Revista de Psicodidáctica 28 (2023) 173–181

Revista de Psicodidáctica

www.elsevier.es/psicod

Original

Generalizability of alignment and sorting effects in secondary education: Evaluation of the effectiveness of an activity for the entrepreneurial competence promotion

Sara Martínez-Gregorio * and Amparo Oliver

Department of Methodology for the Behavioral Sciences, University of Valencia, Spain

ARTICLE INFO

Article history:
Available online 12 May 2023

Keywords:
Entrepreneurship education
Entrepreneurial intention
Vocational training
Psychological capital
Prosocial behavior

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 towards 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 towards 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.

Generalización de los efectos de alineación y clasificación en educación secundaria: Evaluación de la eficacia de una actividad para la promoción de la competencia emprendedora

Palabras clave:
Educación en emprendimiento
Intención emprendedora
Comportamiento prosocial
Orientación vocacional
Capital psicológico

RESUMEN

La iniciativa emprendedora se considera una de las competencias clave a trabajar en la enseñanza secundaria. Sin embargo, hay escasa investigación sobre la eficacia de las actividades de exposición al emprendimiento en la adolescencia. Los resultados pueden interpretarse erróneamente si no se tienen en cuenta efectos ocultos como los de clasificación y alineación. El objetivo de este estudio es doble. En primer lugar, comprobar la eficacia de una actividad de exposición al emprendimiento en un instituto de enseñanza secundaria en España. En segundo lugar, identificar la presencia de los efectos de clasificación y alineación en población adolescente. El estudio se basa en un diseño cuasi-experimental con grupo control con 225 estudiantes participantes, 158 han sido asignados aleatoriamente al grupo de intervención ($M = 13.19 \pm 0.91$ años, rango de 11 a 15; 57.6% chicos) y 67 al control ($M = 13.33 \pm 0.88$ años, rango de 11 a 15; 59.7% chicas), conforme a un muestreo por conglomerados. Han sido evaluadas antes y después de

PII of original article:S1136-1034(23)00008-4.

* Corresponding author.
E-mail address: sara.martinez@uv.es (S. Martínez-Gregorio).

https://doi.org/10.1016/j.psicoe.2023.05.002

la intervención variables relevantes como la intención emprendedora, la autoeficacia emprendedora, la actitud hacia el emprendimiento, la norma subjetiva, el capital psicológico, el comportamiento prosocial y la certeza sobre la elección de futuros estudios. La actividad de exposición al emprendimiento consta de seis sesiones en las que se pide a los estudiantes que, en equipos, desarrollen una idea emprendedora que ayude a resolver un problema social. Los resultados, considerando las medias de los grupos, sólo muestran diferencias estadísticamente significativas en actitudes hacia el emprendimiento. La intervención actúa como amortiguador del descenso de esta variable en el grupo intervención. El análisis confirma que los efectos de alineación y clasificación al evaluar la intención emprendedora en actividades de exposición al emprendimiento no son exclusivos de universitarios y pueden generalizarse a adolescentes. Se discuten las implicaciones en orientación vocacional.

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 thought 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, its 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; 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 four were conducted in secondary education and one 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 towards 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 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 (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 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*: A greater increase in their *entrepreneurial intention*, *attitudes towards entrepreneurship*, *subjective norm* and *entrepreneurial self-efficacy*, than a control group. *Hypothesis 2:* A greater increase in their *psychological capital*, than a control group. *Hypothesis 3:* A greater increase in their *prosocial behavior*, than a control group. *Hypothesis 4:* 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, 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*: 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:* 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 schools, three secondary schools participated in the research; two public secondary 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 1 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*

Table 1
Sociodemographic characteristics for intervention and control group

	Intervention (n = 158)	Control (n = 67)	Statistical test
Mean age (*SD*)	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 (*SD*)	2.43(0.77)	2.61(0.82)	$t(201) = -1.416$; $p = .16$; $d = -0.22$ 90%CI [−0.47, 0.01]

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.

Instruments

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

Entrepreneurial Intention. This variable, as well as its antecedents (attitude towards 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 towards 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 towards 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 towards 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 (UV INV_ETICA 1806947), as well as the Education Government of Valencia, approved the research. 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 six 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 towards 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 ($\Delta\bar{EI}_i$) 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 ($\bar{EI}_{t=1}$) on the $\Delta\bar{EI}_i$.

$$\Delta\bar{EI}_i = \left|EI_{i,t=2} - mean(EI_{t=2})\right| - \left|EI_{i,t=1} - mean(EI_{t=1})\right|$$

Table 2
Descriptive statistics pre and post intervention for intervention and control group

	Intervention ($n = 158$)		Control ($n = 67$)	
	Pre *M*(*SD*)	Post *M*(*SD*)	Pre *M*(*SD*)	Post *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 towards Entrepreneurship; SN = Subjective Norms; ESE = Entrepreneurial Self-Efficacy; PC = Psychological Capital; PSB = Prosocial Behavior.

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 ($\bar{EI}_{t=1}$) as a predictor. Model 3 included the effect of the change in *attitudes towards entrepreneurship* (ΔATE) and *entrepreneurial self-efficacy* (ΔESE) on the dependent variable.

Results

Pre-intervention comparability assessment

Table 2 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 towards 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].

Results for the effectiveness of the activity

Once the pre-intervention equivalence was verified, a MANOVA yield 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* $F(1, 213) = 0.300$, $p = .0.59$, $\eta^2 = .001$), *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 towards entrepreneurship*, $F(1, 219) = 4{,}267$, $p = .04$, $\eta^2 = .019$). Figure 1 shows its change through the measurement times. Although both groups reduced their *attitude towards entrepreneurship*, the entrepreneurship promotion activity buffered the decrease in the intervention group.

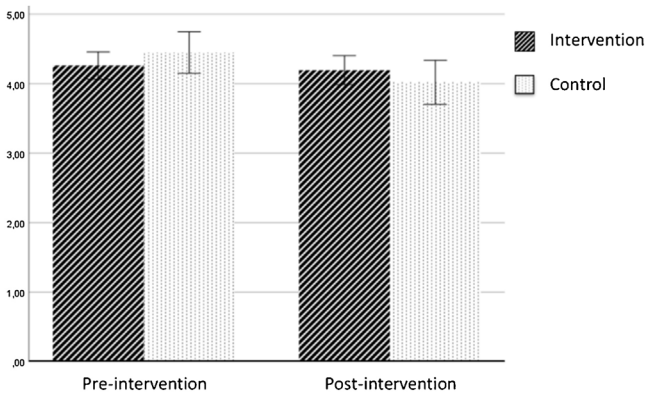

Figure 1. Results for attitudes towards entrepreneurship.

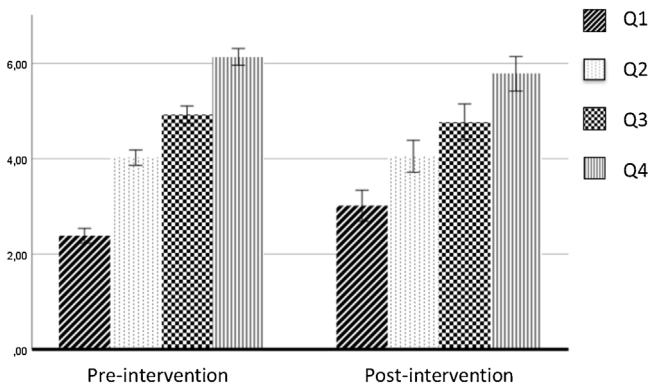

Figure 2. Changes in entrepreneurial intention considering levels of entrepreneurial intention pre-intervention.

Table 3
Entrepreneurial intention changes depending on entrepreneurial intention pre-intervention

	Pre-intervention *M*(*SD*)	Post-intervention *M*(*SD*)	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]

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

Table 4
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			
$\bar{EI}_{t=1}$		−.552***	−.553***
ΔATE			.014
ΔESE			.094
R^2	.016	.309	.313
Adjusted R^2	−.005	.289	.282

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

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 their interest 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 3 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 2). Contrarily, those students with the highest *entrepreneurial intention* pre-intervention presented a statistically significant moderate decrease as a result of their participation in the activity (Figure 2).

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 4 shows the results for all the models tested. Model 2 tested the impact of $\bar{EI}_{t=1}$ on $\Delta\bar{EI}_i$. 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 3). Model 3 explored the effect of the ΔATE and ΔESE on the sorting and alignment effect. Table 4 shows a non-statistically significant effect in both cases. Model 4 shows how the ΔATE did not increase the impact of $\bar{EI}_{t=1}$ on $\Delta\bar{EI}_i$. However, ΔESE increment amplified the impact of $\bar{EI}_{t=1}$ on $\Delta\bar{EI}_i$. Model 5 showed no effect for the triple-interaction between $\bar{EI}_{t=1}$, ΔATE, and ΔESE.

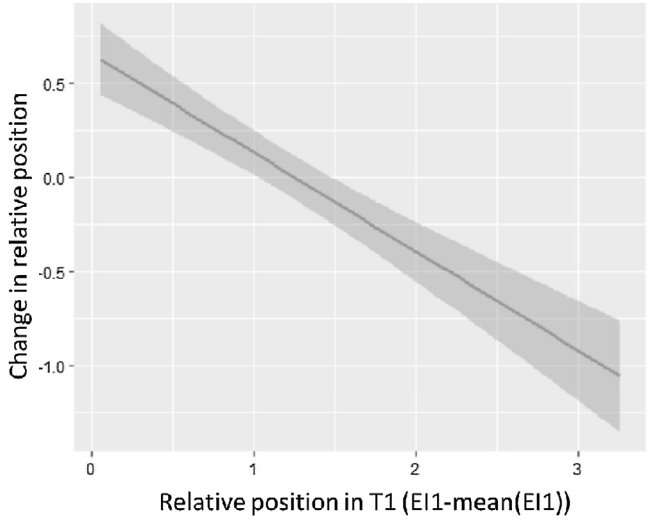

Figure 3. Effect plot.

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 and 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 towards 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 towards 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 increased. 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 six 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 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.

Acknowledgments

Sara Martínez-Gregorio is a researcher beneficiary of the FPU program from the Spanish Ministry of Universities (FPU18/03710). We would like to thank the management teams of the secondary schools that participated in the program on a voluntary basis.

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