plan de negocio (estudio de mercado, estudio financiero.....)	1	2	3	4	5	6	7
3	Realizar trámites administrativos y burocráticos necesarios para crear tu empresa.....	1	2	3	4	5	6	7
4	Trabajar bajo un continuo estrés, presión y conflicto.....	1	2	3	4	5	6	7
5	Reclutar, seleccionar y entrenar a tus empleados.....	1	2	3	4	5	6	7
6	Relacionarte con personas clave para obtener dinero para tu empresa.....	1	2	3	4	5	6	7
7	Tolerar los cambios inesperados en las condiciones de tu negocio.....	1	2	3	4	5	6	7
8	Persistir frente a la adversidad de tu negocio.....	1	2	3	4	5	6	7
9	Formar asociaciones o alianzas con otras empresa.....	1	2	3	4	5	6	7

18. Señala tu acuerdo con estas frases:

(1) Nunca (2) Algunas veces (3) A menudo		
1	Intento alegrar a la gente cuando está triste.....	1 2 3
2	Paso tiempo con mis amigos.....	1 2 3
3	Cuando tengo que hacer cosas que no me gustan enloquezo.....	1 2 3
4	Intento ayudar a los demás.....	1 2 3
5	Soy amable.....	1 2 3
6	Lloro por cosas que no son importantes.....	1 2 3
7	Comparto las cosas que me gustan con mis amigos.....	1 2 3
8	Me siento molesto.....	1 2 3
9	Ayudo a otros con sus deberes.....	1 2 3
10	Dejo que otros usen mis juegos.....	1 2 3
11	Tengo pesadillas.....	1 2 3
12	Me gusta jugar con otros.....	1 2 3
13	Confío en otros.....	1 2 3
14	Me muerdo las uñas.....	1 2 3
15	Abrazo a mis amigos.....	1 2 3

19. ¿Has considerado alguna vez fundar tu propia empresa?

1. No, nunca	2	3	4	5	6	7. Sí, muchas veces
☐	☐	☐	☐	☐	☐	☐

20. ¿Piensas que en el futuro crearás tu propio negocio?

1. Definitivamente no	2	3	4	5	6	7. Definitivamente sí
☐	☐	☐	☐	☐	☐	☐

21. Si llegara el momento y pudieras elegir libremente qué carrera laboral seguir, ¿qué preferirías?

1. Trabajar para otros	2	3	4	5	6	7. Crear tu propia empresa
☐	☐	☐	☐	☐	☐	☐

22. Imagina que estás acabando tu carrera, ¿con qué probabilidad consideras que crearías tu propia empresa en 5 años?

1. Totalmente improbable	2	3	4	5	6	7. Totalmente probable
☐	☐	☐	☐	☐	☐	☐

23. Si finalmente decidieras crear tu propia empresa, lo harías principalmente por...

1. Necesidad, falta alternativa mejor	2	3	4	5	6	7. Vocación, oportunidad negocio innovador
☐	☐	☐	☐	☐	☐	☐

24. Marca en qué medida el programa de emprendimiento te ha ayudado a aumentar las siguientes competencias.

(1) Nada --- (7) En gran medida

1	Mi comprensión de las actitudes, valores y motivaciones de los emprendedores (por ejemplo, ¿por qué actúan los emprendedores?)	1	2	3	4	5	6	7
2	Mi comprensión de las acciones necesarias para poner en marcha un proyecto (por ejemplo, ¿qué se necesita hacer?)	1	2	3	4	5	6	7
3	Mi manejo práctico de habilidades para poner en marcha un proyecto (por ejemplo, ¿cómo se empieza un proyecto?)	1	2	3	4	5	6	7
4	Mi habilidad para desarrollar redes de contactos (por ejemplo, ¿a quién necesito conocer?)	1	2	3	4	5	6	7
5	Mi habilidad para identificar una oportunidad (por ejemplo, ¿cuándo necesito actuar?)	1	2	3	4	5	6	7

25. Muestra tu grado de satisfacción general con el curso de emprendimiento.

1. Nada satisfecho/a	2	3	4	5	6	7. Totalmente satisfecho/a
☐	☐	☐	☐	☐	☐	☐

26. ¡Ya has terminado! En este espacio puedes dejar cualquier comentario que desees hacernos llegar:

¡Muchas gracias por tu participación!

Appendix 20. Journal version of Study 1

The International Journal of Management Education 19 (2021) 100545

Contents lists available at ScienceDirect

The International Journal of Management Education

journal homepage: www.elsevier.com/locate/ijme

Effect of entrepreneurship education on entrepreneurship intention and related outcomes in educational contexts: a meta-analysis

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ARTICLE INFO

Keywords:
Entrepreneurship education
Entrepreneurship intention
Education impact
Meta-analysis

ABSTRACT

Although some meta-analyses have investigated the effect of Entrepreneurship Education (EE), they mixed studies with high and low methodological quality. Thus, their results might overestimate the impact. This paper aims to examine the efficacy of the EE in student samples, attending to studies with a pre-posttest design and a control group.

The results showed small effect sizes for EE in increasing Entrepreneurship Intention (EI) and Self-efficacy. Moreover, meta-regression confirmed that the duration of intervention programs predicted larger effect sizes for the EI. Finally, the practical implications of other potential moderator variables are discussed.

Credit author statement

Sara Martínez-Gregorio: Conceptualization, Methodology, Investigation, Formal analysis, Writing – Original Draft. Laura Badenes-Ribera: Methodology, Data Curation, Formal analysis, Writing – Original Draft. Amparo Oliver: Conceptualization, Methodology, Writing – review & editing.

1. Introduction

To the extent that education has a transformative role in societies, educational agents have shown a growing interest in Entrepreneurship Education (EE), especially in higher education (Alammi, 2019; Luzzo et al., 2013). Entrepreneurship is considered a crucial element for economic development that can be promoted and developed through education (Karauka, 2005; O'Connor, 2013).

However, EE goes beyond entrepreneurs' production. It is a valuable skill for citizens' personal and not just for professional development. From the beginning, Joseph Schumpeter's in the 1940s describes entrepreneurs as agents of change. The *Consortium for Entrepreneurship Education* (2006) states that entrepreneurship is more than teaching someone how to run a business, it is also promoting critical thinking and sense of self-worth. Today's world challenges are both economic and social. It is essential to mobilize science, technology, and innovation not solely for encouraging economic benefits, but also for anticipating and responding to social problems (OECD, 2011).

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<https://doi.org/10.1016/j.ijme.2021.100545>

Received 1 April 2021; Received in revised form 22 July 2021; Accepted 23 July 2021
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Researchers share the interest in EE. Consequently, research related to EE has significantly increased in recent years (Aparicio et al., 2019; Linares & Fayolle, 2015). Despite this growth in scientific production, there is still no accord in the definition of "entrepreneurship education" (Linares, 2004; Mwusaliwiba, 2010; Pittaway & Cope, 2007). Bae et al. (2014) would simplify the issue in their study by stating that "by entrepreneurship education, we are referring to education for entrepreneurial attitudes and skills" (p. 219), leaving a broad framework where diverse interventions and programs would have space. Some scholars are sceptical about considering new venture creation as the main and unique educational objective of EE (Kuratko, 2005; Mwusaliwiba, 2010). From a wider point of view, EE aims to promote entrepreneurial attitudes, spirit, and culture, which could be applied in different life fields.

Given the interest in the field and the mentioned increase in related publications, several authors have carried out literature reviews in order to pool the knowledge generated (Aparicio et al., 2019). Specifically, there has been a proliferation of reviews and meta-analyses that attempt to highlight and compile the evidence found regarding the efficacy or impact of these types of interventions (Alamzi, 2019; Bae et al., 2014; Brüne & Lutz, 2020; Kuratko, 2005; Longva & Foss, 2018; Lorz et al., 2013; Martin et al., 2013; Mwusaliwiba, 2010; Nabi et al., 2017; Peterman & Kennedy, 2003).

Among the set of variables used to measure the impact of the interventions, entrepreneurship intention seems to occupy a principal place in the literature (Alamzi, 2019). As several authors recognized (Linares & Fayolle, 2015; Rahm, 2019), a great part of the research on EE and entrepreneurship intention is based on the theoretical framework of the Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991). According to this theory, planned behaviours (such as starting a business) can be predicted through intentions to carry out those behaviours. Furthermore, following this theory, entrepreneurship intention is influenced by three previous independent determinants: attitude towards entrepreneurship, subjective norm, and perceived behavioural control (Kolwreid, 1996).

According to the TPB, EE would not only directly affect entrepreneurship intention but it would also affect its antecedents (Rauch & Hulsink, 2015; Varamaki et al., 2015). For this reason, we can find studies of the efficacy of EE that include these antecedent variables to observe its possible change (for example, González-López et al., 2019; Varamaki et al., 2015).

Apart from the TPB model, alternative approaches in literature could be found. Firstly, some authors propose to use the TPB model using Entrepreneurial Self-efficacy instead of Perceived Behavioural Control (for example, Kumar & Das, 2019; Rueda et al., 2018). Entrepreneurial self-efficacy is described as the personal confidence in their capability to achieve entrepreneurial goals (Chen et al., 1998).

Additionally, there are studies developed in the framework of Shapero's Entrepreneurial Event model (Shapero & Sokol, 1982). This model considers perceived desirability and perceived feasibility as the antecedents of entrepreneurship intention. Perceived desirability refers to how attractive or desirable is the behaviour. Instead, perceived feasibility is related to the perception of the capability to perform the behaviour (Lorz et al., 2011). Consequently, some impact studies include perceived desirability and perceived feasibility as variables to measure the effect of EE (for example, Costa et al., 2018; Dickel et al., 2019). Although the TPB and Shapero's model are the ones most commonly found in the literature, alternative models continue to emerge (Tony & Pandede, 2020).

Having described what can be understood as the impact of EE, we return to the aforementioned literature reviews. There are two clear consensus from the literature reviews of the impact of EE. Firstly, empirical studies on the impact of EE are contradictory (Bae et al., 2014; Longva & Foss, 2018; Lorz et al., 2013; Martin et al., 2013). We can find studies that show a positive impact (for example, Gielnik et al., 2013; Souitaris et al., 2007), as well as a negative one (for example, Mentoor & Friedrich, 2007; Oosterbeek et al., 2010), or non-significant (for example, Huber et al., 2014; Varamaki et al., 2015). Among the previously mentioned reviews, it is worth noting the presence of three meta-analyses (Alamzi, 2019; Bae et al., 2014; Martin et al., 2013). All of them included samples of nascent or active entrepreneurs and they found a small relationship between entrepreneurship and its possible results. Martin et al. (2013) suggest that the methodologically less rigorous studies cause an overestimation of the impact of the intervention programs.

This controversy regarding the effect of EE may be related to lack of methodological rigor in the investigations (Bae et al., 2014; Linares & Fayolle, 2015; Longva & Foss, 2018; Martin et al., 2013; Nabi et al., 2017; Peterman & Kennedy, 2003). Several methodological reviews of the literature have pointed out a variety of weaknesses that might undermine confidence in the belief that EE can produce entrepreneurship. One of the methodological weaknesses in research design: most of the studies use one-group pretest-posttest and posttest-only with a non-equivalent comparison group (Linares & Fayolle, 2015; Lorz et al., 2013; Rideout & Gray, 2013). Lorz et al. (2013) found 69% of studies applied solely posttest data collection. Moreover, only 31% of the reviewed studies applied pretest-posttest design, but 61% of them did not use a control group.

If we return to the aforementioned meta-analyses, it can be seen that specific inclusion criteria regarding methodologic aspects of the study design were not included in any of these meta-analyses. In this way, Martin et al. (2013) concluded that, of the 42 studies identified, only 11 investigations had a design with pre and post-treatment measures and a control group. In reviewing the meta-analysis of Bae et al. (2014), it has been concluded that, of the 73 articles included, only 8 share the aforementioned design characteristics.

To overcome this problem regarding the methodology of the studies, Longva and Foss (2018) proposed a review of the literature published before 2018 that had the following inclusion criteria: 1) quantitative measurement of the effect of EE, 2) participants had to be students at primary, secondary or tertiary level, 3) longitudinal study (with pre and posttest) and 4) design with a control group. They identified a total of 17 articles, which seem to show contradictory results.

The present paper aims to shed light by carrying out a meta-analysis to integrate the knowledge on the impact of EE specifically attending to studies with a rigorous methodological design. Additionally, this study is the first attempt to study the effect of EE in student samples without including nascent or active entrepreneurs. Consequently, the specific objectives were: (1) to compute the mean efficacy of the EE to improve entrepreneurship intention and other outcome measures such as Control, Attitude toward entrepreneurship, Self-efficacy, Feasibility, Desirability, and Need for achievement; (2) to analyse the heterogeneity among the effect size estimates; (3) to search for substantive (for example, treatment, participant, context) and methodological studies' characteristics

that can be statistically related to the effect size indexes and, thus, can account for the effect size variability.

2. Method

A meta-analysis was performed following the guidelines for Reporting Systematic Reviews and Meta-Analyses (Moher et al., 2009), and the recommendations proposed by the American Psychological Association Publications and Communications Board Task Force (Appelbaum et al., 2016, Table, 9, pp. 21–23).

The study selection criteria were partially based on those proposed by Longva and Fos (2016). In order to be included in the meta-analysis, each study should meet the following criteria: (1) to be an original, quantitative study; (2) to include a quantitative measure of EE impact; (3) participants in the study had to be students at primary, secondary or tertiary level (nascent entrepreneurs were not included); (4) due to the methodological aspects, the studies had to use pre and posttest design and (5) a control group; (6) to be written in English or Spanish; (7) available in full text; and (8) statistical data provided in the study had to allow us to calculate the effect sizes. No restrictions were included concerning cultural context, type of EE, or year of publication. The exclusion criterion was: case series studies or $N = 1$.

2.1. Search strategy of studies

A literature search for articles that meet the aforementioned requirements was conducted based on the two previous meta-analyses (Boe et al., 2014; Martín et al., 2013), whose bibliographic searches have been expanded until April 2020. In order to make exhaustive research, several databases were consulted: Web of Science, Scopus, PROQUEST, and Science Direct. The search was performed using different combinations of the following terms: 'entrepreneurship training', 'entrepreneurship program', 'entrepreneurship curriculum', 'entrepreneurship education', or 'enterprise education'; and 'impact', 'effect', 'outcome', 'learning', 'entrepreneurship intention', 'willingness to start a business' or 'willingness to start a venture'. Additionally, the reference section of previous literature reviews and meta-analyses were reviewed to identify additional studies that meet the criteria. Specifically, the consulted literature

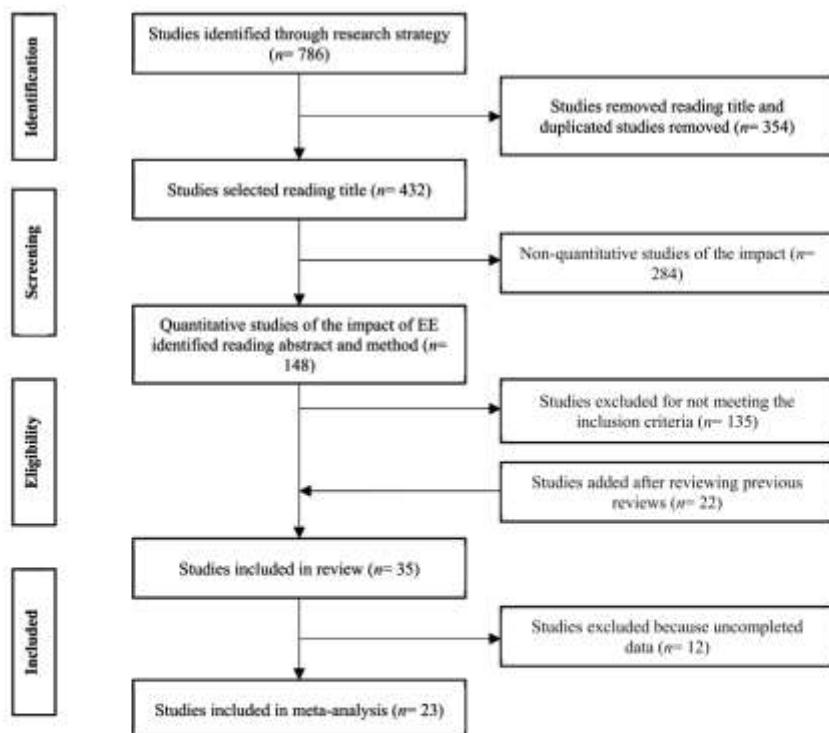


Fig. 1. Stages in the process for selecting studies for the meta-analysis.

reviews were: Boe et al. (2014), Brine and Lutz (2020), Dickson et al. (2008), Longva and Foss (2018), Lorz et al. (2013), Martin et al. (2013), Mwusulwiba (2010), Nabi et al. (2017), Rahim (2019) and Rideout and Gray (2013). The process of screening and selection of the studies can be seen in Fig. 1.

The database search produced a total of 786 results. The titles of these articles were reviewed, and 432 studies were pre-selected, after removing duplicated ones. A total of 149 studies that carried out a quantitative measurement of the impact of EE were identified, only 13 of them fulfilled the inclusion criteria. Afterward, 22 additional articles that meet the criteria were identified reviewing the aforementioned previous reviews. Finally, a total of 35 were enclosed in the review. Nevertheless, twelve articles did not report on effect size or statistical data to compute it. Authors were emailed to obtain these data but they did not reply to the request. Thus, these studies were excluded from the meta-analysis. Consequently, the meta-analysis enclosed 23 published articles; all of them were published in a peer-reviewed journal, except Lorz et al. (2011), between 1996 (Hansenmark, 1996) and 2020 (Cern et al., 2020). Four of the 23 articles provided data of two (Dickel et al., 2019; Ismail et al., 2018; Varamini et al., 2015), and three (Mentoor & Friedrich, 2007) independent samples. Therefore, the database for the meta-analysis included a total of 28 independent samples.

2.2. Coding of the studies

Studies' characteristics were extracted in a standardized and systematic manner applying to each study the protocol established. The characteristics extracted were: (1) year of the study; (2) geographical location; (3) sample size (total and by groups); (4) mean age (total and by groups); (5) sex distribution (total and by groups); (6) education level (primary, secondary or tertiary); (7) outcome; and (8) statistics reported to calculate the effect sizes. Finally, methodological quality was measured using an *ad hoc* 12-dichotomous item checklist (see Appendix 1) based on checklists previously used and in other methodological reviews (Lorz et al., 2013; Maher et al., 2003; Sánchez-Meca et al., 2014).

Each item rated 1 when the study met the criteria and 0 if the criteria are not met or the information is not available to evaluate it. A total quality score is calculated by adding up the results of all the criteria. The total score range between 0 and 12, a higher score means higher quality.

The inter-rater reliability for methodological quality was satisfactory, with an intraclass correlation of 0.979. Minimum inconsistencies between coders were resolved by consensus, and a third reviewer was consulted if necessary.

2.3. Computing effect sizes

Although all studies enclosed in the meta-analysis ($n = 23$) employed a research design pretest-posttest with a control group, some of them ($n = 7$) did not report statistical data to compute the effect size for the control group. The lack of statistical data for control groups conditioned the selection of the effect size index. Consequently, the analysis unit was the group, not the study, and the effect size index was the standardized mean change scores index (d), computed as the difference between the posttest and means divided by the standard deviation within groups. Because d has a slight positive bias, the unbiased estimate called Hedges' g was applied: $g = c(m) * d$, $c(m)$ being a correction factor for small sample sizes (Hedges & Olkin, 1985). To control some of the validity threats of this effect size index, the d index was computed for both intervention and control groups, separately. And then, an adjusted average effect was used, d_{adj} , computing the difference between the average d indices of the intervention groups, d_i , and the control, d_c , groups ($d_{adj} = d_i - d_c$). The adjusted index allowed us to control the testing effects and, thus, it offers a more appropriate estimate of the true intervention effect. Positive values for d represented a favourable change in the group from the pretest to the posttest. According to Campbell and Stanley's (1966) criteria, effect sizes of 0.2, 0.5, and 0.8 can be interpreted as reflecting small, moderate, and large effect sizes, respectively.

Separate effect sizes were calculated for Entrepreneurship intention, Control, Attitude towards Entrepreneurship, Self-efficacy, Feasibility, Desirability, Need for achievement and Subjective norm.

To measure the reliability of the effect size computations a double process of effect size calculations was performed. The inter-coder reliability was excellent, with a mean intra-class correlation of 0.89 ($SD = 0.18$). In addition, the calculation for which the raters disagreed was discussed and easily resolved by consensus.

2.4. Statistical analysis

Independent meta-analyses were conducted with the effect sizes for each outcome measured in at least 3 independent samples. As not all studies measured all outcomes, each meta-analysis enclosed a different number of studies, which ranged from 20 to 3 studies. Random-effects models were assumed in the statistical calculations (Borenstein et al., 2009). For each meta-analysis, a pooled standardized mean change difference and its corresponding 95% confidence interval (CI) were calculated. Additionally, the statistical significance of the pooled standardized mean difference was examined by the Z test.

Forest plots were elaborated to display the individual and pooled effect size estimates, with their 95% CIs, and to allow visual inspection of variability among effect sizes. Additionally, both Cochran's Q -statistic and the I^2 index were calculated (Higgins et al., 2003). A Q -statistic with $p < .05$ denoted a variability among the effect sizes. I^2 index values of around 25%, 50%, and 75% indicated low, moderate, and large variability, respectively (Huedo-Medina et al., 2006).

To assess the potential effect of moderator variables on effect size heterogeneity, weighted analyses of variance (ANOVAs) were performed for categorical variables and meta-regressions for continuous variables, by assuming a mixed-effects model (Borenstein et al., 2009; López-López et al., 2014). The statistical significance was assessed with the Q_b statistic for categorical moderators and Q_n

statistic for continuous moderators. Additionally, an estimate of the proportion of variance accounted for by the moderator variable was calculated (López-López et al., 2014; Raudenbush, 2009). The model misspecification was assessed with the Q_W statistic for categorical moderators and the Q_E statistic for continuous moderators.

Lastly, to examine publication bias, a funnel plot with Duval and Tweedie's trim-and-fill method for imputing missing data and the Egger test were performed (Duval & Tweedie, 2000; Sterne & Egger, 2005). When there are fewer than 10 studies the power of Egger's test is insufficient to distinguish chance from genuine asymmetry (Higgins & Green, 2011).

The statistical analyses were conducted using the Comprehensive Meta-analysis software program version 3.0 (Borenstein et al., 2014), and were interpreted assuming a significance level of 5% ($p < .05$) and, using two-tailed tests.

3. Results

3.1. Descriptive characteristics of the studies

Appendix 2 displays a summary of the studies' characteristics included in the systematic review. As it can be seen, 17 articles have been found after the years of publications of the previous meta-analysis (Blue et al., 2014; Martin et al., 2013). It should be noted that 82.85% of them have been carried out with university population.

Overall, all studies used a convenience sample selected from primary schools ($n = 1$), secondary schools ($n = 5$) or university ($n = 29$) setting and a pre-post design with control group. A large number of studies were conducted in Europe ($n = 22$), with three of them being carried out in the United States of America (USA) and the other five in Asia, three in Africa, and two in Australia.

Regarding the participants' characteristics, the mean age of all participants ranged from 11.63 to 26 years, with a mean age of 21.12 ($SD = 3.70$). The percentage of females ranged from 21% to 70%, with an average percentage of 51.5 ($SD = 12.69$). Eleven studies did not report on the age and/or sex distribution of participants.

Teaching methods. Another difference among entrepreneurship programs is the teaching method used (Mwanalwiba, 2010). It seems that previous research sorts teaching methods into two categories: "passive methods" (also known as "traditional methods" or "teacher-centered methods") and "active methods" (also known as "innovative methods" or "student-centered methods") (Ismael et al., 2018; Mwanalwiba, 2010; Varamäki et al., 2015).

The studies identified were classified according to this categorization. Those that included an approach focused on student's experiences were considered as "active methods" and they should include activities as participating in real companies, making a business plan, or virtual simulations (Varamäki et al., 2015). The most used teaching method is "active methods" ($n = 26$), whereas only 6 studies used "passive methods". Two papers specifically studied the effect of the teaching method (Ismael et al., 2018; Varamäki et al., 2015). Categorization is found in Appendix 2.

Outcomes measures. The 35 articles have been classified according to the dependent variables that were taken into consideration in the study to see the effect of the intervention. Specifically, 10 variables have been measured most frequently in the literature (see Appendix 2). The most analysed outcome was the entrepreneurship intention ($n = 22$), followed by control ($n = 12$), self-efficacy ($n = 12$), and attitude toward entrepreneurship ($n = 9$). The outcome least frequently examined was social orientation ($n = 2$) followed by feasibility, risk-taking, and need of achievement ($n = 5$), desirability, and subjective norm ($n = 6$).

Additionally, a set of entrepreneurial skills as proactivity (Huber et al., 2014; Sánchez, 2013) or innovation (Mentoor & Friedrich, 2007) are often considered. However, they have not been investigated in a sufficient number of studies to be included in the meta-analysis and these variables are sufficiently different from each other that they cannot be considered as a whole.

3.2. Methodological quality assessment

The detailed results obtained from methodological quality assessment, that is, the scores of individual studies on each quality item and the Total Quality Score (TQS) are available under request. The TQS was obtained by adding up the 1s and 0s for the checklist items

Table 1
Results for the effect sizes according to the outcome measure for the intervention and control groups.

Outcome measure	Intervention groups						Control groups					
			95% CI		Q	I^2			95% CI		Q	I^2
	k	d	dl	du			k	d	dl	du		
Entrepreneurship intention	20	0.215	0.098	0.332	243.854***	92.2	12	0.008	-0.125	0.141	97.63***	88.7
Control	10	-0.007	-0.327	0.312	372.514***	97.6	4	-0.020	-0.160	0.120	7.497***	56
Attitude	8	0.030	-0.141	0.182	58.905***	88.2	3	0.031	-0.112	0.173	4.303***	53.6
Self-efficacy	7	0.307	0.159	0.514	120.250***	95	4	0.002	-0.065	0.090	7.744*	61.3
Feasibility	5	0.139	-0.100	0.379	24.247***	83.5	4	-0.161	-0.361	0.040	9.929***	69.6
Desirability	5	0.031	-0.056	0.116	4.805	16.7	3	0.187	-0.234	0.609	16.239***	87.7
Need for achievement	5	0.044	-0.243	0.331	119.596***	96.7	3	-0.048	-0.234	0.139	7.598*	73.7
Subjective norm	4	0.058	-0.167	0.284	22.424***	86.6	1	0.075	-0.018	0.168	-	-

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. 95% C.I.: 95% confidence interval. k: number of studies. d+: mean effect size. dl and du: lower and upper confidence limits. Q: heterogeneity statistic. I^2 : heterogeneity index (%).

(range = 0–12). The average methodological quality score of the studies was 8.97 ($SD = 1.62$ Mode = 10), ranging from 6 to 12 points.

All of studies applied appropriate statistical tests (non-parametric vs. parametric methods) to measure the effect ($n = 35$) and did not dichotomize the assessment of dependent variables ($n = 35$). In addition, most of them met the following criteria: (a) the expected effect was theoretically based ($n = 34$); (b) they provided a detailed description of entrepreneurship intervention which included learning objectives ($n = 25$), intervention duration ($n = 20$) and/or pedagogical methods used ($n = 27$); (c) they had an adequate sample size in the posttest ($n = 24$); (d) they employed measurement instruments with good psychometric properties (validity and reliability) to assess dependent variables ($n = 25$); (e) they reported results of between groups statistical comparison for at least one key outcome ($n = 34$), and (f) they had no private financial support ($n = 32$).

However, most of the studies did not run a random assignment of the participants to control and intervention group ($n = 5$), and only in the 50% of them, control and intervention groups were similar at baseline regarding important indicators ($n = 18$).

3.3. Synthesis of results

Table 1 displays the results of the meta-analysis obtained separately for the intervention groups and the control groups in each outcome measure. In most of them, there was not a statistically significant average effect of EE for the intervention groups. The results only revealed a statistically significant average effect of EE for the intervention groups on Entrepreneurship intention and Self-efficacy scores.

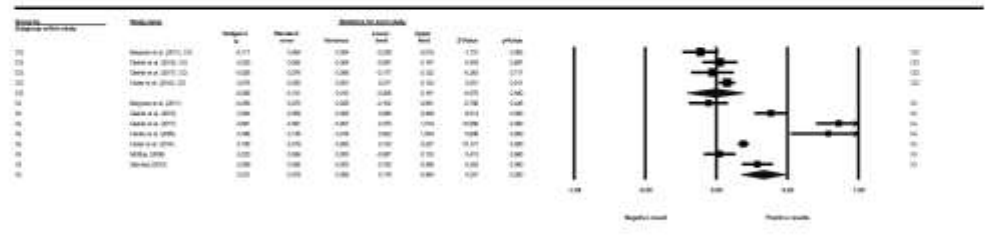
Focusing on the Entrepreneurship intention, the results revealed a statistically, significant average effect for the intervention groups ($d_i = 0.215$, $k = 20$), whereas the average effect for the control groups was practically null ($d_c = 0.008$, $k = 12$). Moreover, a weighted ANOVA employed to compare the two average effects revealed statistically significant differences between both ($Q_B(1) = 4.938$, $p = .026$, $R^2 = 0.09$). Nevertheless, the average d index obtained for the intervention groups may be overestimating the true effect (due to its low internal validity). To resolve this issue and controlling the testing effects suffered by these d indices, an adjusted average effect, d_{adj} , was defined and computed as the difference between the average effect of the intervention groups, d_i , and the average effect of the control groups, d_c : $d_{adj} = d_i - d_c$. Thus, for the global measures of Entrepreneurship intention an estimate of the true treatment effect was $d_{adj} = 0.215 - 0.008 = 0.207$, an effect estimate that can be considered of small magnitude (Cohen, 1988). Fig. 2 shows a forest plot for the Entrepreneurship intention classified as a function of the intervention groups and the control groups.

Regarding to Self-efficacy, the results revealed a statistically, significant average effect for the intervention groups ($d_i = 0.337$, $k = 7$), whereas the average effect for the control groups did not yield statistical significance ($d_c = 0.002$, $k = 4$). When the two average effects were statistically compared, the difference between them led to a statistically significant difference, ($Q_B(1) = 7.053$, $p = .008$, $R^2 = 0.24$). The difference between the two average effects provided an adjusted effect size of a small to medium magnitude: $d_{adj} = 0.337 - 0.002 = 0.335$ (Cohen, 1988). Fig. 3 shows a forest plot for the Self-efficacy classified as a function of the intervention groups and the control groups.

3.4. Moderator analysis

As Table 1 presents, effect sizes for the intervention groups exhibited large variability in Entrepreneurship intention and other outcome measures, with I^2 ranging between 83.5% and 97.6%, except to desirability outcome ($I^2 = 16.7$). Hence, an analysis of the studies' characteristics that might influence the effect size heterogeneity was performed. However, due to the few studies and some studies not reporting sociodemographic variables, it was impossible to conduct further analyses that might explain the heterogeneity of effect sizes for most of the meta-analyses carried out. It was only possible to perform a moderator variables analysis for Entrepreneurship intention measures ($k = 20$) by sample characteristics (for example, mean age, percentage of females, geographical location, and socio-economic context by country), study characteristic (for example, year publication and methodological quality), and intervention characteristics (for example, duration in months). Specifically, weighted ANOVAs for categorical moderator variables and simple meta-regression for continuous moderator variables were used, with the standardized mean change as the dependent variable.

Table 2 shows the results of the weighted ANOVAs performed on the categorical variables, such as the continent where the study was conducted, the socio-economic context of the country where the study took place, which was coded as Emerging market and



developing economies and Advanced economies, following the International Monetary Fund (IMF) classification (International Monetary Fund, 2020). The results of the ANOVA did not reach statistically significant values on examined categorical variables. Nevertheless, focusing on the continent where the study was conducted, only the studies carried out in Europe ($d_+ = 0.208$, $k = 11$) or Africa ($d_+ = 0.455$, $k = 2$) reached a small to moderate and statistically significant mean effect.

On the other hand, focusing on the socioeconomic context for the country, for both groups, a small and statistically significant mean effect was obtained. Specifically, for the Advanced economies the mean effect was $d_+ = 0.178$ ($k = 11$), and for the Emerging market and developing economies the mean effect was $d_+ = 0.259$ ($k = 9$).

Table 3 presents the simple meta-regressions performed on continuous variables, such as mean age, and gender (% female) of the sample, as well as the duration of the intervention program. The only moderator variable that yielded a statistically significant relationship with effect sizes was the duration of the intervention program for the individual studies, accounting for 23% of the variance ($p < .05$).

3.5. Analysis of publication bias

Of the 8 funnel plots elaborated (available under request), the trim- and-fill method required the imputation of effect sizes in two of them to achieve symmetry. One of these was the funnel plot that showed the effect size for the feasibility measures. In this case, Duval and Tweedie's method imputed one effect estimate. However, the adjusted average d ($d_+ = 0.068$; 95% CI [-0.168, 0.305]) presented a slight difference from the original average d ($d_+ = 0.139$). The other asymmetrical funnel plot displayed the meta-analysis of the effect size for the desirability measures. In this case, Duval and Tweedie's method imputed two effect estimates, but, the adjusted average d ($d_+ = 0.027$; 95% CI [-0.052, 0.106]) presented a negligible difference from the original average d ($d_+ = 0.031$).

In addition, the Egger test yield statistical significance only for the meta-analysis of attitude measures ($p = .004$, $k = 8$) and subjective norm ($p = .21$, $k = 4$) (see Table 4). Consequently, based on the results of these different analyses, publication bias can reasonably be ruled out as a threat to meta-analytic findings.

4. Discussion

The objective of this research was to perform a meta-analysis to investigate the efficacy of EE interventions on entrepreneurship intention and other outcome measures, specifically attending to studies carried out in the academic context with a pre and posttest design and a control group. As for the maximum value is 12, the mean methodological quality score of 8.97 for all the studies enclosed in this systematic review ($n = 35$) represents moderate-to-large quality, enhancing the credibility of the conclusions.

The findings clearly show that there was not a statistically significant average effect of EE for the intervention groups on most of the outcome measures. There was only a statistically significant average effect of EE for the intervention groups on Entrepreneurship Intention ($d_+ = 0.215$) and Self-efficacy scores ($d_+ = 0.337$). As aforementioned, given the problems with the internal validity of the d index obtained from one-group designs, an adjusted average effect was used, d_{adj} , calculating the difference between the average d indices of the intervention, d_+ , and the control. The adjusted index for Entrepreneurship intention was $d_{adj} = 0.207$, an effect estimate that can be considered of small magnitude (Cohen, 1988), and for Self-efficacy was $d_{adj} = 0.335$, an effect estimate that can be considered of small to medium magnitude (Cohen, 1988).

These results found in academic samples with high methodological rigor agree with the findings of previous meta-analyses. Although its small or medium magnitude, a positive relationship between EE and entrepreneurship intention and entrepreneurship-related human capital assets was established (Bae et al., 2014; Martin et al., 2013). Although the lack of methodological rigor may have overestimated the results (Martin et al., 2013), they still occur in similar sizes in more rigorous studies.

It has been argued that the variability of results in the primary studies may be due to the diversity of programs, lengths, and samples used in the impact studies (Longyn & Fom, 2010; Luzz et al., 2013). Nevertheless, there are other tentative explanations in the literature. Fretschner and Lampe (2019) focused on the "alignment" and "sorting" effects to explain the controversial results related to the impact of EE on entrepreneurship intention. The alignment effects explain how the students with low entrepreneurship intention at the beginning of the course will increase their entrepreneurship intention because they might find something they would enjoy in

Table 2
Results of the weighted ANOVAs for the influence of categorical variables on the effect sizes.

Moderator variable	k	d_+	95% CI		ANOVA results
			d_l	d_u	
Geographic location:					
Europe	11	0.208	0.046	0.370	$Q_B(3) = 2.042, p = .564; R^2 = 0.0; Q_W(16) = 202.821, p < .001$
Asian	5	0.167	-0.073	0.409	
Africa	2	0.455	0.087	0.823	
Others (USA, Australia)	2	0.119	-0.251	0.490	
Socioeconomic context for country:					
Advanced economies	11	0.178	0.013	0.343	$Q_B(1) = 0.419, p = .517; R^2 = 0.0; Q_W(18) = 242.171, p < .001$
Emerging market and developing economies	9	0.259	0.079	0.438	

Note. C.I.: 95% confidence interval. k: number of studies. d_+ : mean effect size. d_l and d_u : lower and upper confidence limits. Q_B : between-categories Q statistic. Q_W : within-categories Q statistic. R^2 : proportion of variance accounted for by the moderator variable.

Table 3

Results of the simple weighted meta-regressions of continuous moderators on the effect sizes for Entrepreneurship intention measures.

Moderator variable	k	b _j	Q _b	Q _E	R ²
Participant characteristics:					
Mean age (years)	10	-0.0192	0.32	126.16***	0.0
Gender (% females)	16	-0.0007	0.02	219.83***	0.0
Intervention characteristics:					
Duration (months)	15	0.0538	4.68*	118.60***	0.23
Study characteristics:					
Year publication	20	0.0067	0.15	236.86***	0.0
Number items used to assess EI	19	-0.0330	1.52	235.45***	0.02
Methodological quality checklist (0-12)	20	0.0239	0.32	243.47***	0.0

k: number of studies. b_j: unstandardized regression coefficient. Q_b: Q statistic to test for the moderator variable significance. Q_E: Q statistic to test for model misspecification. R²: variance accounted for by the moderator variable. *p < .05. ***p < .001.

Table 4

Analyses of Publication Bias with the Egger Test.

Outcome	K	Intercept	SE	T	df	p-value
Entrepreneurship intention	20	-2.650	2.346	1.1309	18	.273
Control	10	-4.94	5.48	0.90	8	.303
Attitude	8	-6.84	1.50	4.57	6	.004
Self-efficacy	7	3.170	2.92	1.09	5	.326
Feasibility	5	3.09	3.63	0.85	3	.457
Desirability	5	-0.43	1.45	0.30	3	.784
Need for achievement	5	-2.94	3.97	0.74	3	.514
Subjective norm	4	-5.36	0.79	6.75	2	.021

Note: SE: Standard error; T: T-test; df: Degrees of freedom.

entrepreneurship. This effect is contrary for the students with high entrepreneurship intention before the course, who will acquire a more realistic view of entrepreneurship. The alignment effect could affect other variables in the same way.

Publication bias was ruled out as a threat to the meta-analytic findings, and a large heterogeneity was found among the individual effect sizes. However, it was only possible to perform moderator variables analysis to determine the studies' characteristics that might explain at least part of the effect size heterogeneity for Entrepreneurship intention measures, due to few studies and the fact that some of them did not report on sociodemographic variables. Findings from moderator analysis revealed that only the intervention duration was statistically related to effect sizes. Specifically, studies with longer intervention duration produce more change in entrepreneurship intention. As Oosterbeek et al. (2010) claimed, the duration of the entrepreneurship programs is an interesting research area. Our results reinforce the statement of Oosterbeek et al. (2010) and contradict the results of Lutz et al. (2011), who found that the duration of the program only affected the perceived behavioural control. Consequently, although most of the courses taught in the university context last approximately one semester, it would be advisable to extend the duration of the courses to consolidate the acquisition of the outcomes of interest.

Previous research shows cultural differences in entrepreneurship intention (Iakovleva et al., 2011; Shuseu et al., 2013). Our study suggests that the differential effectiveness of EE is not the reason for these differences. The country or socio-economic context (advanced vs. emerging markets) has not shown moderator effects. It means that entrepreneurship programs are being equally effective despite the country of application. Although the effect of subjective norms on entrepreneurship intention varies across the country (Mariano et al., 2012), the programs seem to be well adapted to each context.

4.1. Limitation and strengths

Some limitations should be acknowledged. First, our study focuses on evaluating the impact at the second level of the Kirkpatrick model (Kirkpatrick, 1996), that is, we do not measure the impact of the programs directly on behaviour. However, this approach continues to be the predominant perspective in evaluating the impact of programs carried out in educational contexts and this study collects previous literature.

Second, the meta-analysis is based on few studies, given that twelve studies could not be enclosed in the final analysis because they did not provide the statistical data necessary to compute the effect sizes. Moreover, some of the included studies did not supply statistical data to calculate the effect size for the control group. Consequently, the effect size index was the standardized mean change scores index for intervention and control groups, separately. To resolve the problems with the internal validity of this effect size and provide a more realistic estimate of the true effect, an adjusted average effect was used, d_{adj} , calculating the difference between the average d indices of the intervention and the control groups.

Additionally, most of the studies enclosed in this meta-analysis used convenience samples taken from a University setting, which limits the generalization of these results to other education levels. Consequently, it is necessary to conduct more research on the EE effect in other levels of education (for example, secondary level).

On the other hand, the lack of information in primary studies on variables related to participants' characteristics or intervention characteristics limited our ability to analyse moderating variables that could explain heterogeneity across studies. Therefore, it is possible that other moderator variables not considered might be relevant in explaining this variability (for example, intervention characteristics). Moreover, some primary studies did not provide all the information needed to code all moderator variables enclosed in the meta-analysis.

However, several strengths should also be mentioned. Foremost, this study employs a meta-analytic approach to examine the impact of EE, specifically attending to studies with a rigorous methodological design, pooling estimates across a wide range of studies. The rigorous selection of the studies tried to assure the quality of the evidence. Thereby, it was more relevant to summarize the evidence selecting studies with high methodological quality than to review and synthesize a larger number of studies with poor methodological quality. Consequently, this meta-analysis allows a more accurate view of the impact of EE, with the limitations mentioned above. In addition, international studies are enclosed in this meta-analysis and, consequently, results are not country-specific, which strengthens the external validity of this study.

4.2. Recommendation for future research

Throughout the discussion, recommendations for future research arising from the current findings and review of the literature have been identified (for example, *Loetz et al., 2013; Rideout & Gray, 2013*). These suggestions include (1) representative sampling of participants (for example, probabilistic sampling with diverse recruiting methods), (2) samples selected from secondary level and in vocational schools; (3) detailed information about the intervention program (for example, duration, pedagogical methods, so on); (4) validity and reliability tests to assess outcome measures; (5) detailed information about descriptive statistics for outcome measures (for example, means and standard deviations) for both intervention and control group, separately, in pretest and posttest phases; (5) detailed information about potential moderators to advance theoretical understanding (for example, sociodemographic characteristics of the participants). This would not only facilitate the carrying out of meta-analyses, but also the replication of primary studies and the comparison of different studies.

Recent research has highlighted the need to explore the intention-behaviour gap. Students may lose their entrepreneurial intention because of the difficulties they face as independent entrepreneurs (*Harina, Gießelmann, Güntsch, & Schlichting, 2021*). Consequently, it is recommended to study the effect directly on entrepreneurial behaviour with longitudinal follow-up (*Rahm, 2019*).

Additionally, future research should deepen in the process through which the EE impacts the entrepreneurship outcomes. *Ndofinipi (2020)* found that psychological traits as need for achievement partially mediated the relationship between EE and entrepreneurial intention.

5. Conclusion

The present study contributes clarifying the effectiveness of entrepreneurship programs in an essential context: the educational field without including nascent entrepreneur samples. Additionally, it is based exclusively on methodologically rigorous studies. As a result, these programs have shown effectiveness in promoting entrepreneurship intention and self-efficacy across the students. These results support the development of initiatives to boost entrepreneurship in educational centers, with samples that have not necessarily shown prior interest in entrepreneurship.

Furthermore, it is still necessary to improve the quality of impact studies of EE and the reporting of its results. To continue deepening the knowledge of the moderating variables of the impact of the programs, we need the research works to provide detailed information on the procedures used in the entrepreneurship programs. Rigorous and comprehensive efficacy studies are needed to learn about good practices that guarantee the desired results with methodologies adapted to each education stage.

Declaration of competing interest

The authors declare no conflicts of interest.

Acknowledgements

Sara Martínez-Gregorio is a researcher beneficiary of the FPU program from the Spanish Ministry of Sciences, Innovation and Universities (FPU18/03710).

Appendix 1. Checklist for assessing the methodological quality of the studies

Item	Description
1	Expected effect was theoretically based (Yes: 1; No: 0)
2	Detailed description of entrepreneurship intervention 1. It includes learning objectives. (Yes: 1; No: 0)
3	Detailed description of entrepreneurship intervention 2. It includes duration. (Yes: 1; No: 0)

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(continued)

Item	Description
4	Detailed description of entrepreneurship intervention 3. It includes pedagogical methods. (Yes: 1; No: 0)
5	Randomized control and treatment group (Yes: 1; No: 0)
6	Groups were similar at baseline regarding important indicators (Yes: 1; No: 0; Unable to determine: 0)
7	Adequate sample size in the posttest (Yes: 1; No: 0)
8	The assessment of dependent variables was not dichotomized (Yes: 1; No: 0)
9	The measurement instrument used to assess dependent variables shows good psychometrics properties (validity and reliability) (Yes: 1; No: 0; Unable to determine: 0)
10	The statistical test used to assess the effect was appropriated to the data (non-parametric vs. parametric) (Yes: 1; No: 0)
11	Results of between groups statistical comparison are reported for at least one key outcome (Yes: 1; No: 0)
12	Absence of private financial support (Yes: 1; No: 0)

Note: The methodological quality checklist is based on 12 dichotomous criteria. The presence of the criterion is given a 1 point and its absence 0. The maximum possible score is 12.

Appendix 2. General characteristics of the studies

	Study	Country		Mean Age	Sex Distribution (% female)	Education level	Duration	Teaching methods	Outcome measured
1.	Adzyska (2012)	UE	200 intervention 76 control	–	44.92	Secondary	1 year	AM	A
2.	Bergman et al. (2011)	Israel > 1	122 intervention 144 control	14.26	54.96	Secondary	1 year	AM	SE
3.	Gem et al. (2020)	Albania	200 intervention 328 control	–	60.4	Tertiary	–	–	EI
4.	Geste et al. (2018)	Portugal and Germany	181 intervention 102 control	21	55	Tertiary	4 weeks	PM	F
5.	DeTienne and Chandler (2009)	United States	71 intervention 59 control	24	45.9	Tertiary	4 months	PM	–
6.	Dinkel et al. (2019)	Germany and Bangladesh	164 intervention 81 control	22.40	40.82	Tertiary	4 months	AM	D, EI, F
7.	Delishti et al. (2016)	Albania	106 intervention 80 control	–	52	Tertiary	4 months	AM	A, C, EI
8.	Fernández-Pérez et al. (2019)	Spain	640 intervention 111 control	22	62.3	Tertiary	4 months	–	C, EI, SE, SN
9.	García-Rodríguez et al. (2016)	Spain	22 intervention 52 control	–	63.43	Tertiary	4 months	AM	D, EI, F
10.	Gielak et al. (2015)	Uganda	184 intervention 153 control	24.6	40	Tertiary	3 months	AM	EI, SE
11.	Gielak et al. (2017)	Kenya	125 intervention 102 control	24.6	22.5	Tertiary	3 months	AM	EI, SE
12.	González-López et al. (2019)	Spain	310 intervention 269 control	20.9	55	Tertiary	8 months	AM	A, C, EI, SN
13.	Hahn et al. (2020)	Austria, Estonia, Germany, Hungary, Italy, Poland, Spain, Switzerland	101 intervention 324 control	25.57	59.5	Tertiary	–	–	–
14.	Hauke et al. (2005)	USA	70 intervention 70 control	–	–	Tertiary	4 months	AM	D, EI, F, SE
15.	Hoxenmark (1998)	USA	19 intervention 50 control	21.92	44.9	Tertiary	1 year	AM	C, NA
16.	Holzer et al. (2014)	Netherlands		11.63	50.3	Primary		AM	NA, SE, RT

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(continued)

Study	Country	Mean Age	Sex Distribution (% female)	Education level	Duration	Teaching methods	Outcome measured
17. Ismail et al. (2018)	Malaysia	1729 intervention 684 control 203	70	Tertiary	2-4 weeks 4 months	Both	EI
18. Karlsson and Moberg (2013)	Denmark	105 control 51	26.78	Tertiary	-	AM	A, SE
19. Lutz et al. (2011)	Switzerland	21 control 119	-	Tertiary	4 months	AM	A, C, EI, SN
20. McStay (2008)	Australia	153 control 190	43.2	Tertiary	4 months	AM	D, EI, SE
21. Moseley and Pridemore (2007)	South Africa	229 control 418	-	Tertiary	4 months	PM	C, NA
22. Naki et al. (2018)	UE	45 control 89	18-25	Tertiary	-	AM	C, EI
23. Oosterbeek et al. (2010)	Netherlands	61 control 104	45	Tertiary	1 year	AM	NA, SE, RT
24. Peterson and Kinnedy (2009)	Australia	146 control 109	16.18	Secondary	5 months	AM	D, F
25. Rauth and Huisink (2015)	Netherlands	58 intervention 54 control	21	Tertiary	1 year	AM	A, C
26. Sanchez (2011)	Spain	404 intervention 400 control	64.2	Tertiary	8 months	AM	EI, SE, RT
27. Sanchez (2013)	Spain	347 intervention 369 control	57.46	Secondary	8 months	AM	EI, SE, RT
28. Schroder and Schmitt-Rodensand (2006)	Germany	321 intervention 302 control	53.08	Secondary	-	PM	C, EI
29. Soellnitz et al. (2007)	UK and France	124 intervention 126 control	-	Tertiary	5 months	AM	A, C, EI, SN
30. Sukreepworakiat et al. (2018)	Thailand	30 intervention 30 control	-	Tertiary	-	AM	EI
31. Thomsby et al. (2009)	USA	71 intervention 15 control	-	Tertiary	2 years	AM	-
32. van Biejk and Belgith-Mohar (2019)	Arab Emirates	130 intervention 114 control	68.7	Tertiary	4 months	-	EI
33. Vornonik et al. (2015)	Finland	66 intervention 131 control	61	Tertiary	-	Both	A, C, EI, SN
34. Volery et al. (2013)	Switzerland	189 intervention 102 control	46	Tertiary	6-12 months	AM	D, NA, SE, RT
35. Zampetakis et al. (2015)	Greece	60 intervention 51 control	66.8	Tertiary	3 months	-	A, C, EI, SN

Note: AM: Active method; PM: Passive method; A: Attitude towards entrepreneurship; C: Control or Perceived Behavioral Control; D: Desirability; EI: Entrepreneurship intention; F: Feasibility; NA: Need for achievement; SE: Self-efficacy; SN: Subjective Norm; RT: Risk-taking.

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Appendix 21. Journal version of Study 2



Article

Measuring Entrepreneurship Intention in Secondary Education: Validation of the Entrepreneurial Intention Questionnaire

Journal of Psychoeducational Assessment
2022, Vol. 40(4) 499–513
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Abstract

This article is the first attempt to validate the Entrepreneurial Intention Questionnaire (EIQ) in secondary education students. It is based on the Theory of Planned Behavior (TPB) and includes its constructs: attitude towards entrepreneurship, subjective norm, entrepreneurial self-efficacy, and entrepreneurial intention. The promotion of entrepreneurship in early education requires valid and reliable measures to assess the desired outcomes and evaluate the effectiveness of the interventions. The EIQ presents good psychometric qualities in a Spanish sample of high school students ($N = 226$): (a) The four-factor structure fits the data with factor loadings ranging between .378 and .862; (b) Each dimension presents satisfactory reliability results (above .7); and (c) The dimensions reproduce expected relationships with entrepreneurial attitudes. Additionally, competing models of the TPB have been tested to provide evidence to support a modified version of the original TPB model. Consequently, the EIQ is adequate for secondary education in Spain, being especially useful for longitudinal studies.

Keywords

scale validation, entrepreneurship, entrepreneurial intention, secondary education, theory of planned behavior

Introduction

Entrepreneurship is an important factor in the economic development of countries (Acs et al., 2017). Entrepreneurship is considered as a result of a conscious and planned decision (Liñán & Chen, 2009), which can be promoted and taught through education and experience (Iyigün, 2015). From the European Commission (2016), entrepreneurship is understood as a lifelong skill that

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must be introduced in the early stages of education. Some European countries are actively promoting entrepreneurial education in secondary education. In the Spanish context, the Organic Law of Education (LOE 2/2006, 2006) includes autonomy and personal initiative as competencies that must be promoted in compulsory education (Bernal-Guerrero, 2014). Entrepreneurship is considered a key competence for secondary education since the Organic Law for the Improvement of Education Quality (LOMCE 8/2013, 2013). According to Johansen and Schanke (2013), almost 90% of secondary schools in Norway provide some kind of entrepreneurial education.

Fostering entrepreneurial education in secondary schools is considered as a key instrument for the promotion of innovation systems and entrepreneurship (Fagerberg & Scholer, 2008). Huber et al. (2014) concluded that early entrepreneurial education is essential, due to the fact that entrepreneurial skills could be easier developed if they are promoted from early education. Longitudinal studies evidence that students who took a junior entrepreneurship program in high school were more likely to participate in entrepreneurial ventures (Elert et al., 2015).

Despite a tendency in government policy to promote entrepreneurial education in early education, research has focused on university students (Longva & Foss, 2018; Mwasalwiba, 2010; Nabi et al., 2017). Although not prevalent, some research has explored the effectiveness of entrepreneurial education in secondary students (e.g., Athayde, 2012; Peterman & Kennedy, 2003; Sánchez, 2013). Within the methodological rigorous impact studies, effectiveness could be measured through an improvement in entrepreneurial attitudes (Athayde, 2012), entrepreneurial self-efficacy (Bergman et al., 2011; Sánchez, 2013), or entrepreneurial intention (Sánchez, 2013; Schröder & Schmitt-Rodermund, 2006), among other outcomes. Among all these possible variables, the most frequently used to assess the impact of entrepreneurial education is entrepreneurial intention (Bae et al., 2014; Longva & Foss, 2018; Martínez-Gregorio et al., 2021).

The entrepreneurial intention could be understood as “the conscious state of mind that precedes action and directs attention toward entrepreneurial behaviors such as starting a new business and becoming an entrepreneur” (Moriano et al., 2012, p. 165). Its importance resides in its predictive power on behavior (Armitage & Conner, 2001). Although some controversy regarding the intention-behavior link exists in the entrepreneurship field, recent research supports Krueger’s claim (2000) who considered entrepreneurial intention as the single best predictor of entrepreneurial behavior. Since Kautonen et al. (2015) carried out a longitudinal study that supported the effect of entrepreneurial intention on behavior, some authors have added evidence in the same direction (Figueiredo & Lyons, 2021; Gieure et al., 2020).

Regarding the conceptualization of entrepreneurial intention and its antecedents, the most frequent theoretical framework is the Theory of Planned Behavior (TPB) (Ajzen, 2001; Liñán & Fayolle, 2015). This theory posits three antecedents of intention: attitude toward the behavior, subjective norm, and perceived behavioral control. Other factors are considered to influence intentions through these (Moriano et al., 2012).

The first antecedent is attitude towards entrepreneurship, which is the positive or negative personal evaluation of the condition of being an entrepreneur (Kolvereid, 1996). Subjective norm refers to social support to carry out (or not) an entrepreneurial behavior (Liñán & Chen, 2009). Currently, some controversy regarding the effect of subjective norm exists. Since Armitage and Conner (2001) questioned its predictive power, alternative models have been tested. Heuer and Liñán (2013) satisfactorily tested a modified model in which subjective norm has an indirect effect on entrepreneurial intention through attitudes towards entrepreneurship and perceived behavioral control. Finally, perceived behavioral control is defined as the perceived ease to perform an entrepreneurial behavior. Although Ajzen (2002a) stated perceived behavioral control has the third component of the TPB, numerous studies have replaced perceived behavioral control with entrepreneurial self-efficacy (Krueger et al., 2000; Moriano, 2005; van Gelderen et al., 2008). Despite being related constructs, Ajzen (2002b) emphasized their differences, including the

controllability component in perceived behavioral control. In their meta-analytic review, [Ammitage and Conner \(2001\)](#) supported a distinction between self-efficacy and perceived behavioral control, concluding that self-efficacy could be a better predictor of entrepreneurial intention.

A related topic of interest is how this variable could be measured. In the beginning, measuring entrepreneurial intention in the general population was controversial at times ([Liñán & Chen, 2009; Thompson, 2009](#)). Some studies used single items to measure intention ([Barba-Sánchez & Atienza-Sahuquillo, 2018; Krueger et al., 2000; Shahin et al., 2021](#)), or defined entrepreneurial intention as the opposite of organizational employment ([Kolvereid, 1996](#)). The scale most frequently used was developed by [Liñán and Chen \(2009\)](#). This scale follows the structure of the TPB, including 4 subscales: entrepreneurial intention, subjective norm, attitude towards entrepreneurship, and perceived behavioral control. With this scale, [Liñán and Chen \(2009\)](#) tried to solve the “need to develop more adequate reliable and valid instruments to analyze entrepreneurial perceptions and intentions,” (p. 594). However, some authors have developed alternative scales (e.g., [Asghar et al., 2019; Kautonen et al., 2015; Thompson, 2009](#)). One of the most interesting ones is the Entrepreneurial Intention Questionnaire (EIQ), initially developed by [Moriano \(2005\)](#) and updated latterly by [Rueda et al. \(2015\)](#). Surprisingly, despite being different scales, the scale published by [Moriano \(2005\)](#) and [Rueda et al. \(2015\)](#) and the one by [Liñán and Chen \(2009\)](#) share the same name. From now on, in this article, the EIQ will refer to the scale developed by [Rueda et al. \(2015\)](#).

Unlike previous scales, the EIQ follows [Ajzen's \(2002a\)](#) recommendations of how to measure attitudes and subjective norms as a composite measure ([Moriano et al., 2012](#)). This scale has been validated in different countries ([Da Fonseca Oliveira et al., 2016; Laguía et al., 2017; Rueda et al., 2015](#)), and it has been used in cross-cultural studies ([Moriano et al., 2012](#)). Nevertheless, most of the samples were with university students ([Laguía et al., 2017](#)), and it has never been validated for secondary or high school students.

As previously stated, little attention has been paid to the early stage [do Paço et al. \(2011\)](#) of compulsory education. However, recently, some scales have been validated in secondary samples to measure basic business knowledge ([Bernal-Guerrero, et al., 2020](#)), entrepreneurial competencies ([Cárdenas-Gutiérrez et al., 2021](#)), entrepreneurial personality ([Ortuño-Sierra et al., 2021](#)) or attitudes towards entrepreneurship ([Oliver & Galiana, 2015](#)). [Sánchez \(2013\)](#) was the first to attempt to explore entrepreneurial intention in the context of secondary school Spanish students, whereas [do Paço et al. \(2011\)](#) satisfactorily tested the TPB model with secondary students. But there is still a need to develop reliable and valid instruments to measure entrepreneurial intention in secondary education. More studies are needed to gather robust validity evidence for the use of entrepreneurial scales with adolescents and young people ([Ortuño-Sierra et al., 2021](#)).

This study aims to adapt and validate the EIQ ([Rueda et al., 2015](#)) in a Spanish sample of secondary students. The objectives are specifically for secondary student population: (a) to test the factorial structure of the scale, (b) to analyze its reliability, (c) to test the relationships between TPB constructs and entrepreneurial attitudes, as external validity evidence, and (d) to study the adequacy of competing models of TPB ([Heuer & Liñán, 2013](#)), in which subjective norm has a different role.

Method

Sample and Procedure

Our sample consisted of 226 secondary students from high schools of Valencia (Spain). 58.8% were girls ($n = 133$). The age of the participants ranged between 11 and 17, with an average age of 14.03 ($SD = 1.46$). 56.2% attended public high schools ($n = 127$), whereas 41.2% attended private institutions ($n = 93$).

Data came from a cross-sectional study that met the ethical standards of the American Psychological Association. The research received the ethical approval of the Ethical Commission of the University of Valencia (UV-INV_ETICA-1218680). Questionnaires were distributed online (92.48%, $n = 209$) or in paper in the high schools (7.52%, $n = 17$), as required for some schools. Questionnaires were administered once the secondary school authorities and parents had been informed about the objectives and procedure of the survey and had approved the protocol. Each family had to sign an informed consent to allow the participation of their children. Participation was voluntary and not rewarded. Anonymity and confidentiality were guaranteed. The questionnaire took about 25 minutes to complete, approximately.

Instruments

The survey included a set of socio-demographic questions and the following scales:

- EIQ (Rueda et al., 2015). In this study, we used a version of the EIQ adapted to the high school context. The EIQ scale is available under request to the original authors (Rueda et al., 2015). This scale included four subscales: attitudes towards entrepreneurship, subjective norms, entrepreneurial self-efficacy, and entrepreneurial intention. All items were measured through a Likert scale ranging between 1 and 7.

As mentioned, the EIQ follows Azjen's (2002a) recommendations, measuring attitudes and subjective norms as composite measures. Consequently, attitude towards entrepreneurship was measured with two groups of six items. The first group of questions asked about the expected results of entrepreneurship (i.e., "Creating a new company or becoming an entrepreneur would mean for you... 1. Facing new challenges") and the second one, about the desirability of these results (i.e., "Indicate how desirable are they for you in your everyday life... 1. Facing new challenges"). Both sets of items are multiplied, and a higher score means a more positive attitude toward entrepreneurship. Subjective norms were measured as a composite measure, too. It included three items asking about the perception of their close contacts about entrepreneurship (i.e., "Indicate the extent to which they agree if you decide to pursue a career as an entrepreneur... 1. My closest family") and three items asking about the importance given to these people (i.e., "Indicate to what extent do you care about what they think as you decide on whether or not to pursue a career as an entrepreneur... 1. My closest family") These sets of items should be multiplied to obtain the 3 final items for subjective norm.

Regarding entrepreneurial self-efficacy, it was measured by 6 items (i.e., "If you were to create your own business, to what degree would you be able to complete the following tasks? 1. Define your business idea and strategy of your company"). The subscale of entrepreneurial intention was composed of 5 items asking about the likelihood of the individual following an entrepreneurial career (i.e., "Do you think that in the future you will create your own company?"). The psychometric properties of the scale in secondary students are reported in the present paper.

We carried out some modifications to the original scale to adapt it to secondary education students. The dimensions of attitudes towards entrepreneurship and self-efficacy remain identical. When measuring subjective norm, Rueda et al. (2015) considered five groups of relevant people: close family, close friends, colleagues, partners, and children. Some of these items do not apply in adolescence. Consequently, the modified version asks for the perception about entrepreneurship and the importance given to close family, friends, and teachers. Regarding the dimensions of entrepreneurial intention, Items 1, 2, and 6 remain identical. Item 3 has been adapted by changing "if the opportunity presents itself" to "If you had the opportunity to choose freely the career to follow, what would you prefer?". Item 4 asked for the probability of starting a business in the next 5 years. It has been changed to "Imagine you are finishing your studies; with what probability would you consider creating your own business from then to 5 years in time?" Lastly, Item 5 has

been removed because it asked for the entrepreneurial intention in the following 12 months, which is impossible for students 12–16 years old.

Entrepreneurial Attitudes Scale for Students (EASS) (Oliver & Galiana, 2015). This scale measures six entrepreneurial attitudes: proactivity, professional ethics, empathy, innovation, autonomy, and risk-taking. Each attitude constitutes a subscale with 3 items. All items were measured through a Likert scale ranging between 1 ("strongly disagree") and 6 ("strongly agree"). The six-factor structure fit the data adequately ($\chi^2(120) = 220.516$ ($p < .01$), CFI = .965, SRMR = .048, RMSEA = .061 [CI .048–.073]) and Composite Reliability Index (CRI) for each subscale were: .67, .70, .81, .83, .86, and .56, respectively. These results support the psychometric properties reported by Oliver and Galiana (2015).

Statistical Analysis

The validation of the scale was carried out following previous objectives. Factorial validity was tested via confirmatory factor analysis (CFA) with Weighted Least Square Mean and Variance corrected. The model fit of the data was assessed following several fit criteria recommended in the literature (Hu & Bentler, 1999): chi-square statistics, a comparative fit index above .90, the root mean squared error of approximation (RMSEA) under .08 and the standardized root mean squared residuals (SRMR) under .08.

The statistical analysis of the scale included items' means, standard deviation, inter-item correlation, and corrected item-total correlations. Reliability was assessed via Cronbach's alpha and CRI (Raykov et al., 2010), both considered adequate when values $\geq .70$ (Hair et al., 2014).

Evidence for external validity was obtained correlating the TPB constructs (attitudes towards entrepreneurship, subjective norms, entrepreneurial self-efficacy, and entrepreneurial intention) with the attitudes included in the EASS (proactivity, professional ethics, empathy, innovation, autonomy, and risk-taking).

Additionally, competing TPB models were tested via structural equation modeling with the aforementioned fit criteria. Jöreskog (1993) proposed three uses of structural equation models as a way of testing a theory: strictly confirmatory, alternative models and model generating. In this paper, alternative models have been used to determine, between two models, which TPB approach fits the data better. Model 1 was the traditional TPB model (Ajzen, 2001), whereas Model 2 was a modified version based on Heuer and Liñán (2013) that considers the indirect effect of the subjective norm on the entrepreneurial intention through attitudes towards entrepreneurship and entrepreneurial self-efficacy.

To perform the analysis, we used IBM SPSS 26 Statistics and Mplus 8.5 (Muthén & Muthén, 1998–2017).

Results

Factorial Structure

The four-factor structure proposed in previous literature fit the data adequately: $\chi^2(224) = 502.927$ ($p < .001$), CFI = .915, RMSEA = .074, 90% CI [.066, .083], and SRMR = .057. Figure 1 shows the CFA performed with the standardized factor loadings. The factor loadings ranged between .378 and .862. Consequently, each indicator showed a high and statistically significant loading in its theoretical factor ($p < .001$).

As expected, all factors were positively correlated. The correlations between entrepreneurial intention and attitudes, subjective norms and entrepreneurial self-efficacy were .567, .346, and .665, respectively. The theoretical antecedents of entrepreneurial intention showed a positive correlation between them: attitudes and subjective norm .563, attitudes and self-efficacy .593, and subjective norm and self-efficacy .409.

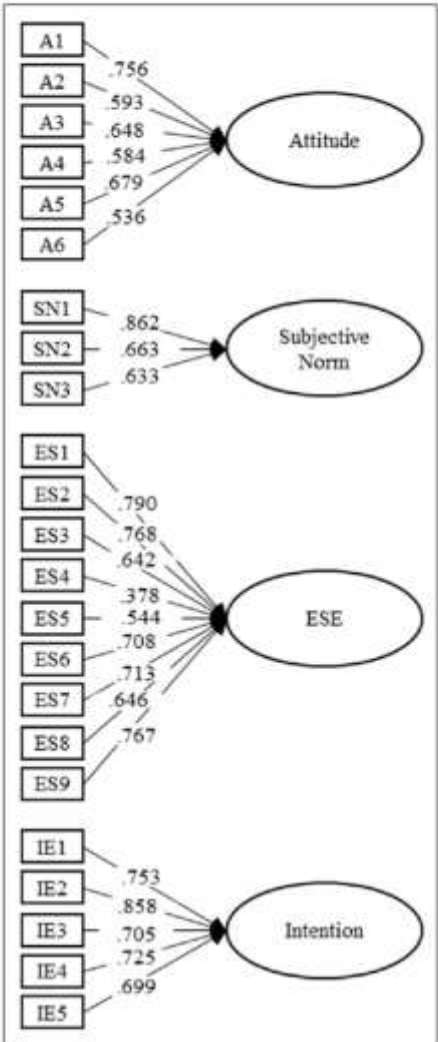


Figure 1. Factorial structure. Note. All the factor loadings were statistically significant ($p < .001$). ESE = Entrepreneurial Self-Efficacy.

Reliability and Descriptive Statistics

Table 1 includes the descriptive statistics (mean, *SD*, skewness, kurtosis, inter-item correlation, and corrected item overall correlation) of all the items grouped by factor. As reliability measures, two indicators were considered: Cronbach's Alpha and CRI. The Cronbach's Alpha for attitude was .802, .756 for subjective norm, .842 for self-efficacy, and .807 for entrepreneurial intention.

Table 1. Means (M), Standard Deviations (SD), Skewness (g1), Kurtosis (g2), Inter-Item Correlations, and Corrected Item-Total Correlations for the EIQ (r_{it}).

		M	SD	g1	g2	1	2	3	4	5	6	7	8	9	r_{it}
Attitude	1	3.78	1.50	.36	-.19										.67
	2	4.03	1.60	.01	-.42	.46									.53
	3	4.37	1.77	.02	-.94	.59	.52								.63
	4	4.01	1.59	.31	-.45	.39	.28	.31							.51
	5	3.19	1.47	.62	.29	.62	.35	.43	.43						.57
	6	4.12	1.97	.02	-1.04	.26	.34	.38	.42	.28					.47
SN	1	5.03	1.63	-.55	-.44										.64
	2	4.18	1.51	-.06	-.44	.63									.62
	3	3.43	1.80	.25	-.64	.47	.44								.50
ESE	1	5.28	1.32	-.44	-.24										.65
	2	5.00	1.41	-.56	-.24	.67									.62
	3	4.66	1.46	-.33	-.27	.50	.43								.59
	4	3.97	1.79	-.21	-.81	.22	.19	.36							.35
	5	5.38	1.38	-.79	.41	.40	.37	.22	.26						.44
	6	5.54	1.35	-.77	.33	.38	.43	.34	.13	.28					.57
	7	4.96	1.36	-.46	.15	.40	.41	.41	.29	.27	.49				.62
	8	5.13	1.38	-.54	.24	.39	.31	.39	.30	.21	.42	.58			.57
	9	5.43	1.27	-.56	.01	.47	.48	.39	.22	.40	.50	.50	.42		.62
Intention	1	3.45	2.22	.35	-1.32										.59
	2	3.83	1.85	.18	-.82	.62									.73
	3	4.72	1.92	-.51	-.62	.40	.60								.60
	4	4.00	1.69	-.03	-.60	.41	.60	.54							.63
	5	5.54	1.82	-1.20	.57	.33	.34	.34	.37						.43

Note. SN = Subjective norm; ESE = entrepreneurial self-efficacy; EIQ = entrepreneurial intention questionnaire.

These results were similar to CRIs, whose values were .802 for attitude, .767 for subjective norm, .878 for self-efficacy, and .865 for entrepreneurial intention. Consequently, we report adequate reliability results for all dimensions in our sample.

External Validity

As evidence of external validity, we performed correlations between the entrepreneurial attitudes include in the EASS and the TPB constructs included in the EIQ: attitude towards entrepreneurship, subjective norm, entrepreneurial self-efficacy, and entrepreneurial intention. The results are included in Table 2. All correlations were positive and statistically significant ($p < .001$). The lowest correlations were between empathy and entrepreneurial intention, and between subjective norm and proactivity. The highest correlations were between attitude and innovation and autonomy and attitude.

Competing TPB Models in Secondary Students

Finally, competing TPB models were tested in secondary education students. Firstly, we tested the goodness of fit of the traditional TPB model proposed by Azjen (2001). As theory suggested, Model 1 was proposed with the dimensions of attitude, subjective norm, and entrepreneurial self-efficacy as antecedents of entrepreneurial intention. The model fit the data satisfactorily: $\chi^2(224) = 502.927$ ($p < .001$), CFI = .915, RMSEA = .074, 90% CI [.066, .083], and SRMR = .057.

Figure 2 presents the structural equation model with the structural coefficients. As can be seen, the stronger predictor of entrepreneurial intention was the entrepreneurial self-efficacy ($\beta = .50$, $p < .001$), followed by attitude ($\beta = .27$, $p < .001$). Although high correlations were in place for subjective norm with attitude ($\beta = .56$, $p < .001$) and entrepreneurial self-efficacy ($\beta = .40$, $p < .001$), it had no direct effect on entrepreneurial intention ($\beta = -.01$, $p > .05$). Moreover, the relationship between attitude and self-efficacy was strong ($\beta = .59$, $p < .001$). Model 1 explained 49.5% of the variance of entrepreneurial intention.

Next, a modified TPB model based on Heuer and Liñán (2013) was tested (Model 2). Model 2 differs from Model 1 in that it includes an indirect effect of subjective norm on entrepreneurial

Table 2. Correlations Between EIQ and EASS for Students Dimensions.

EIQ	EASS					
	Proactivity	Ethics	Empathy	Innovation	Autonomy	Risk-taking
Attitude	.342	.404	.279	.481	.481	.458
SN	.176	.304	.313	.307	.380	.233
ESE	.398	.439	.285	.475	.410	.407
Intention	.331	.363	.137	.447	.309	.328

Note. SN = Subjective norm; ESE = entrepreneurial self-efficacy.

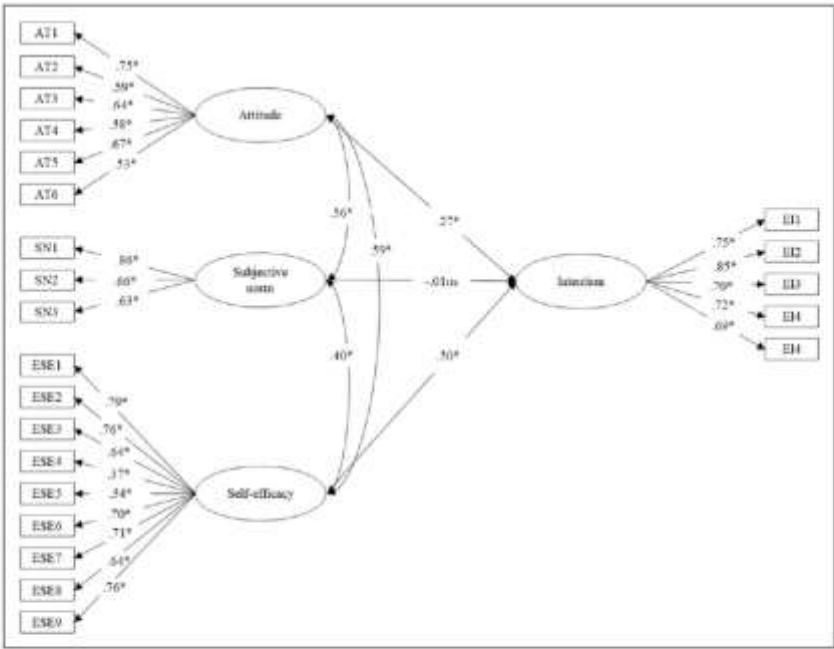


Figure 2. Model 1, Traditional theory of planned behavior model. Note. * $p < .001$.

intention through attitudes towards entrepreneurship and self-efficacy, instead of a direct effect. The model presented a satisfactory fit to the data: $\chi^2 (225) = 494.44$ ($p < .001$), CFI = .918, RMSEA = .073, 90% CI [.064, .082], and SRMR = .057.

Figure 3 shows Model 2 with the standardized structural coefficients. The effects of attitudes towards entrepreneurship and self-efficacy are similar to Model 1: $\beta = .26$ ($p < .001$) and $\beta = .50$ ($p < .001$), respectively. Subjective norm explained 31.5% of attitude toward entrepreneurship and 16.5% of self-efficacy. Consequently, it showed a statistically significant indirect effect on entrepreneurial intention ($\beta = .35$, $p < .001$). Model 2 explained 48.6% of the variance of entrepreneurial intention.

From a strictly statistical point of view, there were no differences between models' fits (instead of models' adjustments) adjustments ($\Delta \chi^2 = 0.04$, $\Delta d.f. = 1$, $p > 0.05$). Although both models were similar, Model 2 resulted in a more parsimonious model that considers the indirect effect of subjective norm on entrepreneurial intention, respecting the theoretical constructs of the original TPB.

Discussion

The growing interest in entrepreneurial education (Aparicio et al., 2019) in the early educational stages is a challenge for researchers (Aggarwal & Shrivastava, 2021; Bernal-Guerrero & Cárdenas-Gutiérrez, 2017; Liñán & Fayolle, 2015). To follow recent governmental educational recommendations and policies, it is crucial to have adapted entrepreneurial programs and reliable instruments to measure their effectiveness. Consequently, the aim of this study was to provide evidence about the adequacy of the EIQ (Rueda et al., 2015) in secondary school student samples.

The EIQ has shown satisfactory psychometric properties that support its use in secondary education. Following the TPB model, the EIQ reproduces a four-factor structure that includes the

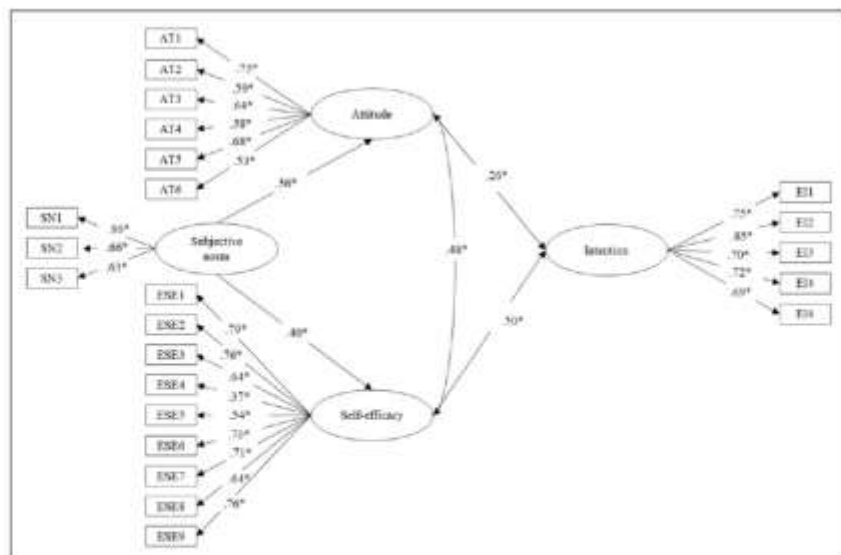


Figure 3. Model 2: Modified theory of planned behavior model.

dimensions of entrepreneurial intention and its three antecedents: attitude, subjective norm, and entrepreneurial self-efficacy. Moreover, all items present high and statistically significant factor loadings into their theoretical latent factor. Our results are similar to those found in previous studies with samples of university students in different countries (Da Fonseca Oliveira et al., 2016; Laguía et al., 2017; Rueda et al., 2015).

Regarding the reliability results, Cronbach alphas and CRIs are all above the cut-off value of .70 for all dimensions. The CRIs are provided to complement the reliability study as they have been considered a more accurate measure of reliability (Raykov et al., 2010).

Once the factorial validity and reliability are established, the psychometric study is complemented with evidence of external validity. Each dimension is correlated with the entrepreneurial attitudes included in the EASS (Oliver & Galiana, 2015).

Finally, the adequacy of the TPB model in secondary education is supported. Specifically, both models show satisfactory goodness-of-fit indices. As expected and evidenced in previous studies, attitudes and entrepreneurial self-efficacy are antecedents with an impact on entrepreneurial intention. However, the direct effect of subjective norm on entrepreneurial intention proposed in the traditional TPB model is not supported. This result is consistent with the traditionally weak role of subjective norm in the model (Armitage & Conner, 2001; Liñán & Chen, 2009) and in accordance with non-significant direct effects in previous studies (Autio et al., 2001; Esfandiari et al., 2019; Krueger et al., 2000; Schlaegel & Koenig, 2014). Previous EIQ validation studies with university samples showed low direct effect of subjective norm on entrepreneurial intention, ranging between .08 and .15 (Da Fonseca Oliveira et al., 2016; Laguía et al., 2017; Rueda et al., 2015). Liñán and Chen (2009) suggested the possibility of an indirect effect of subjective norm through entrepreneurial self-efficacy and attitude. This effect has been tested following Heuer and Liñán's (2013) proposal. Agreeing with recent research (Farooq, 2018; Kruse, 2020), subjective norm seems to be an antecedent of attitudes towards entrepreneurship and self-efficacy. Despite not having a direct effect on entrepreneurial intention, it remains theoretically relevant by presenting a moderate indirect effect.

This result is contextualized in a Spanish secondary school student sample. Cultural context and sample characteristics are relevant in the study of subjective norm. Moriano et al. (2012) found that the direct effect of subjective norm could vary across countries, not being as significant in Spain as in India or Netherlands. However, the effect of subjective norms is not consistent across studies. Kautonen et al. (2015) hypothesized that differences in the effect of subjective norm across studies could be related to samples, being subjective norm less important in students' samples than in the adult population.

The traditional TPB model validated with the EIQ explains 49.5% of the variance of entrepreneurial intention, whereas the modified version explains 48.6%. Both percentages are a little higher than the previously found in EIQ validations with university samples, which ranges from 39 to 46.5% (Da Fonseca Oliveira et al., 2016; Laguía et al., 2017; Moriano et al., 2012; Rueda et al., 2015). When TPB is tested with other questionnaires, the quantity of explained variance is also similar in the adult population (Kautonen et al., 2013; 2015) and secondary students (do Paço et al., 2011; Roy et al., 2017). To achieve a better explanation of entrepreneurial intention, researchers have explored different pathways. One alternative is the integration of the TPB model with the Entrepreneurial Event Model (EEM) (Shapiro & Sokol, 1982), which could increase the percentage of explained variance of entrepreneurial intention up to 50–60% (Esfandiari et al., 2019; Schlaegel & Koenig, 2014; Solesvik et al., 2012). Another fruitful alternative is considering personality traits as background variables in the TPB model, which could increase the predictive power up to 40–80% (Eid et al., 2019; Karimi et al., 2017; Maheshwari, 2021; Munir et al., 2019; Roy et al., 2017). Consequently, although TPB antecedents seem to be the most predictive

variables (Maheshwari, 2021), other constructs should also be measured in secondary education to complement the EIQ.

The present study has limitations that should be considered for generalization. First, the study was carried out with Spanish students. The sample size fits the literature recommendations according to the structural complexity of the model (Soper, 2021; Westland, 2010) in order to test the Structural Equation Model (for 4 latent and 23 observed variables with a desired statistical level of .8, anticipated overall effect size of .25 and probability of .05 the minimum required is 209 cases). However, to generalize the results and strengthen this evidence, it is necessary to continue research on the application of this scale in different contexts. Second, the study design was cross-sectional and the antecedents of entrepreneurial intention were measured at the same time as entrepreneurial intention. These design characteristics do not allow us to make any causal inferences. Finally, the intention-behavior gap is not studied. As a result, the predictive validity of the scale considering entrepreneurial behavior as the final outcome is not evidenced.

In conclusion, the adapted version of the EIQ has evidence of validity and reliability measuring TPB constructs in secondary education in the Spanish-speaking context. Consequently, this scale could be used in future research to evaluate the prevalence of entrepreneurial intention in high schools. It is a useful and standardized instrument to test the effectiveness of entrepreneurship programs. Additionally, our results suggest the adequacy of the EIQ for longitudinal studies, since it is one of the few scales that have validations that support its use in secondary education and university.

Acknowledgments

Sara Martínez-Gregorio is a researcher beneficiary of the FPU program from the Spanish Ministry of Science, Innovation and Universities (FPU18/03710).

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Ethical Approval

All ethical guidelines were followed as required for conducting human research. The research received the ethical approval of the Ethical Commission of the University of Valencia.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Appendix 22. Journal version of Study 3

Brief Report



Bayesian Confirmatory Factor Analysis of the Psychological Capital PCQ-12 Scale

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Abstract: Psychological Capital (PsyCap) is a key construct in psychological research across the lifespan. Although the 12-item Psychological Capital Questionnaire (PCQ-12) is among the most used scales to approach its measurement, its factor structure and reliability remain controversial, particularly in samples of adolescents. Data came from a cross-sectional survey administered to 267 Spanish adolescents, 59.9% girls ($M_{age} = 13.95$, $SD = 1.56$). Confirmatory Factor Analyses (CFAs) in Mplus 8.6 were used to compare three competitive models (one factor, four correlated factors, and a second order structure) estimated with Bayesian methods. Although Self-Efficacy, Hope, and Optimism significantly explained their indicators, and their cross-loadings were not statistically significant, Resilience operated differently. We obtained evidence supporting the second-order structure. Also, it becomes clear that the scale has difficulties measuring Resilience in adolescents. Consequently, further research should explore new adaptations or alternative measures to overcome these limitations when researching adolescents.

Keywords: psychological capital, psychometric properties, adolescence, Bayesian CFA



Psychological Capital (PsyCap) emerged as a key construct in the organizational literature (Avey et al., 2011), but its relevance across fields is evident (Siu et al., 2021). PsyCap is "An individual's positive psychological state of development that is characterized by (1) having confidence (Efficacy) to take on and put in the necessary effort to succeed at challenging tasks; (2) making a positive attribution (Optimism) about succeeding now and in the future; (3) persevering toward goals and, when necessary, redirecting paths to goals (Hope) in order to succeed; and (4) when beset by problems and adversity, sustaining and bouncing back and even beyond (Resilience) to attain success" (Luthans et al., 2015, p. 2). Its study in school-age youth has been growing over the last few years (Preston et al., 2021). It has been shown to promote subjective well-being (e.g., Datu & Valdez, 2016) or academic performance (e.g., Carmona-Halty et al., 2018; Datu et al., 2018) while reducing anxious and depressive symptoms (e.g., Finch et al., 2020).

The most used PsyCap scales are the 24-item PsyCap Questionnaire (PCQ-24; Luthans et al., 2007) and its brief

version, the 12-item Psychological Capital Questionnaire (PCQ-12; Avey et al., 2011). There are alternatives, such as the Compound PsyCap scale (CPC-12; Lorenz et al., 2016) or an adapted version of the PCQ-12 (Djourouva et al., 2019). The PCQ-12 has been adapted to the academic context (Martínez et al., 2021; Schönfeld & Mesurado, 2020), and also new scales have been developed specifically for students partially based on the PCQ-12 (King & Caleon, 2021).

Despite its use, the factor structure and reliability of PCQ-12 remain controversial (Dawkins et al., 2013; Djourouva et al., 2019). Regarding its factorial structure, the original authors proposed a hierarchical structure with four first-order factors (Self-Efficacy, Hope, Resilience, and Optimism) and one second-order one (PsyCap) (Avey et al., 2011). However, some studies found that a four-factor structure fits better than the second-order model (e.g., López-Núñez et al., 2018; Santana-Cárdenas et al., 2018; Viseu et al., 2012). This controversy appears largely in the adaptations of the scale in Portugal and Spain, which could indicate an effect related to the context or translation (Djourouva et al., 2019). Regarding its reliability, some studies showed problems in some dimensions: in Resilience ($\alpha = .5$) and Optimism ($\alpha = .64$) (López-Núñez et al., 2018); and also in Resilience (Santana-Cárdenas et al., 2018; Viseu et al., 2012).

In adolescents' samples, two validations of the PCQ-12 have been carried out, and both showed some psychometric problems. Martínez and colleagues (2021) found in Spanish and Chilean samples α s of .59 and .68, respectively, for Resilience, and .62 for Optimism in the Spanish sample. Besides, the initial second-order structure only fitted the data well after covariances among residuals were included. Furthermore, the second-order structure was not compared with the alternative four-factor structure. Schönfeld and Mesurado (2020) tested the scale in Argentinian adolescents with good reliability results, but they tested a four-factor model without comparing it with the second-order model initially proposed in the literature. Previous validations in adolescent samples tested different factor structures without comparing alternative models, evidencing the lack of consensus in the field.

As the PsyCap research has been receiving attention in recent years and the PCQ-12 is used frequently (Martínez et al., 2019; Siu et al., 2021), it is essential to guarantee its adequate psychometric properties. The PCQ-12 offers a shorter alternative to the PCQ-24 for studies with time constraints. This advantage justifies the need to explore its psychometric properties and work to improve them. This study aims to deepen the study of the PCQ-12 in academic contexts by studying its factor structure and reliability.

Method

Participants

Several private and public high schools were contacted to distribute an online questionnaire among their students. Participation was completely voluntary and non-rewarded. Participants were 267 adolescents from Valencia (Spain), with a mean age of 13.96 years ($SD = 1.56$). Ages ranged from 9 to 17 years. In terms of age categories: 22.7% were between 9 and 12 years; 35.4% between 13 and 14 years; and 41.9% between 15 and 17 years. Female participants were 59.9%. One hundred forty-one students came from public high schools (52.8%), whereas 116 studied in private ones (43.4%). For a Confirmatory Factor Analysis (CFA) model with 12 indicators, four latent variables, a power of .8, an α of .05, and an effect size of .4, the sample size calculator expected minimum sample size of 200 (Soper, 2021).

Instruments

Psychological Capital was measured with the Spanish version of the PCQ-12 (León-Pérez et al., 2017) adapted to academic contexts with students' samples (see

e.g., Luthans et al., 2014; Martínez et al., 2021). The adaptation consists of changing references to "work" to "school-work" or "studies." It has four dimensions: Self-Efficacy (3 items), Hope (4 items), Resilience (3 items), and Optimism (2 items). The response format was from 1 = *strongly disagree* to 5 = *strongly agree*.

Procedure

Data collection was conducted online using SurveyMonkey between January and February 2021. The research met APA's ethical standards, and it was approved by the Ethical Commission of the University of Valencia (UV-INV_ETICA-1283019). Participation in the study was voluntary and anonymous. Before starting the survey, families and participants signed informed consent.

Data Analysis

Confirmatory Factor Analyses (CFAs) were conducted to compare competitive structures in Mplus 8.7 (Muthén & Muthén, 1998-2017) and were estimated with Bayesian estimation. Model fit was assessed with: Posterior Predicted p -value (PPp), Bayesian Comparative Fit Index (BCFI), Bayesian Root Mean Square Error of Approximation (BRMSEA), and Deviance Information Criterion (DIC). In order to assess model fit, we have considered values larger than .95 for the CFI and lower than .08 for the RMSEA (Asparouhov & Muthén, 2021; Hu & Bentler, 1999). For model comparison, BCFI differences of less than .01 are considered negligible (Cheung & Rensvold, 2002), and lower values of DIC are considered indicative of a better relative fit. Two independent Markov Chain Monte Carlo (MCMC) chains were used for BCFA (Asparouhov et al., 2015), with a minimum of 200,000 iterations and thin = 4. Muthén and Asparouhov (2012) proposed a new statistical approach, BCFA with near-zero cross-loadings. This approach allows simultaneous estimation of all cross-loadings by using approximate near-zero informative priors to replace the exact zeros for the cross-loadings. Two sets of priors were used for BCFA: diffuse priors without cross-loadings (i.e., cross-loadings were fixed to exact zero); and BCFA, with informative priors for all cross-loadings. These informative priors were normal, with a mean hyperparameter set to zero and a small variance hyperparameter of .01, which yields cross-loading bounds of ± 0.20 (Muthén & Asparouhov, 2012). Additionally, a sensitivity analysis on priors was made by testing multiple variance hyperparameters: .001, .005, .01, and .05. This sensitivity analysis reinforced the use of .01 as the variance hyperparameter. Model convergence was monitored by potential scale reduction (< 1.10 suggesting convergence), checking trace

Table 1. Fit indices and statistics for the estimated models

Model	PPp	DIC	BRMSEA [CI 80%]	BCFI [CI 80%]
One factor	< .01	8,343.3	.129 [.125, .133]	.734 [.715, .750]
Four factors	.012	8,170.5	.059 [.047, .073]	.952 [.929, .970]
Four factors near-zero priors	.142	8,153.8	.044 [.000, .065]	.974 [.943, 1.00]
Second order	.009	8,165.3	.056 [.046, .067]	.952 [.901, .968]
Second order near-zero priors	.121	8,147.2	.041 [.018, .057]	.975 [.951, .995]
Bifactor model	.217	8,145.6	.035 [.000, .054]	.984 [.962, 1.00]

Note. PPp = Posterior Predictive p-value; DIC = Deviance Information Criterion; BRMSEA Bayesian Root Mean Square Error of Approximation; BCFI = Bayesian Comparative Fit Index; CI = Credibility Interval.

and autocorrelation plots, and calculating effective sample size.

Results

Four a priori factor structures were tested: one factor, four correlated factors, a second-order model, and a bifactor structure. The four-factor and the second-order models were also estimated with BCFA with near-zero cross-loadings. Therefore, six CFAs were finally tested.

Goodness-of-fit indices are shown in Table 1. The one-factor structure did not reach a reasonable fit. The four correlated factors, the second order model and the bifactor model, had a very good model fit. The inclusion of near-zero prior cross-loading lead to best fit (cross-loadings exactly zero are not tenable). The best fitting models were the second-order model and the bifactor. However, fit differences were negligible between these two models, the BCFI differences were .009 ($< .01$), and the DIC differences were only 1.6. Therefore, the most parsimonious second-order model was retained.

Table 2 offers the standardized factor loadings for the best fitting model (second-order model with near zero priors). While Self-Efficacy, Hope, and Optimism significantly explained their indicators and their cross-loadings were not statistically significant, Resilience operated differently. Cross-loadings with other factors were also statistically non-significant, but its own indicators were not significantly related to Resilience, except for one item in the second-order model. The best fitting model is the second order BCFA with near zero priors. Additionally, second-order standardized loadings for Self-Efficacy, Hope, Resilience, and Optimism were, respectively: .549, .876, .889, and .788.

These results are reinforced when Composite Reliability Indexes (CRIs) are computed for the four factors based on the loadings of their indicators. CRIs are adequate for Self-Efficacy (.82) and Hope (.76), but not for Optimism (.57) and especially for Resilience (.28). This result shows that the amount of shared variance in the Resilience factor is, for this sample, almost irrelevant.

Table 2. Standardized factor loadings for the best fitting model, the second order model; Bayesian second-order model with near-zero cross-loadings in the second column

Item	Self-Efficacy	Hope	Resilience	Optimism
1. Self-Efficacy 1	.699*	.030	.018	.013
2. Self-Efficacy 2	.940*	-.020	-.010	-.002
3. Self-Efficacy 3	.673*	-.015	.025	.041
4. Hope 1	-.055	.488*	.044	.075
5. Hope 2	-.010	.832*	-.007	.037
6. Hope 3	-.013	.544*	.026	.078
7. Hope 4	-.005	.774*	-.006	.022
8. Resilience 1	.013	.024	.654*	.033
9. Resilience 2	.069	-.002	.208	.018
10. Resilience 3	.075	-.011	.126	.014
11. Optimism 1	.054	-.002	-.015	.821*
12. Optimism 2	.023	.011	.002	.848*

Note. *95% credible interval (CI) did not include 0; cross-loadings in italics.

Discussion

Psychological capital (PsyCap) is an important construct related to many different outcomes in psychological research. Some researchers have shown its usefulness in the academic field by showing its relationship with academic performance (Luthans et al., 2019; Martínez et al., 2019). Therefore, its adequate measurement in populations of students is a non-trivial task. In this vein, this research provides psychometric evidence, from a Bayesian approach, for the PCQ-12 in academic contexts.

While the original development and validation found a second-order structure for the scale (Avey et al., 2011), most studies reported evidence for a four-correlated-factor structure (López-Núñez et al., 2018; Santana-Cárdenas et al., 2018; Viseu et al., 2012). This research has tested four alternative models: one factor, four factors, a second-order factor, and a bifactor model. To our knowledge, our research is the first one that explores the possibility of a bifactor structure. Among them, the second-order model and the bifactor showed the best fit to the data. For the sake of parsimony, the second-order model is retained.

These results support the original factor structure proposed by the authors (Avey et al., 2011) and some previous research (e.g. Kamei et al., 2018; León-Pérez et al., 2017).

Although the overall model fit of the scale is adequate, this scale has important psychometric problems, specifically in the measure of Resilience. Reliability results of our research show that, with a sample of this age, the valid measurement of Optimism and especially Resilience is jeopardized, which is in line with other results found in the Spanish-speaking context (Martínez et al., 2021; Schönfeld & Mesurado, 2020). The indicators of Resilience in the PsyCap scale simply do not share enough common variance, and the measuring of this dimension of PsyCap is poor. Resilience items came from the Resilience Scale (Wagnild & Young, 1993), a 25-item scale considered the best option to study Resilience in the adolescent population (Ahern et al., 2006). However, the items included in the PCQ-12 were chosen based on the psychometric results of the PCQ-24 in a sample of 106 engineers (Avey et al., 2011), retaining those items with higher factor loadings and better contribution to internal reliability and construct validity. This procedure, based on a small non-representative sample, could not guarantee the adequacy of the item selection in other samples.

The Resilience item with the worst performance in the factor was Item 10 ("I can get through difficult times at school because I've experienced difficulty before"). The same item showed a factor loading under .3 in a Spanish adaptation (León-Pérez et al., 2017). Item wording could be complex to understand and difficult to answer for adolescents because it is asking for the co-occurrence of two facts: (1) "I can get through difficult times at school" and (2) "I've experienced difficulty times," and the second fact led me to the first one. Younger students could not have experienced difficult times and still believe in their ability to succeed in the future. However, the reliability problems in the Resilience factor were not always related to this item in previous literature. Some studies have also found problems with item 9 (Martínez et al., 2021; Santana-Cárdenas et al., 2018).

Reliability problems in Optimism and Resilience are a common problem in PCQ-12 validations in Spanish and Portuguese translations (López-Núñez et al., 2018; Santana-Cárdenas et al., 2018; Viseu et al., 2012). However, several previous studies using the PCQ-12 in not Spanish-speaking context just inform the reliability of the global PsyCap and do not report the reliability of its dimensions. For example, in Dawkins and colleagues' (2013) review, no studies included using the PCQ-12 reported reliability for the dimensions. It is noteworthy that the study that originally proposed the PCQ-12 does not inform about the reliability of Optimism or Resilience (Avey et al., 2011). Consequently, although the reliability problems could be related to cross-cultural factors and translations, we need further

research also in English-speaking countries. A potential solution could be a revision of the items included in these dimensions considering wider representative samples or an increment in items.

Our study presents some limitations. First, it has been developed with a Spanish sample of students, which could compromise the generalizability of the results. Second, as a psychometric evaluation of the scale, this study lacks the consideration of nomological validity. This research was mainly focused on the factorial structure; complementary validity evidence is needed.

In conclusion, our study roughly confirmed the theoretically proposed second-order structure and highlighted the reliability problems of some of its dimensions. We ask researchers to improve the scale adaptation process or explore alternative measures developed specifically in academic contexts for Resilience (King & Caleon, 2021). Additionally, it could be good advice to include more indicators of Optimism (Djourouva et al., 2019).

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History

Received February 1, 2022

Revision received July 16, 2022

Accepted August 18, 2022

Published online November 2, 2022

EJPA Section / Category Positive Psychology & Assessment

Publication Ethics

The procedure was in accordance with the ethical standards of the Ethical Commission of the University of Valencia (UV-INV-ETICA-1263019) and with the 1964 Helsinki Declaration and its later amendments.

Authorship

Jesús M. Tomás: Conceptualization, methodology, formal analysis, writing – original draft. Sara Martínez-Gregorio: Conceptualization, investigation, writing – original draft. Amparo Oliver: Conceptualization, methodology, writing – review and editing.

Open Science

We report how we determined our sample size, all data exclusions (if any), all data inclusion/exclusion criteria, whether inclusion/exclusion criteria were established prior to data analysis, all

<https://content.hogrefe.com/doi/pdf/10.1027/1015-5759/a000718> - Sara Martínez-Gregorio <sara.martinez@ur.es> - Wednesday, November 02, 2022 2:38:33 AM - IP Address: 147.136.104.150

measures in the study, and all analyses including all tested models. If we use inferential tests, we report exact p values, effect sizes, and 95% confidence or credible intervals.

Open Data: The information needed to reproduce all of the reported results is available in <https://osf.io/t74kb/> (Tomás et al., 2022).

Open Materials: I confirm that there is sufficient information for an independent researcher to reproduce all of the reported methodology (Tomás et al., 2022).

Preregistration of Studies and Analysis Plans: This study was not preregistered.

Funding

Sara Martínez-Gregorio is a researcher beneficiary of the FPU program from the Spanish Ministry of Sciences, Innovation and Universities (FPU18/03710). This research is framed in project PID2021-124418GB-I00 funded by MCIN/AEI/10.13039/501100011033 and by ERDF A way of making Europe.

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Appendix 23. Journal version of Study 4



Article

A Psychometric Study of the Prosocial Behavior Scale: Differential Item Functioning by Gender

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Abstract: Some scales co-exist in the literature to measure prosocial behavior in adolescents. Gender differences in prosocial behavior have been a controversial topic of research. To strengthen future research in the area, the psychometric properties of the most used instruments must be guaranteed, especially its gender non-bias. Our study provides psychometric evidence for the Prosocial Behavior Scale in a sample of adolescents, exploring: (a) its factor structure; (b) reliability; (c) gender-related differential item functioning (DIF); (d) nomological validity. A sample of 512 high school students (mean age = 13.62 (SD = 1.34), 51.6% females) participated in the research. Confirmatory Factor Analysis (CFA) was used to test the factor structure of the scale, which adequately fitted the data ($\chi^2 (35) = 152.224$, $p < 0.001$, Comparative Fit Index (CFI) = 0.905, Root Mean Squared Error of Approximation (RMSEA) = 0.085 90%CI [0.072–0.099], Standardized Root Mean Squared Residual (SRMR) = 0.079). Reliability results were good ($\alpha = 0.74$, $\omega = 0.74$). Regarding the DIF, five items presented some gender-related bias, generally benefiting females. However, the DIF impact could be considered negligible. Correlations with the subdimensions of the psychological capital offered evidence of the nomological validity of the scale. In conclusion, the scale presented adequate psychometric properties that support its ability to effectively assess prosocial behavior and gender differences in the prosocial behavior samples of adolescents. Additionally, the results obtained imply that gender differences in the manifestations of prosocial behavior require measurements that can fairly sample behaviors characteristic of each gender.

Keywords: differential item functioning; psychological capital; validation; prosociality; adolescence; psychometric properties



Citation: Martínez-Gregorio, S.; Tomás, J.M.; Oliver, A. A Psychometric Study of the Prosocial Behavior Scale: Differential Item Functioning by Gender. *Behav. Sci.* **2023**, *13*, 259. <https://doi.org/10.3390/bs13030259>

Academic Editor: Gongming Niu

Received: 25 January 2023

Revised: 7 March 2023

Accepted: 9 March 2023

Published: 15 March 2023



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1. Introduction

Prosocial behavior refers to voluntary actions conducted to benefit others [1]. Although this behavioral tendency would be positive along the lifespan, it may be crucial in some early stages as adolescence. Previous empirical research supports the idea that prosocial behavior promotes positive academic outcomes [2], psychosocial adjustment [3,4], and well-being [5,6].

Different self-reported scales for assessing prosocial behavior in adolescents co-exist in the literature. Table 1 includes the scales most widely used internationally. Some of them approach the construct from multidimensional perspectives, whereas others present a unidimensional structure. The Objective Measure of Prosocial Reasoning (PROM) method [7] includes stories that invoke a conflict between adolescent needs, wants, and desires and those of others. The respondents are asked to decide what the main character of the story should do, showing their prosocial reasoning. Another multidimensional worldwide spread instrument is the Prosocial Tendencies Measure—Revised (PTM-R) [8]. This is the adapted version for adolescents of the Prosocial Tendencies Measure (PTM) [9]. Not being that common, the Teenage Inventory of Social Skills (TISS) [10] measures prosocial behaviors

such as cooperation or altruism in one of their two sub-scales. Complementary, the other one assesses asocial behaviors such as aggression or social anxiety.

Broad instruments for adolescent adjustment can also include a dimension for prosociality. That is the case for the Strengths and Difficulties Questionnaire (SDQ) [11]. The SDQ is a screening tool for assessing psychosocial adjustment in children and adolescents. Despite not being prosocial-specific, it presents a five-item subdimension that measures prosocial behavior. The use of this dimension as a prosociality scale is interesting because it has been included in the National Health Survey in Europe [12]; therefore, a large quantity of data is available. The SDQ has alternative versions wherein the rater is a teacher or the parents [12,13]. Although our work is focused on self-reported prosociality scales, there are other alternatives for assessing prosocial behavior with external raters, such as the prosocial with peers subscale in the Child Behavior Scale (CBS) [14] or the parent-report Brief Adolescent Prosocial Perceptions Scale (BAPPS-P) [15]. The latter has a self-reported alternative, the BAPPS-S. However, to date, it has been scarcely used.

The last scale widely used to assess prosocial behavior is the Prosocial Behavior Scale (PBS) [16], which is different from the Adult Prosocial Behavior Scale [17]. PBS is a 10-item unidimensional scale. Originally, it included 15 items; however, five of them are control items that are not taken into consideration for the total prosocial behavior score. It has been mainly used in a Spanish-speaking context, where we can find many articles using it in the last 20 years [18–32]. Although being widely used, a proper psychometric study for the Spanish adaptation has never been carried out. Some papers refer to Del Barrio et al. [33] to justify the adequate psychometric properties of the instrument. However, it is a widespread mislead. Del Barrio et al. [33] studied the psychometric properties of the Aggression and Emotional Instability scales from Caprara and Pastorelli [16], but not the psychometric properties of the PBS. Through previously cited research, we know that its reliability results range between 0.60 and 0.85 [18–32]. However, only two previous studies have reported evidence about its factor structure [19,26]. Carlo et al. [19] found problems with one item and reported the Confirmatory Factor Analysis (CFA) results of a reduced version with nine items. Consequently, as far as our concern, Malonda et al. [26] were the first authors to report a satisfactory adjustment of the unidimensional structure.

This lack of a properly complete and more updated psychometric study of the PBS affects specifically the validity related evidence. For example, some relevant aspects such as the gender-related differential item functioning remain understudied. By gender-related differential item functioning, we refer to the fact that the item score depends not just on the prosocial behavior of the respondent, as it would also vary considering their gender. Gender differences, while studying global prosocial behavior, consistently benefit females [34]. Some authors have argued that, rather than a matter of grade differences in the actual prosocial behavior, there are perhaps differences in how each individual, females and males, acts prosocially [35]. Eagly [36] concluded that females present more prosocial behavior related to communal attributes, whereas males' prosocial behavior may be more agentic. Consequently, it has been criticized that the items of prosocial behavior scales may typically reflect gender-role stereotypes, being more prevalent on the female-type of prosocial behavior [37]. Xiao et al. [38] conducted a meta-analysis of gender differences in adolescents using the PTM-R. They found that gender differences were higher in those dimensions considered "gender-type prosocial behavior". Females report higher levels of altruistic, compliant, and emotional prosocial behavior, whereas males present higher levels of public prosocial behavior [38]. Similarly, Nielson et al. [37] noticed that, on prosocial behaviors oriented to peers, females presented higher emotional support, inclusion, and sharing.

Table 1. Instruments for assessing prosocial behavior in adolescents.

Scale	Original Authors	N Items	Dimensions	Psychometric Studies	Recent Applications
Objective Measure of Prosocial Reasoning (PROM)	Carlo et al. [7]	56 items	Hedonistic, needs-oriented, approval, stereotypic, and internalized	English [7]; Spanish [27,39]; Chinese [40]; Portuguese [43]	[42,43]
Prosocial Behavior Scale (PBS)	Caprara and Pastorelli [16]	10 items	Unidimensional	Italian [16]; Spanish [26]; English [8]; German [44]; Lithuanian [41]; Chinese [45]; Portuguese [46]; Spanish [30]; English [11]; Chinese [48]; Dutch [49,50]; German [51]; Norwegian [52]; Spanish [12,53,54]; French [55]; Swedish [51,56]; Cypriot Greek [51]; Italian [51]	[20,32]
Prosocial Tendencies Measure—Revised (PTM-R)	Carlo et al. [8]	25 items	Altruistic, compliant, emotional, dire, public and anonymous		[38,47]
Strengths and Difficulties Questionnaire (SDQ)—Prosocial dimension	Goodman [11]	5 items	Unidimensional		[57,58]
Teenage Inventory of Social Skills (TISS)	Inderbitzen and Foster [10]	40 items	Prosocial behavior and asocial behavior	English [10]; Spanish [39]	[60]

The complexity of the measurement of gender differences in prosocial behavior requires robust psychometric studies that guarantee adequate item functioning. These efforts have been previously carried out when studying the gender invariance of the SDQ [12,53], the PTM-R [18,30], and the PROM [39]. All of them were reported in a multigroup CFA analysis conducted to examine invariance across gender. However, not all of them achieved a scalar gender invariance. Ortuño-Sierra et al. [53] did not test scalar invariance, and only tested the equivalences of the structure and factor loadings, that is, metric invariance. Carlo et al. [39] did not find support for the scalar gender invariance of the PROM, finding differences in five-item intercepts.

Although previous research has used the PBS to explore gender differences in prosocial behavior [18,24,61], its gender-related differential item functioning has never been analyzed. Research with other scales of prosociality suggests that this aspect is crucial to effectively measure prosociality in both genders, not being affected by a gendered vision of prosociality. Consequently, given the importance of the PBS in a Spanish context, a proper psychometric study to guarantee its reliability and validity in its Spanish form is required. Therefore, our study aims to evaluate the psychometric properties in its Spanish adaptation. The study has four objectives: (a) to verify its one-dimensionality; (b) to test its reliability; (c) to explore its gender-related differential item functioning; (d) to collect evidence of its nomological validity. The following hypotheses are derived from these objectives:

Hypothesis 1 (H1). *The PBS has a unidimensional structure.*

Hypothesis 2 (H2). *The reliability results of the scale in Spanish adolescents are adequate.*

Hypothesis 3 (H3). *The items of the PBS do not present gender-related differential functioning.*

Hypothesis 4 (H4). *The results of the PBS are positively related to the psychological capital of the students, as evidence of nomological validity [62,63].*

2. Materials and Methods

2.1. Participants

The sample was composed of 512 high school students from Valencia, Spain. The mean age was 13.62 (SD = 1.34). Of the participants, 51.6% ($n = 264$) were females and 45.5% ($n = 233$) were males. Nine students (1.8%) self-identified themselves as “other” and six did not answer the question. Regarding their high schools, 57.22% ($n = 293$) attended public ones, whereas 26.37% ($n = 135$) attend private or semi-private ones. Most of the respondents were studying compulsory secondary education: 132 (25.8%) in their first course, 83 (16.2%) in their second course, 190 (37.1%) in their third course, and 72 (14.1%) in the fourth course. Twenty-five students were in post-compulsory secondary education, baccalaureate: 21 (4.1%) were in their first year and 4 (0.8%) were in the second and final year. The remaining 2% ($n = 10$) did not declare which course they were attending.

2.2. Procedure

The sampling for the study was performed at the convenience of the educational centers that were supportive of the research. The only inclusion criteria were that the students were in secondary education and that their families agreed to their participation; no exclusion criteria were considered. The survey and procedure met the American Psychological Association (APA) Ethical Standards for human research and were approved by the Research Ethics Committee of the University of Valencia as well as the Educational Government of Valencia (UV-INV_ETICA-1218680). The research team contacted the high school education authorities to present the research project and ask for their authorization to send the information to the families. In those high schools willing to participate, the families and students were informed about the research, and they signed informed consent. Participation in the survey was anonymous, voluntary, and non-rewarded.

Once informed consent was received, students answered the survey in class. The estimated duration for the entire survey was 20–25 min; however, there was no time constraint for any of the participants. Students who did not wish to participate remained in the classroom studying on their own until the rest of the classmates finished the questionnaire. As data were recruited in class, the lack of response from the participants was negligible (less than 1%).

2.3. Instruments

Alongside the socio-demographic questions (age, gender, course, and high school), two questionnaires were administered for the current research:

- **Prosocial Behavior Scale (PBS)** [16]. Although this scale includes 15 items, just 10 of them ask for prosocial behavior. The remaining five items are control items that do not contribute to the total prosocial behavior score (items PB3, PB6, PB8, PB11, and PB14). This research only analyzes those items measuring prosocial behavior. However, the items are named through the manuscript, retaining their original numeration from 1 to 15. The item content is presented in Table 2. In this study, the items were administered in its Spanish form. The answer format is a 3-point Likert scale (1—never, 2—sometimes, and 3—often).
- **Psychological Capital Questionnaire (PCQ-12)** [64]. This questionnaire was recently adapted and validated for Spanish adolescent samples by Tomás et al. [65]. It measures the four subdimensions of psychological capital in the educational context: self-efficacy (three items), hope (four items), resilience (three items), and optimism (two items). An example item is “I usually take stressful things at school in stride”. Following Tomás et al.’s [65] adaptation, we used a 5-point Likert response format, ranging from 1—strongly disagree to 5—strongly agree. The four-factor structure with a second-order factor fits adequately our data: $\chi^2(50) = 269.181$, $p < 0.001$, Comparative Fit Index (CFI) = 0.936, Root Mean Squared Error of Approximation (RMSEA) = 0.095 90%CI [0.084–0.106], and Standardized Root Mean Squared Residual (SRMR) = 0.052.

The reliability results for our sample administration were for self-efficacy ($\alpha = 0.81$, $\Omega = 0.85$), hope ($\alpha = 0.76$, $\Omega = 0.81$), resilience ($\alpha = 0.37$, $\Omega = 0.38$), and optimism ($\alpha = 0.61$; $\Omega = 0.67$).

Table 2. Item content.

	Content
PBS1	I try to make sad people happier
PBS2	I spend time with my friends
PBS3 *	When I have to do things that I don't like I get mad
PBS4	I try to help others
PBS5	I am gentle
PBS6 *	I cry about things that don't matter
PBS7	I share things I like with my friends
PBS8 *	I feel annoyed
PBS9	I help others with their homework
PBS10	I let others use my toys
PBS11 *	I have bad dreams
PBS12	I like to play with others
PBS13	I trust others
PBS14 *	I bite my fingernails
PBS15	I hug my friends

Notes: * Control items.

2.4. Data Analysis

The psychometric properties of the PBS were assessed following four steps: (1) factor structure, (2) descriptive statistics and reliability, (3) differential item functioning, and (4) nomological validity.

The factor structure was assessed using Confirmatory Factor Analysis (CFA) carried out in Mplus 8.7 [66]. Due to the categorical nature of the response scale, corrected Weighted Least Square Mean and Variance (WLSMV) was used as the estimation method. Some indices were considered to evaluate the adequacy of the unidimensional structure of the data [67], including (1) the chi-square test; (2) the CFI (adequate if above 0.9); (3) the RMSEA (adequate if below 0.08); (4) the SRMR (adequate if below 0.08). Full Information Maximum Likelihood methods were used for missing data, as they are reliable for missing at random (MAR) and missing completely at random (MCAR) missingness [68].

Some descriptive statistics for the items were calculated with IBM SPSS Statistics 26, i.e., means, standard deviations, skewness, kurtosis, inter-items correlations, and corrected item-total correlations. Reliability was assessed via Cronbach's alpha and McDonald's omega. Both indicators are considered adequate if their value is above 0.7 [69].

Next, the Differential Item Functioning (DIF) was evaluated in R [70], using the *lordif* package [71]. Based on the Graded Response Model, the *lordif* package tests DIF, estimating three nested proportional-odds logistic regression models. Model 1 expresses the cumulative probabilities that the true item response falls into if a specific response category is higher based on one's level in the trait (in this case, the prosocial behavior). Model 2 adds the effect of the grouping variable (gender) on this probability, or uniform DIF. Model 3 includes the interaction of the trait and the grouping variable to assess non-uniform DIF. From this framework [72], the contrast of the fit of the models, in terms of the likelihood ratio test (χ^2), allows us to detect different kinds of DIF. Uniform DIF is tested by comparing likelihood values for Models 1 and 2, whereas non-uniform DIF is tested by comparing Models 2 and 3. Additionally, a statistically significant result in the chi-square test between Models 1 and 3 could be interpreted as a "total DIF effect" [71]. Some authors also propose that the magnitude of DIF could be measured through changes in the *pseudo*- R^2 statistics. We employed the McFadden *pseudo*- R square. Zumbo [73] set some cut-off criteria to interpret them, being results under 0.13 and 0.26 and thus considered negligible and moderate, respectively. Results above 0.26 were considered large. The DIF analysis

was followed with some visual analyses of the plots the lordif package offers for items with DIF and the individual-level DIF impact.

Lastly, nomological validity was assessed through Pearson's correlations between psychological capital subdimensions and the total score of prosocial behavior (PB). Based on previous literature, the psychological capital could be consider as a precursor of prosocial behavior [62,63]. Consequently, positive correlations between both constructs indicated the nomological validity of the PBS. This analysis was performed in IBM SPSS Statistics 26. To complement DIF analyses, a new aggregate measure of prosocial behavior (PB *), without including items with DIF, was computed and correlated with the psychological capital subdimensions and PB. Correlation comparisons were conducted between PB and PB * correlations with the psychosocial capital dimensions to assess DIF's impact on nomological validity.

3. Results

3.1. Factorial Structure

A CFA was specified and tested to verify the theoretical unidimensional structure. The model fit adequately with the data: $\chi^2 (35) = 152.224$, $p < 0.001$, CFI = 0.905, RMSEA = 0.085 90%CI [0.072–0.099], SRMR = 0.079. Figure 1 shows the standardized factor loadings of the items. All of them are well above 0.3, ranging between 0.407 and 0.803.

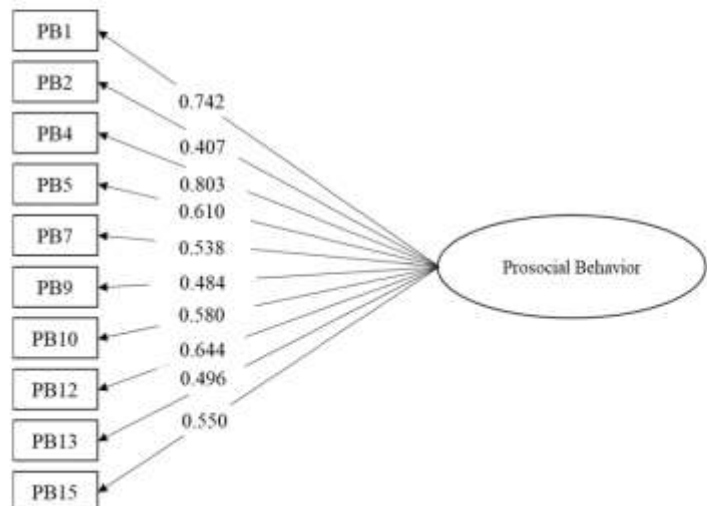


Figure 1. Factorial structure. Note: all the factor loadings are statistically significant $p < 0.001$.

3.2. Descriptive Statistics and Internal Consistency

Table 3 includes the descriptive statistics (mean, standard deviation, skewness, kurtosis, inter-item correlation, and corrected item-total correlation) of the items. Considering that the Likert scale ranges between 1 and 3, all the item means are above the mid-point. The item-total correlations are all above 0.3. However, item 2 presents the lowest item-total correlations with non-statistically significant inter-item correlations in items 4, 5, and 9. Item 2 had the lowest factor loading, as shown in Figure 1. The reliability results for the scale are good, with a Cronbach's alpha of 0.74 and a McDonald's omega of 0.74.

Table 3. Means (M), standard deviations (SD), skewness (g1), kurtosis (g2), inter-item correlations, and corrected item-total correlations (r_{it}).

	M	SD	g1	g2	PB1	PB2	PB4	PB5	PB7	PB9	PB10	PB12	PB13	r_{it}
PB1	2.75	0.48	−1.68	1.93										0.44
PB2	2.70	0.50	−1.29	0.58	0.15 *									0.30
PB4	2.73	0.47	1.36	0.62	0.52 *	0.07ns								0.48
PB5	2.70	0.50	−1.33	0.73	0.29 *	0.09ns	0.39 *							0.41
PB7	2.50	0.60	−0.75	−0.41	0.18 *	0.19 *	0.19 *	0.15 *						0.42
PB9	2.24	0.63	−0.25	−0.65	0.28 *	0.05ns	0.34 *	0.21 *	0.21 *					0.37
PB10	2.40	0.65	−0.61	−0.61	0.24 *	0.14 *	0.27 *	0.19 *	0.28 *	0.24 *				0.42
PB12	2.66	0.57	−1.50	1.24	0.18 *	0.30 *	0.15 *	0.28 *	0.31 *	0.19 *	0.34 *			0.46
PB13	2.37	0.62	−0.45	−0.66	0.15 *	0.25 *	0.16 *	0.26 *	0.26 *	0.11 *	0.22 *	0.30 *		0.39
PB15	2.25	0.76	−0.46	−1.14	0.28 *	0.16 *	0.35 *	0.24 *	0.25 *	0.16 *	0.23 *	0.21 *	0.20 *	0.41

Notes: * $p < 0.001$; ns = non-statistically significant.

3.3. Gender-Related Differential Item Functioning

Figure 2 shows the theta distribution for females and males. Although males show a slightly lower level of prosocial behavior, there is a broad overlap in the distributions. Table 4 presents the results for the χ^2 tests between Model 1 and Model 2, Model 1 and Model 3, and Model 2 and Model 3 for all items. The statistically significant difference between Model 1 and Model 2 indicates the presence of a uniform DIF, whereas the statistically significant difference between Model 2 and Model 3 denotes a non-uniform DIF in the item. The statistically significant chi-square test between Model 1 and 3 may be interpreted as an overall test of the “total DIF effect”. The results in Table 4 indicate that items PB1, PB4, PB12, PB13, and PB15 present DIF. All of them present uniform DIF; however, items PB1 and PB12 also present non-uniform DIF. The non-uniform DIF in these items indicates that the DIF varies depending on the prosocial behavior level. However, considering the $pseudoR^2$ changes, the DIF in all the items may be considered negligible [73].

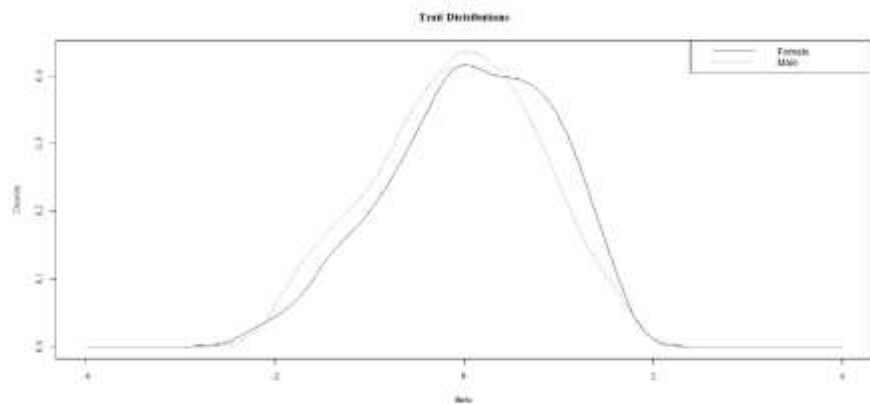


Figure 2. Theta distributions by gender.

Table 4. Chi-square tests and changes in McFadden’s $pseudoR^2$ for DIF detection.

	Model 1 vs. Model 2		Model 1 vs. Model 3		Model 2 vs. Model 3	
	p -Value χ^2 Test	$PseudoR^2$ Δ McFadden	p -Value χ^2 Test	$PseudoR^2$ Δ McFadden	p -Value χ^2 Test	$PseudoR^2$ Δ McFadden
PB1	0.000	0.053	0.000	0.088	0.000	0.035
PB2	0.082	0.006	0.199	0.006	0.645	0.000
PB4	0.000	0.045	0.000	0.053	0.054	0.007
PB5	0.847	0.000	0.968	0.000	0.867	0.000
PB7	0.921	0.000	0.403	0.002	0.179	0.002
PB9	0.038	0.005	0.053	0.007	0.212	0.002
PB10	0.190	0.002	0.290	0.003	0.383	0.000
PB12	0.000	0.025	0.000	0.038	0.004	0.013
PB13	0.000	0.016	0.002	0.016	0.630	0.000
PB15	0.000	0.084	0.000	0.087	0.106	0.003

Figures 3–7 show the diagnosis plots for each item with DIF. While interpreting the plots, we should keep in mind that items PB1 to PB4 retain two response categories from the original 3-point Likert scale because the program, by default, retains those categories with a minimum of five cases per cell. Each figure displays four graphics: (1) the upper-left graphic presents the item characteristic curves (ICCs) for each group; (2) the upper-right plot shows the differences between the ICCs for each group; (3) the lower-left graphic shows item response functions for each group and the values for the slopes and category threshold values (in that order); (4) the lower-right plot shows the ICCs’ differences when weighted by the distribution for the focal group (males).

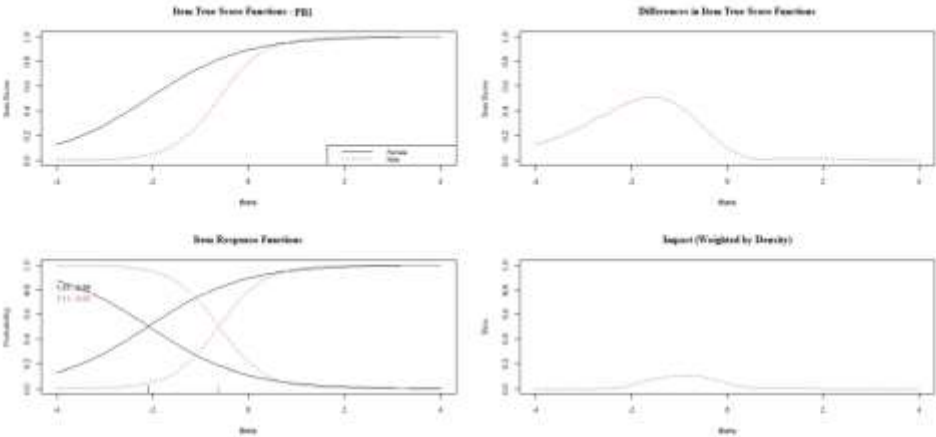


Figure 3. DIF plots for item PB1.

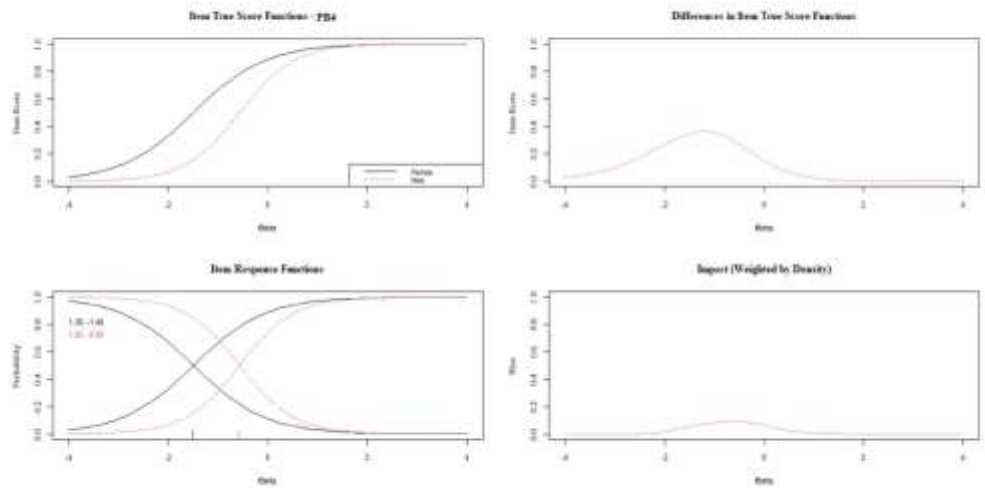


Figure 4. DIF plots for item PB4.

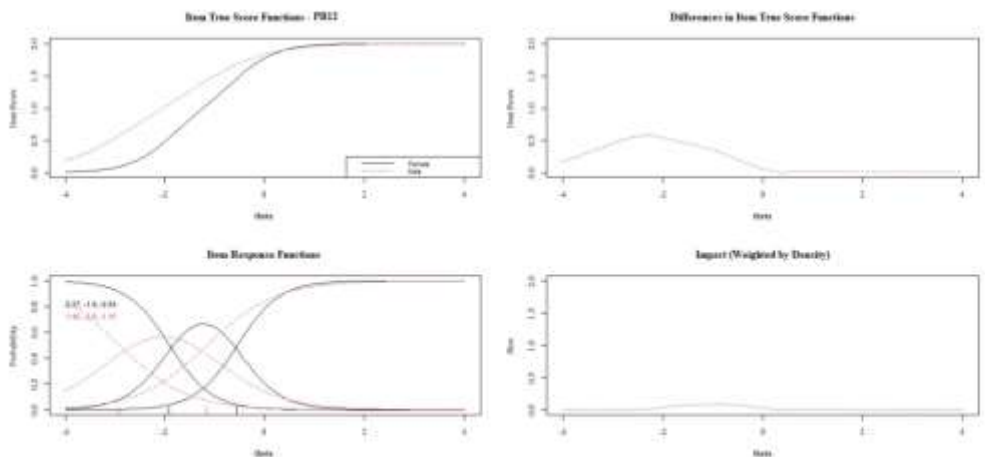


Figure 5. DIF plots for items PB12.

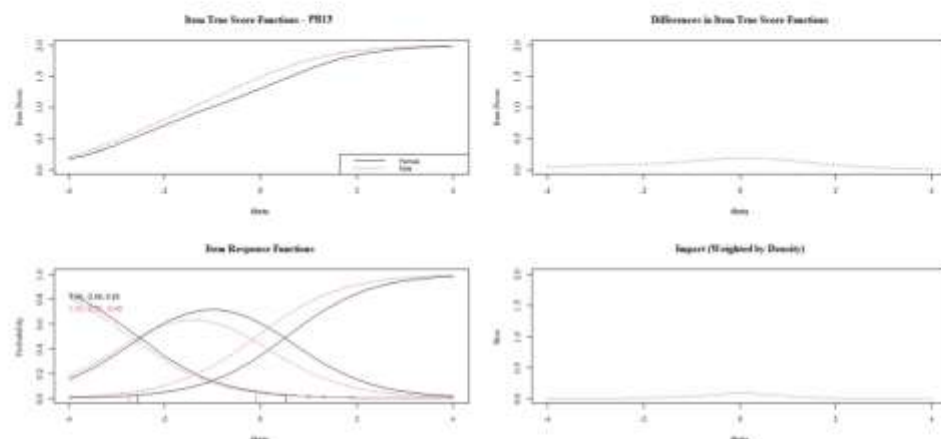


Figure 6. DIF plots for item PB13.

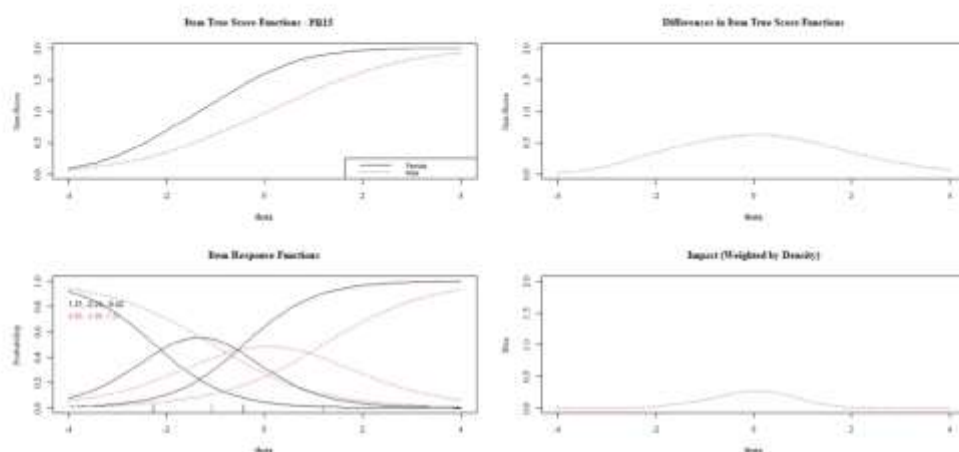


Figure 7. DIF plots for item PB15.

The visual analysis of item PB1 (Figure 3) indicates a DIF, especially on the lower levels of prosocial behavior, where females present higher item scores with the same theta value. Additionally, the item presents a non-uniform DIF, being more discriminant for males (2.11 vs. 1.01).

As can be seen in Figure 4, item PB4 only presents uniform DIF, which is more prevalent in the lower levels of prosocial behavior. As in item PB1, females tend to select higher categories than males with the same overall prosocial behavior. The graphics show the lack of large changes in the item slope between groups (1.38 vs. 1.83), which supports the null non-uniform DIF.

Figure 5 offers DIF results for item PB12. Although the DIF is mainly due to the first threshold (-1.9 vs. -2.9), as in previous items, item PB12 shows the opposite DIF. In this case, the males present a higher item score with the same level of overall prosocial behavior.

Additionally, item PB12 shows a non-uniform DIF, with a higher slope value for females (2.37 vs. 1.46).

Figure 6 demonstrates that item PB13 presents a slightly uniform DIF, benefiting male results. Contrary to the previous items, in this case, the DIF is more pronounced in the middle levels of prosocial behavior.

Lastly, Figure 7 displays a uniform DIF for item PB15. As in most of the items with DIF, females present a higher item score than their male counterparts with the same overall prosocial behavior. Once the DIF has been analyzed item by item, Figure 8 shows the impact of these DIFs on the test characteristic curves (TCCs). The DIF effect on TCCs seems to be scarce while considering all the items, which is in line with the interpretations of the $pseudoR^2$ differences.

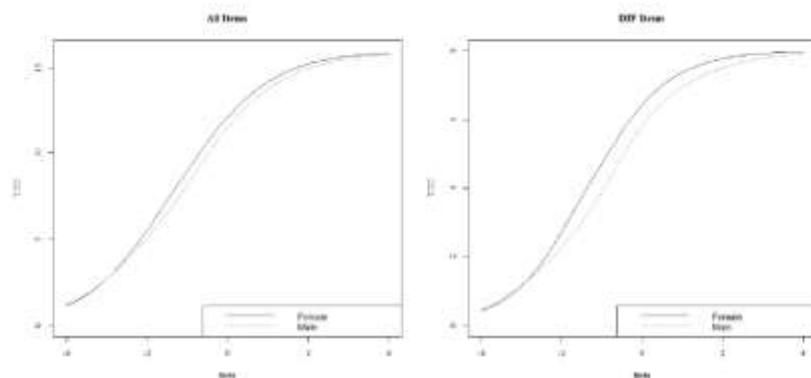


Figure 8. Tests characteristics curves (TCCs) by group.

The analysis of the individual-level DIF impact complements the DIF exploration. The boxplot in Figure 9 indicates the differences between the individual scores ignoring DIF and those that consider it (purified). The median difference in theta estimation for the global sample is close to zero. However, the second plot in Figure 9 indicates that, in all levels of prosocial behavior, the females, in almost all cases, would receive a lower score if we account for DIF. Contrarily, the correction for DIF would lead to higher scores in males.

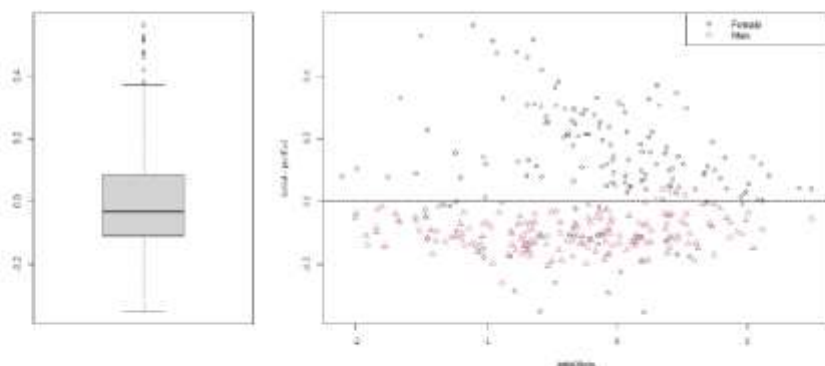


Figure 9. Individual-level DIF impact.

3.4. Nomological Evidences for Validity

The nomological validity of the scale was assessed by correlating the prosocial behavior (PB) results with other theoretically related constructs, such as the psychological capital subdimensions, namely, self-efficacy, hope, resilience, and optimism. Table 5 presents all the correlations. Additionally, an aggregated measure of the items without DIF (PB*) was calculated and included in the correlations. All the correlations were positive and statistically significant ($p < 0.001$). The correlation between the Prosocial Behavior Scale with and without items with DIF is positive and high ($r = 0.89$, $p < 0.001$). Contrasts between the validity coefficients obtained with PB and PB* show no statistically significant differences ($p > 0.05$), indicating a small or null impact of the DIF in the nomological validity of the scale.

Table 5. Nomological validity.

	Self-Efficacy	Hope	Resilience	Optimism	PB	PB *
Self-efficacy	1	0.382	0.322	0.361	0.295	0.256
Hope		1	0.292	0.504	0.309	0.309
Resilience			1	0.292	0.149	0.152
Optimism				1	0.261	0.245
PB					1	0.887
PB *						1

Notes: All the correlations are statistically significant $p < 0.001$; PB = Prosocial Behavior; PB * = Prosocial Behavior scale without items with Differential Item Functioning.

4. Discussion

This paper aims to conduct the first psychometric study of the PBS in a Spanish sample. In doing so, we offer evidence of its one-dimensionality, reliability, differential item functioning, and nomological validity. Our results support the use of the scale in Spanish-speaking contexts as a brief and robust measure of global prosocial behavior. Additionally, we develop the study of the conceptualization of prosocial behavior by considering gender differences.

The unidimensional factor structure adequately fitted the data, and all the items presented factor loadings above 0.3, which is in line with the previous study that reported PBS factor structure in a similar sample [26]. Its reliability was also adequate and fit into the range of reliability results of previous studies [18–32].

Regarding the DIF study of PBS items, our results could be considered consistent with previous literature. Although half of the items presented DIF, its effect on the global scale functioning may be considered negligible. However, some insights arise from them. Firstly, the measurement of prosocial behavior using this scale benefits females' scores. The DIF analysis could help us to understand those behaviors that are more characteristic in males and those that are more prevalent in females' prosocial behavior. The items that did not present a DIF were the ones related to sharing behaviors, such as PB7 ("I share things I like with my friends") or PB10 ("I let others use my games"), the helping behavior with classmates' homework (PB9), and items PB2 and PB5, related to the time spent with friends and kindness, respectively. These results are similar to those reported by Eisenberg and Fabes [34].

Our results suggest that these kinds of prosocial behaviors would be equally present in females and males. Contrarily, differences emerged in the rest of the scale. Females presented a higher probability to manifest a higher score on those items related to emotional support as PB1 ("I try to make sad people happier"), PB4 ("I try to help others"), and PB15 ("I hug my friends"). This result agrees with Xiao et al. [38], who found that females present higher results on the emotional dimension of the PTM-R as well as in the results of the qualitative studies with adolescents [74]. The only items where males performed better were PB12 ("I like to play with others") and PB13 ("I trust others").

These results should not be interpreted as innate differences between men and women. For example, although some studies presented gender differences in empathy [75], these differences could not exist on natal levels of empathy [76]. Rather, they would be attributable to different patterns of socialization [77]. It would be the predominant culture that favors the appearance of some behaviors and not others in each gender [78]. Additionally, another factor that could artificially generate gender differences is the self-reported method, where females could tend to declare higher prosocial behavior to show congruency with the female stereotype of “kindness” [34,78,79]. All of these aspects should be kept in mind while developing prosocial behavior measures and when studying gender differences. Nielson et al. [37] developed a longer multidimensional scale that includes twenty items classified into five categories (defending, emotional helping, inclusion, physical helping, and sharing), trying to balance male characteristics behaviors with female ones. They did this to generate a scale that offers a comparable total score.

Finally, we tested the nomological validity of the scale by correlating the total prosocial behavior score with the subdimensions of the psychological capital. As expected, all the correlations were positive and statistically significant. Our results were similar to those found in an adult sample by Aydin and Aslan [80], who also found that the subdimension with the lowest relationship with prosocial behavior was resilience. Zhang et al. [63], through a longitudinal study, tested the predictive power of psychological capital on prosocial behavior, verifying its antecedent role. In this case, only optimism and self-efficacy showed statistically significant coefficients. Studies that included psychological capital as a global dimension also reported a positive effect on prosocial behavior [63,81]. Consequently, the PBS scores reproduce the relationships previously found in the literature with other prosocial behavior scales.

Our study presents some limitations. First of all, it is based on a cross-sectional sample of high school students from Spain. Consequently, the generalizability of the psychometric properties reported to primary students or Latin American countries requires further research. Future studies may propose longitudinal investigations to ensure scale invariance over time. These studies will make the results obtained from different educational levels comparable and will guarantee the robustness of the studies of the development of prosocial behavior during education. Additionally, the inclusion of more than one time measurement would allow future researchers to complement the psychometric study with evidence of test-retest reliability. As another limitation to be acknowledge, gender has been considered only as a dichotomous variable. Other variables, such as gender-role orientation, would be also interesting to understand regarding the interaction of the individual gender alignment with the DIF.

In summary, the PBS has shown adequate psychometric properties and, when the items are administered together, their gender bias is negligible. Consequently, it could be a good alternative for researchers or practitioners who need to administer a global and relatively short prosocial behavior scale. Additionally, our results indicate that a consideration of the specific characteristics of the prosocial behavior in each gender is crucial to properly understand gender differences without biases that systematically benefit females or, less frequently, males. Once we more accurately approach an understanding of these differences, we could better design more effective initiatives to promote sustainable prosociality.

Author Contributions: Conceptualization, S.M.-G.; methodology, S.M.-G. and J.M.T.; formal analysis, S.M.-G. and J.M.T.; investigation, S.M.-G. and A.O.; data curation, S.M.-G.; writing—original draft preparation, S.M.-G.; writing—review and editing, A.O. and J.M.T.; supervision, A.O. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Spanish Ministry of Universities, grant number FPU18/03710.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Committee of the University of Valencia (protocol code UV-INV_ETICA-1806947 and 4 November 2021).

Informed Consent Statement: Written informed consent has been obtained from the legal tutors and participants.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: Sara Martínez-Gregorio is a researcher beneficiary of the FPU grant from the Spanish Ministry of Universities (FPU18/03710). This study is framed according to the goals of the consolidated teaching innovation group CIDES-CR "Competencies and teaching innovation in higher education with vulnerable groups" (GCID23_2577102) and the consolidated teaching innovation group IDEEA "Teaching Innovation in Statistics and Related Subjects" (GCID23_2574917), of which the authors are members. We would like to thank the management teams and teachers of the high schools that participated in the research on a voluntary basis.

Conflicts of Interest: The authors declare no conflict of interest.

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