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10-4-2017

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### Recommended Citation

Costa, S.F., Santos, S.C., Wach, D. and Caetano, A. (2018), Recognizing Opportunities across Campus: The Effects of Cognitive Training and Entrepreneurial Passion on the Business Opportunity Prototype. *Journal of Small Business Management*, 56: 51-75. <https://doi.org/10.1111/jsbm.12348>

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# **Recognizing Opportunities across Campus: The Effects of Cognitive Training and Entrepreneurial Passion on the Business Opportunity Prototype**

by *Sílvia F. Costa, Susana C. Santos, Dominika Wach, and António Caetano\**

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*We analyze the effects of the program Cognitive Entrepreneurial Training in Opportunity Recognition on the accurate assessment of prototypical viability of business opportunities. The training integrates the principles of experiential learning and is designed to reach students across campus. We also investigate the moderating role of entrepreneurial passion on opportunity recognition learning. We use a quasi-experimental design with pre-test, post-test in two European universities. The results demonstrate that the training has positive significant effects on the accurate identification of business opportunities' prototypical viability. Intense positive feelings about entrepreneurship moderate the learning process. We provide insights into entrepreneurship education practice across campus.*

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## **Introduction**

Entrepreneurship education provides students with relevant entrepreneurial experiences, competencies, ways of thinking, and ways to analyze the world (Fayolle 2013; Neck and Greene 2011). Because entrepreneurship education focuses on raising entrepreneurial awareness, on developing a way of thinking (Fayolle, Gailly, and Lassas-Clerc 2006), and on creating an entrepreneurial mindset (Krueger 2007), it requires the adoption of educational approaches focusing on cognition. In contrast to the inherited and stable traits perspective, cognitive approaches focus on the individuals' potential

to develop their cognitive mechanisms through significant experiences, which they transform into knowledge (Corbett 2005; Fayolle, Gailly, and Lassas-Clerc 2006; Pittaway and Cope 2007). Additionally, several scholars (e.g., Béchard and Grégoire 2005) have proposed that entrepreneurship is best learned through experiential learning, since it modifies students' cognitive structures and ways of thinking, and results in the recognition of de facto opportunities (Corbett 2005). Thus, entrepreneurship programs focusing on cognition and experiential learning—as a way to create an entrepreneurial mindset—are relevant to all study areas and

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\*This research project was funded by Fundação para a Ciência e a Tecnologia, Ph.D. Grant SFRH/BD/76079/2011.

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individual interests across campuses (Béchar and Grégoire 2005; Neck and Greene 2011).

Building on entrepreneurial cognition and entrepreneurship education literatures, we argue that entrepreneurship education goals (i.e., raising entrepreneurial awareness, developing students' entrepreneurial mindsets, and providing relevant entrepreneurial experiences with strong theoretical foundations that allow for knowledge transformation) are best achieved by developing educational programs that focus on (1) cognitive training (i.e., the development of participants' entrepreneurial mindsets) and (2) experiential learning methodologies (i.e., relevant entrepreneurial experiences that students transform into knowledge).

Focusing on cognitive mechanisms (such as prototypes) increases entrepreneurial awareness and results in effective opportunity recognition (Baron 2006), which is the first stage and primary trigger of the entrepreneurial process (Baron and Shane 2008). The literature on entrepreneurship education shows that specific domain experiences (such as contacting with case studies, entrepreneurs, and entrepreneurial-related activities) are crucial to developing entrepreneurial awareness and mindsets (Krueger 2007; Politis 2005). Focusing on experiential learning as an educational method helps to transform individuals' life experiences into knowledge. Such programs, which focus on entrepreneurial cognition and experiential learning, can enhance the ways in which students observe the world in an entrepreneurial way and can enable them to effectively recognize business opportunities (e.g., Anderson and Jack 2008; Bae et al. 2014; Baron 2006). These programs and initiatives must be transversal, that is, they must have the potential to reach students across a campus, irrespective of their scientific background or study field.

Although entrepreneurship education programs can be widely relevant across campuses, they must consider individuals' different characteristics and affective predispositions toward entrepreneurship (Anderson and Jack 2008; Shinnar, Hsu, and Powell 2014). Awareness of participants' different affective and motivational tendencies may result in different individual learning outcomes and depths of learning. While other studies have explored the relationship between training and opportunity recognition (e.g., DeTienne and Chandler 2004), and affect is known to influence entrepreneurial cognition (Cardon et al. 2009), there is little

evidence about the roles of different affective predispositions toward entrepreneurship on learning in entrepreneurship education. Entrepreneurial passion is a positive predisposition toward entrepreneurship (Cardon et al. 2009), and has been receiving attention in the entrepreneurial affection literature. However, there is still insufficient understanding on the role of entrepreneurial passion in the development of cognitive structures and its influence on experiential learning.

We examine the efficacy of a cognitive training based on the principles of experiential learning (Cognitive Entrepreneurial Training in Opportunity Recognition) on the use and accuracy of the business opportunity prototype, a cognitive structure that is fundamental for opportunity recognition (Baron 2006; Baron and Ensley 2006). Additionally, we take a step further, exploring the moderating role of entrepreneurial passion in entrepreneurial cognitive learning.

Our contribution goes beyond testing the causal relationship between training and opportunity recognition by means of a cognitive and experiential learning approach: we help to uncover the specific affective individual-level conditions under which entrepreneurship education is more effective. We investigate the training's effectiveness and the moderating role of entrepreneurial passion among students from different scientific study fields and colleges in two European universities, demonstrating the importance of entrepreneurship education across campus.

## **Entrepreneurial Cognition and Entrepreneurship Education: An Overview**

The literature on entrepreneurial cognition and education on cognitive frameworks mainly focuses on the opportunity recognition stage (e.g., Corbett 2005). Some scholars identify the learning process leading to opportunity recognition as an extremely relevant one to be studied in entrepreneurship education literature (e.g., Harrison and Leitch 2005). Other scholars emphasize the cognitive mechanisms underlying opportunity recognition focusing on it as a way of thinking and critically analyzing relevant information, more than mere knowledge accumulation and acquisition (e.g., Baron and Ensley 2006).

The cognitive perspective postulates that everything individuals do depends on mental

processes. Information is categorized and analyzed within mental structures that individuals develop during their life experience (Baron 1998, 2006; Palich and Bagby 1995; Rosch 1978). Entrepreneurial cognition can thus be defined as “the knowledge structures that people use to make assessments, judgments or decisions involving opportunity evaluation and venture creation and growth” (Mitchell et al. 2002, p. 97). It is crucial to consider cognitive frameworks to promote entrepreneurial awareness, since they guide individuals to be alert to specific information in an environment, toward opportunity recognition (Baron 2004, 2006). Further, as cognitive structures such as prototypes develop through individuals’ significant and relevant experiences (Baron 2006; Barsalou 1983; Rosch 1978), experiential learning can enable de facto learning on how to observe, categorize, and recognize event patterns in an environment (Corbett 2007; Politis 2005). Thus, cognitive training, focusing on the cognitive mechanisms’ development, such as prototypes, and adopting experiential learning methodologies results in effective opportunity recognition (Baron 2006; Corbett 2005).

The cognitive perspective is crucial to the further development of entrepreneurship education, for four reasons. First, it does not rely on inheritance or stability principles (Baron 2006; Palich and Bagby 1995). While traits theory, for instance, focuses on personality traits that are inherited, stable, and enduring over time (Cope 2005; Palich and Bagby 1995), cognitive theory is based on the principle that individuals are able to develop their cognitive frameworks through significant experiences that they transform into knowledge. This transformation of experiences into knowledge is a learning process that is situated and contextualized in a given setting (e.g., Corbett 2007).

Second, the cognitive approach on entrepreneurship advances the field by asking pertinent research questions, such as *how* do entrepreneurs think and perform certain activities (Mitchell et al. 2002). The cognitive perspective describes entrepreneurs’ mindsets, from which other current or potential entrepreneurs can learn.

Third, the cognitive perspective assigns agency to an entrepreneur in the entrepreneurial process. According to the cognitive perspective, the entrepreneur possesses mental frameworks that he or she develops through life experiences, and then uses these cognitive

frameworks to make sense of the environments and contexts they are integrated in. Every individual has his or her own learning style (Dutta and Crossan 2005), and learning outcomes are also influenced by other personal factors such as emotion and affect (Dutta and Crossan 2005).

Last, the cognitive perspective is often useful to addressing how opportunities are identified. Opportunity recognition is the first stage of the entrepreneurial process (e.g., Baron and Shane 2008; Haynie et al. 2010; Shane 2012; Shepherd 2004), and it is critical that individuals who are interested in becoming entrepreneurs are trained in opportunity recognition, even before other technical competencies are taught (for instance, writing or building business plans) (Corbett 2007; Kuratko 2005; Pittaway and Cope 2007). However, opportunity recognition often depends on finding or seeing what others cannot see. Cognitive training, via developing one’s cognitive frameworks toward effective opportunity recognition, is crucial to training potential entrepreneurs to develop an entrepreneurial mindset (Krueger 2007).

### **Experiential Learning and Opportunity Recognition**

Entrepreneurship education, as a discipline that seeks to raise awareness about entrepreneurship, must focus on key aspects in the entrepreneurial process, such as creativity, the ability to identify opportunities, developing an entrepreneurial mindset, and understanding how ideas are generated and evolve over time (Corbett 2005; Krueger 2003; Kuratko 2005). Further, entrepreneurship education programs that rely only on management competencies (such as writing business plans) promote idea convergence rather than creative thinking and “thinking outside the box” (Honig 2004). These contents are more related to stability, consistency, and predictability, rather than the uncertainty and constant change typically associated with entrepreneurial activity (Cope 2005). We do not affirm that teaching management skills to potential entrepreneurs is inappropriate, since we agree that management competencies are crucial to entrepreneurial success (Man, Lau, and Chan 2002). However, besides the spectrum of management competencies, entrepreneurs must perform unique activities that reflect other entrepreneurial competencies (Morris et al. 2013). Thus, the development of entrepreneurial cognitive mechanisms is crucial to complement an effective entrepreneurship program, since

these skills can help individuals to develop an entrepreneurial mindset (Krueger 2007) which is unique to entrepreneurship education.

We argue that promoting an entrepreneurial mindset focusing on opportunity identification and evaluation is crucial to entrepreneurship education. Entrepreneurship results from the combination of individuals and opportunities (Shane 2012; Shane and Venkataraman 2000) and the entrepreneurial process is triggered by opportunity identification (Baron and Shane 2008; Ramos-Rodríguez et al. 2011). Although scholars have long debated on the ontology of opportunities—whether opportunities are discovered, created, or recognized (see Alvarez and Barney 2007; Ramoglou and Tsang 2016), in this study we embrace opportunity recognition, which depends on pattern recognition and on the use of mental prototypes to identify an opportunity (Baron 2004; Baron and Ensley 2006). We use two arguments to justify the pertinence of opportunity recognition in our study. First, opportunity recognition is strongly anchored in the idea that the individual-opportunity nexus is central to entrepreneurial activity. In this sense, both environmental and individual idiosyncrasies are central to the triggering of entrepreneurial activities (Shane 2003). This argument is key, since we aim to promote entrepreneurial learning in the classroom about opportunity recognition by focusing on students' individual characteristics. Thus, we consider both objective information from the environment and an individual's characteristics to be crucial to opportunity identification. Second, the idea of opportunity recognition through pattern recognition assigns agency to the individual in opportunity identification, since pattern recognition can be learnt through training in cognitive structures such as prototypes (Baron 2004, 2006; Baron and Ensley 2006). Opportunity recognition requires voluntary, active, and endogenous agency from an individual, who has a central and active role in recognizing opportunities, based on his or her unique and subjective experiences and interpretation of available information. Although some elements of opportunities present in an environment (patterns) can be considered objective, individuals need to make sense of this information, using their mental prototypes and their idiosyncratic experiences, knowledge, feelings, and affective states. In this sense, focusing on opportunity recognition is central to our research.

Opportunity recognition strongly depends on an active and engaged analysis of an environment (Baron 2004) and on individuals' experiences and feelings. Thus, experimenting solutions to problems, learning by doing, critically reflecting on theories and engaging in real-life situations have stronger impacts on entrepreneurial learning and on the development of students' perceptions and entrepreneurial intentions (Liñán, Santos, and Fernández 2011; Pittaway and Cope 2007; Rasmussen and Sørheim 2006).

This type of approach on education is called experiential learning and it has its roots in the work of Kolb (Kolb 1984; Kolb and Kolb 2005). According to Kolb (1984), experiential learning consists in creating knowledge by transforming experience, according to four learning processes: experience (feeling), reflective observation (watching), abstract conceptualization (thinking), and active experimentation (doing). The variability between these processes depends on the ways individuals acquire and transform information, which results in four learning styles: divergent, assimilative, convergent, and accommodative learning. According to Corbett (2005), experiential learning is key to opportunity recognition, since all learning styles have roles in the opportunity recognition process: *convergent* learning is important for inventorying stocks of knowledge and experience in a given area upon preparing to recognize a business opportunity; *assimilative* learning plays a role when reflecting on an idea and considering its different potentialities (i.e., during idea incubation); *divergent* learning is useful to evaluate ideas in a first stage when assessing their feasibility; and *accommodative* learning is crucial to execute an idea in terms of planning and the decision to pursue the idea and to exploit it (Corbett 2005). Other scholars support the idea that experiential learning can impact students' abilities to engage in real-life opportunity recognition (e.g., Pittaway and Cope 2007; Rasmussen and Sørheim 2006).

In our view, the combination of learning processes and the opportunity recognition process are deeply rooted in cognitive mechanisms. According to Baron (2006), entrepreneurs "connect the dots" between seemingly unrelated events to identify patterns in an environment, which are recognized as opportunities. Further, pattern recognition becomes easier and more effective with experience, which helps individuals to develop their business opportunity prototype, leading to more effective opportunity

recognition (Baron and Ensley 2006). In this sense, we argue that experiential learning processes enable potential entrepreneurs to learn how to recognize opportunities, by developing their cognitive opportunity recognition framework, and by enhancing their entrepreneurship competencies through education (Morris et al. 2013).

Several studies have examined opportunity identification training's roles in entrepreneurship education programs (e.g., Craig and Johnson 2006; DeTienne and Chandler 2004; Souitaris, Zerbini, and Al-Laham 2007). However, we still lack explanations on how the cognitive frameworks responsible for opportunity recognition, such as prototypes, are acquired and developed. In our view, this task must focus on experiential learning as a way to effectively develop the cognitive mechanisms responsible for opportunity recognition.

### **Developing the Business Opportunity Prototype through Experiential Learning: A Cognitive Training Approach**

Individual perception and interpretation of surroundings are important to developing opportunity recognition skills (DeTienne and Chandler 2004). Drawing on opportunity recognition theory (Baron 2004, 2006; Baron and Ensley 2006) and the principles of experiential learning (Corbett 2007; Kolb 1984), we developed the educational program Cognitive Entrepreneurial Training in Opportunity Recognition (see Table 1). Since this training is a key element of our empirical study's design, we present exhaustive information about its contents in the methodology section.

*Opportunity Recognition—Importance and Definition.* Opportunity recognition has a crucial role in entrepreneurial activity. Awareness of opportunity recognition as the beginning of the entrepreneurial process is important, since potential entrepreneurs can be oriented to developing this competence as the starting point of their entrepreneurial activities. We define an entrepreneurial business opportunity as the “perceived means of generating economic value (i.e., profit) that previously has not been exploited and is not currently being exploited by others” (Baron 2006, p. 107). This definition emphasizes the newness and innovative character of an entrepreneurial opportunity. It also refers to a service or product with the ability to generate profit and that is desired by potential

customers (Baron 2006). Although we are aware of other definitions of opportunities in the literature, this one allows for an objective identification of the primary characteristics of an opportunity.

*Connecting the Dots to Recognize a Business Opportunity.* Based on general cognition research and cognitive frameworks in particular, Baron (2004, 2006) introduced the connecting the dots perspective as a way to recognize opportunity patterns. Baron suggests that individuals identify business opportunities by perceiving connections between apparently unrelated events or trends—for instance, changes in technology, demographics, markets, or government policies—as a meaningful pattern that can be recognized as an opportunity. To be recognized as an opportunity, this pattern must undergo a categorization process, that is, a pattern of seemingly unrelated events must be analyzed according to the cognitive opportunity prototype and if there is a fit, such event will be recognized as an opportunity. The idea that opportunities arise from changes in an environment (Baron 2006; Grégoire, Barr, and Shepherd 2010) underlines the importance of acquiring information and knowledge in the opportunity recognition process. Only by having a good overview of what surrounds them, can individuals think critically about these events, and can they recognize in them an innovative, new, and desirable opportunity that is not yet in use.

*The Cognitive Evaluation of Opportunities: The Business Opportunity Prototype.* Prototypical categorization is a cognitive process that suggests that concepts are expressed through the most salient or representative features involved in an underlying structure, namely a group of features that indicate membership in a category (Baron 2006; Grégoire, Barr, and Shepherd 2010). Prototypes are abstract mental representations of the most common salient features combined in an object that represents a category. Baron and Ensley (2006) demonstrated that entrepreneurs develop a business opportunity prototype that allows them to recognize opportunities (Baron and Ensley 2006). The process involves comparing ideas for new products or services with their business opportunity prototype (i.e., their abstract mental representation of an opportunity). If there is a fit, the entrepreneur will recognize and categorize the information as

**Table 1**  
**Experimental Tasks: Content of Cognitive Entrepreneurial Training in Opportunity Recognition**

Topic	Description of Activities	Theoretical Background	Relation to Experiential Learning
Opportunity recognition as the first stage of the entrepreneurial process	Analysis and group discussion about real entrepreneurial cases. Identification of the process phases.	Baron and Shane (2008) Shane and Venkataraman (2000)	Reflective observation Concrete experience
What is an entrepreneurial business opportunity?	Participants reflect on what makes a business opportunity an entrepreneurial one. Analysis of real cases to identify opportunities and false opportunities.	Baron (2004, 2006)	Abstract conceptualization
Connecting the dots to recognize a business opportunity	Participants individually list relevant technological, social, political, and economic changes in their life time. Participants agree on a common list of changes as a framework for the whole group (class). Participants are asked to connect various changes to come up with a business opportunity that is new, has potential economic value, and is desirable.	Baron (2004, 2006)	Concrete experience Active experimentation
Opportunity cognitive evaluation—the business opportunity prototype	The business opportunities are pitched to the whole group. The participants evaluate each other's business opportunities according to the dimensions of the business opportunity prototype <sup>a</sup> : solves customers' problems, generates positive net cash-flow, has manageable risk, is a superior product, and changes the industry.	Baron and Ensley (2006)	Concrete experience Active experimentation Abstract conceptualization
Entrepreneurial competencies	Analysis of speeches of well-known entrepreneurs and discussion of their competencies. Participants reflect on their own their entrepreneurial competencies. <sup>b</sup>	Athayde (2009) Morris et al. (2013) Man, Lau, and Chan (2002)	Reflective observation Abstract conceptualization Distractions task

For greater detail, see the Methodology section.

<sup>a</sup>In this exercise, participants are not aware that these are prototypical dimensions of the business opportunity. They are required to use them to their best understanding of their meanings. This is a measure to control the experimental design's internal validity.

<sup>b</sup>This task was not directly related to the training in opportunity recognition. It was included as a distractive task to avoid collecting data from the post-test immediately after the training.

a business opportunity (Baron 2004). Baron and Ensley (2006) identified the 10 dimensions (i.e., the most salient features) of the business opportunity prototype for both experienced and novice entrepreneurs. The first five dimensions describe the business opportunity upon recognition: solves customers' problems, generates positive net cash-flow, manageable risk, superior product, and ability to change the industry. The other five dimensions relate to the feasibility of business development: overall financial model, advice from experts, unique product, big potential market, and intuition.

We focus on three prototypical dimensions of business opportunity recognition: solves customers' problems, generates cash-flow, and manageable risk. We selected these dimensions, since they are crucial in the early stages of entrepreneurial experience. Santos et al. (2015) provided empirical evidence that these three dimensions are associated with meaning similarity and that they refer to a business opportunity's viability. These three dimensions diverge from the remaining two (superior product and ability to change the industry), which refer to a business opportunity's distinctiveness compared to other opportunities and require greater prior knowledge to be assessed. As Santos and colleagues (2015) demonstrate, in the early stages of entrepreneurial experience, a business opportunity's viability (i.e., the opportunity's characteristics related to solving customers' problems, generating cash-flow, and manageable risk) is more intuitively accessible than the dimensions referring to an opportunity's distinctiveness. Further, in their seminal study, Baron and Ensley (2006) found that experienced entrepreneurs' prototypes are better defined and richer in content than those of novice entrepreneurs; this finding stresses the importance of experience and learning on prototype development.

According to Corbett (2005), one's ability to recognize opportunities can be enhanced by experiential learning approaches. In addition, since opportunity recognition depends on cognitive structures, having relevant experiences is necessary to develop them. The program Cognitive Entrepreneurial Training in Opportunity Recognition includes activities that stimulate the various experiential learning processes and seeks to develop participants' abilities to recognize opportunities, by focusing on the development of their entrepreneurial mindsets. Because the development of an entrepreneurial mindset

occurs at the cognitive level, it is appropriate to analyze how participants develop their cognitive structures responsible for opportunity recognition at a basic level of perception. Prototypes are basic perception mechanisms that can be learned and are therefore indicative of an individual's opportunity recognition accuracy and effectiveness. Since prototypes develop throughout individuals' life experiences, this development continues after the initial training. Enabling students to have relevant and structured entrepreneurial experiences creates the conditions for them to develop their entrepreneurial cognitive structures, such as prototypes. Following this reasoning, we hypothesize that the university students who participate in Cognitive Entrepreneurial Training in Opportunity Recognition will be able to analyze a business opportunity's viability after the training more accurately:

*H1: After training, participants in Cognitive Entrepreneurial Training in Opportunity Recognition demonstrate significantly more accuracy in recognizing the viability dimensions of the business opportunity prototype than before the training.*

Although higher education is often regarded as a predictor of entrepreneurial activity (e.g., Athayde 2009; Bae et al. 2014; Block, Hoogerheide, and Thurik 2011; Rauch and Rijsdijk 2013; Souitaris, Zerbinati, and Al-Laham 2007; Ucbasaran, Westhead, and Wright 2007), we consider that structured educational strategies can result in the sustainable development of an entrepreneurial mindset over time, which is crucial for opportunity recognition and entrepreneurial success. These entrepreneurship education strategies must also focus on the transversal potential that entrepreneurship has to reach all students across campus. Groves, Vance, and Choi (2011) provide evidence that entrepreneurs balance linear and nonlinear cognitive processes, a strategy mostly associated with formal education. Thus, in the case of university students without entrepreneurial experience, such structured training might be relevant to develop the business opportunity prototype at an initial stage, more than mere attendance of a higher education institution. We expect that the university students who participate in Cognitive Entrepreneurial Training in Opportunity Recognition will be able to develop their cognitive abilities to recognize



business opportunities better than university students without this training. In other words, participants will be able to identify the characteristics of a business opportunity related to its viability more accurately than non-participants.

*H2: After training, participants in Cognitive Entrepreneurial Training in Opportunity Recognition demonstrate significantly more accuracy in recognizing the viability dimensions of the business opportunity prototype than in the control group.*

### The Importance of Entrepreneurial Passion in Cognitive Training

The way individuals feel and the moods they experience strongly influence several aspects of entrepreneurial cognition and behavior (Baron 2008, 2015; Hayton and Cholakova 2012). Among the scope of positive and negative affective states that were found to be relevant in the entrepreneurship process (e.g., Chan and Park 2013), entrepreneurial passion has been increasingly attracting scholars' attention as a specific entrepreneurial affective state (Cardon et al. 2009). Entrepreneurial passion has been defined as a conscious, intense, and accessible positive feeling that results from engaging in typical entrepreneurial activities that are central to an individual's identity (Cardon et al. 2009). Entrepreneurial passion is not a personality trait, but an affective internal state that individuals experience when thinking about or engaging in activities that are typically related to entrepreneurship (Cardon et al. 2009). These activities include inventing new solutions and opportunities, founding a business, and developing a business (Cardon et al. 2009, 2012; Murnieks, Mosakowski, and Cardon 2014). In other words, entrepreneurial passion consists of deep and consciously accessible positive feelings that are central to an individual's identity. The combination of these two aspects (intense positive feelings and identity centrality) result in enduring affective experiences that tend to last longer than emotional episodes. Thus, entrepreneurial passion is theoretically defined and measured along these two dimensions: intense positive feelings and identity centrality, which are expressed in three role identities: inventing, founding, and developing (Cardon et al. 2012). Thus, to experience entrepreneurial passion means to experience intense positive feelings while performing typically entrepreneurial tasks

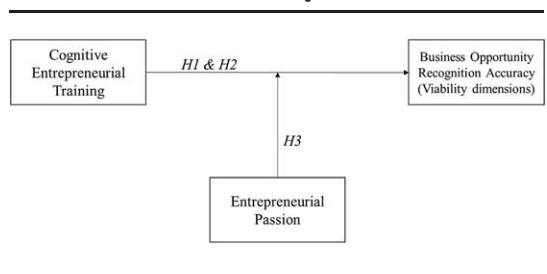
that are central to the entrepreneur's identity (Cardon et al. 2012).

Subsequent research has proposed that entrepreneurial passion is an antecedent of entrepreneurial intentions (Biraglia and Kadile 2016), an outcome of entrepreneurial effort (Gielnik et al. 2015), is transferable from the entrepreneur to employees (Cardon 2008), influences angel investing (Mittens, Sudek, and Cardon 2012), mediates the relationship between self-efficacy and persistence (Cardon and Kirk 2015), and can influence entrepreneurial cognition (Cardon et al. 2009). Although the influences of affective states in general and entrepreneurial passion in particular on entrepreneurial cognition have been recognized in the literature, there is little evidence of their roles in entrepreneurial learning.

Entrepreneurial passion is an internal factor that influences learning since it drives behavior (e.g., Vallerand et al. 2007). This means that one cannot be trained in entrepreneurial passion (in contrast to cognitive skills). Individual affective dispositions and internal states strongly impact on cognitive processes (e.g., Baron 2008, 2015) and can promote or hinder information processing, categorization, and learning processes. Accordingly, it is pertinent to examine whether entrepreneurial passion moderates the relationship between cognitive entrepreneurial training and business opportunity recognition accuracy (see Figure 1).

We assume that entrepreneurial passion has an important role in the opportunity recognition learning process, which requires attention, pattern recognition, and creative problem solving (Cardon et al. 2009). Specifically, we predict that entrepreneurial passion will moderate the relation between the cognitive entrepreneurial training and business opportunity recognition

**Figure 1**  
**Model in Analysis in the Present Study**



accuracy, such that the relationship will be stronger for participants with high entrepreneurial passion, including both intense positive feelings and identity centrality. This prediction reflects the fact that entrepreneurial passion will boost the learning process for individuals with high entrepreneurial passion levels, owing to their intense positive feelings toward entrepreneurial roles and to the centrality of entrepreneurship to their identity. Entrepreneurial passion is experienced consciously, promotes engagement with different roles toward entrepreneurship, and is central to the individual's identity (Cardon et al. 2009). These features of entrepreneurial passion are positive triggers to enhance the learning process. Thus, we focus on explaining how entrepreneurial passion influences the magnitude of the effect of cognitive training in entrepreneurial learning, specifically on opportunity viability recognition (Aguinis, Edwards, and Bradley 2016). In other words, we expect that individuals with high entrepreneurial passion can benefit even more from attending the training than those with lower entrepreneurial passion, and will achieve a more accurate business opportunity cognitive framework. Thus, we hypothesize:

*H3: Entrepreneurial passion moderates the relationship between participating in Cognitive Entrepreneurial Training in Opportunity Recognition and the business opportunity prototype's viability accuracy, such that the training's effect is stronger for participants with high entrepreneurial passion than for those with low entrepreneurial passion.*

## **Methodology**

### **Study Design**

We conducted a quasi-experimental design with a pre-test and a post-test with an experimental and a control groups. Participants in the experimental group took the pre-test questionnaire before the training and the post-test after the training. In the control group, the pre-test and post-test were administered with a three-week interval between them, at both universities. We will now describe the program Cognitive Entrepreneurial Training in Opportunity Recognition—the treatment of this quasi-experimental design study—in detail. Because the course participants (experimental group) assigned themselves to participate in the

training, the groups are not naturally randomized, and our design falls in the category of a quasi-experimental study (Shadish, Cook, and Campbell 2002).

### **Cognitive Entrepreneurial Training in Opportunity Recognition: Content and Procedure**

Participants in the experimental group enrolled in Cognitive Entrepreneurial Training in Opportunity Recognition, a program developed specifically for this study and delivered in two European universities—one in Portugal and one in Germany. The training contents and activities were exactly the same across countries and sessions. In the Portuguese university, the course was administered in Portuguese, while in Germany, the course was in English. Most classes were administered by the same instructor, both in Portugal and Germany.

The program combines content based on entrepreneurial cognition theory and empirical research on opportunity recognition (Baron 2004, 2006; Baron and Ensley 2006; Baron and Shane 2008; Shane and Venkataraman 2000). Such content was translated into classroom activities using experiential learning principles (Corbett 2007; Kolb 1984). The training focused on the importance of opportunity recognition as the first stage of the entrepreneurial process (Baron and Shane 2008; Shane and Venkataraman 2000). The program's main goal was to inform participants in a uniform way about the entrepreneurial process, what entrepreneurial business opportunities are, and how to actively recognize business opportunities using information from an environment.

During the first part of the training, participants engaged in a group discussion about real entrepreneurial cases and identified the different stages of the entrepreneurial process in the cases. The analyses of the cases and subsequent discussion were triggered by reflective observation and concrete experience, allowing participants to realize both the nonlinearity of the entrepreneurial process and the importance of opportunity recognition to trigger the process.

The second part of the training focused on defining an entrepreneurial business opportunity. Participants reflected on what makes an opportunity an entrepreneurial one, guided by the definition of opportunity suggested by Baron (2006): “perceived means of generating economic value (i.e., profit) that previously has not been exploited and is not currently being exploited by others” (p. 107). After reflecting in

groups on what the main characteristics of an entrepreneurial business opportunity are via abstract conceptualization, participants analyzed different examples of business opportunities and classified them into opportunities or false opportunities (i.e., opportunities that were new, desirable, and had the potential to generate profit versus opportunities that eventually failed because they did not fulfill one or more of these characteristics).

The third task in the training involved a *connect the dots* exercise, a cognitive technique used by entrepreneurs to recognize opportunities (Baron 2004, 2006). Participants were asked to individually list all the recent technological, social, political, and economic changes they could think of. To get consensus in the group about this list of changes, a class debate followed, to consensually build a list of changes. This exercise used participants' concrete experience by exploring their knowledge about the changes in the surrounding environment. Using active experimentation, participants were then asked to make connections between changes from each domain (technological, social, economic, and political) and to come up with a business opportunity along the agreed upon criteria: newness, potential economic value, and desirability. After connecting the dots between these changes, every participant had to describe their business opportunity.

The next task involved participants pitching their business idea to the whole class. Participants were asked to rate each other's business opportunities (on a five-point scale) using the dimensions of the business opportunity viability prototype (Baron and Ensley 2006) as criteria: to what extent does it solve customers' problems, its ability to generate net cash-flow, and its extent of manageable risk. Through this exercise, participants re-created the mental framework used by entrepreneurs to evaluate a business opportunity's viability, upon recognition. Thus, the learning processes in this task were active experimentation, concrete experience, and abstract conceptualization. Participants also developed their cognitive abilities to preliminarily assess business opportunities' viability upon recognition by using the business opportunity prototype's criteria. The training included a final task (the distractive task), which focused on entrepreneurial competencies (Athayde 2009; Man, Lau, and Chan 2002; Morris et al. 2013), to prevent participants from immediately answering the post-test questionnaire. Participants analyzed speeches from well-known entrepreneurs and

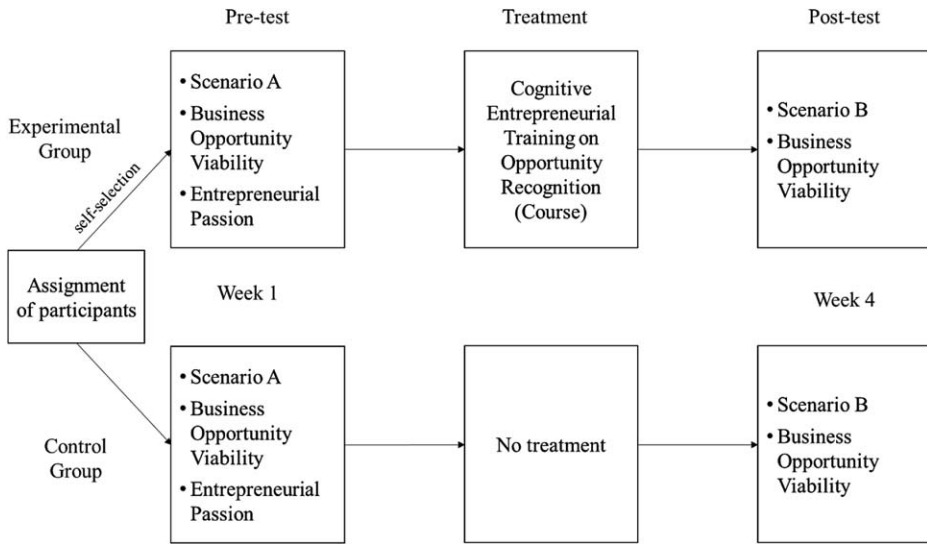
their experiences and to reflect on their own entrepreneurial competencies by comparison, using reflective observation and abstract conceptualization. Table 1 describes the course content, experimental tasks, and the links between content about opportunity recognition from an entrepreneurial cognition perspective and the principles or experiential learning used in the course.

We found no significant cross-country differences in the opportunity recognition training's impacts ( $t_{(179)} = 1.80; p > .05$ ), suggesting that different training languages did not affect the results. Portugal and Germany are considered innovation economies by the Global Entrepreneurship Monitor (e.g., Kelley, Peters, and O'Connor 2009) and share the same values within a broader European culture (House, Javidan, and Dorfman 2001; Javidan et al. 2006). Prototypes find overwhelming agreement among individuals within the same culture (Mitchell et al. 2000; Rosch 1978). Thus, since the two countries share cultural values and the same conditions for entrepreneurship promotion, they were appropriate to test our hypotheses without undermining our study's external validity. Figure 2 describes the study design's task flow and the variables observed at each data collection point.

## Participants

Students from two universities in Portugal and Germany participated in this study. The training was widely advertised to all students across both campuses, which resulted in a varied sample representative of mostly all the study fields in each university. From a total of 326 participating university students from the two universities in the two countries, 200 participated in the program Cognitive Entrepreneurial Training in Opportunity Recognition, while 126 participated in a control group. For several reasons (e.g., dropout between pre-test and post-test, entrepreneurial experience as background, and/or incorrect survey completion), we were able to analyze the answers from 181 participants of the experimental group and 102 answers from the control group, with a final total sample of 283 participants. In accordance with our aim to reach students across each campus, the students' study fields were diverse, covering the main general study areas: Social Sciences and Humanities (39.2 percent), Economics, Management, and Technology (56.5 percent), Health, Architecture, and Philosophy (2.8 percent). Students were on average 21 years old, 55 percent were female and most were attending an undergraduate program (85.2

**Figure 2**  
**Experimental Setting**



percent) while 14.9 percent were attending a graduating program (master or Ph.D.). On average, each participant reported to have had at least one business idea, but they did not have experience in setting up a business. Registration in Cognitive Entrepreneurial Training in Opportunity Recognition was voluntary, and attendants would receive two credits for their participation. Participation in the study for both experimental and control groups was voluntary. Table 2 describes both groups in terms of age, gender, education, educational scientific field, and country.

**Measures**

We subjected all course materials and questionnaires to rigorous translation and back-translation process. The questionnaires for data collection (both on the pre-test and post-test) were in Portuguese and German.

*Business Opportunity Recognition.* To assess the usage accuracy of the business opportunity prototype, we used a scenario in which a business opportunity could be identified, similar to other entrepreneurship studies that have also used scenarios to assess entrepreneurs’ cognitive opportunity recognition mechanisms (e.g.,

Grégoire, Barr, and Shepherd 2010). To avoid learning effects attributable to the instrument, we used two different scenarios in the pre-test and the post-test. For the pre-test, we used a scenario previously validated in the literature (Costa et al. 2016), based on authentic events describing a setting convenient for the recognition of a business opportunity. The scenario suggested the creation of a low-cost airline company based on the history of a de facto low-cost airline (Rae 2007). For the post-test, we used a scenario based on a real business idea presented at a venture competition (Duarte and Casimiro 2010), which described a situation favorable to the production and installation of piezo-electric devices in shopping centers as a way to produce energy. The scenarios<sup>1</sup> were constructed to be equivalent regarding the prototype’s viability dimensions (see Appendix 1, with the pre-test and post-test scenarios in English). To test the equivalence of the scenarios in terms of its prototypical features on viability, we included three questions about solving customers’ problems, generating cash-flow, and manageable risk. We found no differences between the pre-test and the post-test ( $t_{(282)} = 1.13; p > .05$ ), providing evidence that both scenarios are equivalent in terms of viability manipulation.

<sup>1</sup>The scenarios in German and Portuguese are available from the first author upon request.

**Table 2**  
**Sample Descriptive Information**

	Experimental Group		Control Group	
	<i>N</i> = 181		<i>N</i> = 102	
	<i>Mean</i>	<i>S.D.</i>	<i>Mean</i>	<i>S.D.</i>
Age	21	3.46	21	3.16
Number of Business Ideas Previously Identified	2	2.16	1	1.75
	<i>n</i>	Percent	<i>n</i>	Percent
<i>Gender</i>				
Female	90	50.3	67	65.7
Male	91	49.7	35	34.3
<i>Educational Level</i>				
Undergraduate (Attending a BSc Program)	160	88.4	81	79.4
Graduating (Master's or Ph.D.)	21	11.6	21	20.6
<i>Educational Scientific Field</i>				
Social Sciences and Humanities	43	23.8	68	66.7
Economics, Management, and Technology	129	71.3	31	30.4
Other (Health, Architecture, Philosophy, among others)	5	2.8	3	2.9
Missing	4	2.2	–	–
<i>Country</i>				
Portugal	121	66.9	77	75.5
Germany	60	33.1	25	24.5

No differences were observed between the two groups regarding age ( $F_{(1,280)} = 1.86; p > .05$ ), education level (Pearson chi-square = 4.66,  $p > .05$ ,  $df = 2$ ) and country of origin (Pearson chi-square = 2.32;  $p > .05$ ;  $df = 1$ ).

The groups are significantly different in terms of gender (Pearson chi-square = 6.73;  $p < .05$ ;  $df = 1$ ), educational scientific field (Pearson chi-square = 49.58;  $p < .05$ ;  $df = 2$ ), and number of previously identified business opportunities ( $F_{(1,280)} = 7.04; p < .05$ ).

We conducted t-test, ANOVA, and regression analyses to account for the effects of gender, educational area, and number of previously identified business opportunities, respectively, on the difference between scores on the pre-test and post-test for both control group and experimental group. No significant differences imputed to these variables were found: gender experimental group ( $t_{(179)} = -0.57; p > .05$ ) and gender control group ( $t_{(100)} = -0.49; p > .05$ ); education background experimental group ( $F_{(2,178)} = 0.62; p > .05$ ); education background control group ( $F_{(1,100)} = 0.02; p > .05$ ); number of business opportunities experimental group ( $F_{(1,179)} = 0.67; p > .05$ ); number of business opportunities control group ( $F_{(1,100)} = 0.07; p > .05$ ).

The scenarios did not explicitly state which business opportunity was to be identified in them, but provided information in a connecting-the-dots perspective (Baron 2006), allowing participants to recognize the business opportunities in them by linking the information we presented. Immediately after reading the scenario, participants were asked to briefly reproduce the

presented business opportunity in their own words. This was a control question, to guarantee that participants had understood the business opportunities presented in the scenarios in both the pre-test and the post-test.

To operationalize the prototypical dimensions of the business opportunity's viability in the scenarios, each story contained information based

on the dimensions of the business opportunity prototype, as defined by Baron and Ensley (2006). Thus, each scenario (pre-test and post-test) included descriptions of three prototypical dimensions of the business opportunity's viability (see Appendix 1)—solves customers' problems, generates positive net cash-flow, and manageable risk—in three different versions, for which we checked for manipulation effectiveness and equivalence in the pre-test and post-test. Results demonstrate that the scenarios in the pre-test and post-test are equivalent in terms of prototypical manipulation ( $t_{(282)} = 1.13; p > .05$ ).

*Viability Dimensions of the Business Opportunity Prototype.* After reading the scenario and describing the business opportunity in their own words, participants were asked to characterize the business opportunity according to the prototype's viability dimensions. Participants performed this task by completing a 13-item scale adapted from Baron and Ensley's (2006) original items by Costa and colleagues (2016) that describe the three prototypical dimensions of the business opportunity's viability. Participants were asked "In your opinion, are the following items characteristics of the business opportunity you identified?" on a five-point scale (ranging from 1 = not at all to 5 = very much). The prototypical dimension *solves customers' problems* was measured along five items, such as *customers want it* and *meets customers' needs*. The positive net cash-flow dimension was measured along four items, including *generates much cash* and *generates cash quickly*. The manageable risk dimension was measured along four items, including *customers accept it* and *involves technology changes*.

Since the prototypical dimensions of the business opportunity were objectively present in the scenario, we expected that, after the training, the experimental group would more accurately identify business opportunity viability (H1). In this sense, more accurate means scoring higher on the scale referring to the prototype's viability dimensions. Since the scenarios were equivalent and the characteristics were objectively present, we expected the training to enable participants to be more capable of recognizing more prototypical dimensions of business opportunity than in the pre-test. Following this reasoning, testing H1, we expect that, after the training, participants will display higher scores on the composite measures for the business opportunity

viability dimensions: solves customers' problems (SCP), generates positive net cash-flow (PNC), and manageable risk (MR). We also expected that the experimental group will score significantly higher than the control group in these dimensions after the training (H2).

*Entrepreneurial Passion.* To measure entrepreneurial passion, we used a 13-item scale developed by Cardon and colleagues (2012) during the pre-test (i.e., before training for the experimental group and before the session with the control group). Thus, it suits entrepreneurs and students who are regarded as potential entrepreneurs.

Entrepreneurial passion has two dimensions: intense positive feelings (10 items, e.g., "Owning my own company energizes me") and identity centrality (three items, e.g., "Inventing new solutions to problems is an important part of who I am"). We asked participants to indicate the extent to which they agree with each statement on a five-point Likert scale (1 = strongly disagree to 5 = strongly agree). As recommended by Cardon and colleagues (2012), we created two scores: one for intense positive feelings and one for identity centrality.

According to Cardon and colleagues (2012), passion is an internal state that, in contrast to cognitive skills, cannot be instilled by training or manipulated, but it is an internal factor that can influence learning. Thus, no manipulation on the moderator variable (entrepreneurial passion) was performed, similar to other studies using individual-level variables and internal states as moderators (e.g., Colquitt et al. 2002). To analyze the moderation effect of entrepreneurial passion in the learning process, we differentiated between participants with high and low entrepreneurial passion levels. We explain this procedure in the results section.

Cardon and colleagues (2012) indicate that entrepreneurial passion is an endurable phenomenon that lasts for months or even years. This means that it is more endurable than temporary emotions and remains stable over time. Thus, we assessed entrepreneurial passion once before the training. Owing to constraints related to the amount of data we were allowed to collect in the two universities, the entrepreneurial passion items were collected only with German participants. Thus, the sample size to test H3 was 85 participants.

## Results

### The Effect of Cognitive Entrepreneurial Training in Opportunity Recognition on the Use of the Business Opportunity Prototype Dimensions

We observed the correlation between the scores on the pre-test and post-test for the three viability dimensions of the business opportunity prototype. We concluded that each pair of scores was positively and significantly correlated in the experimental group ( $r_{\text{pre-test SCP} \times \text{post-test SCP}} = 0.24$ ;  $p < .05$ ;  $r_{\text{pre-test PNC} \times \text{post-test PNC}} = 0.16$ ;  $p < .05$ ;  $r_{\text{pre-test MR} \times \text{post-test MR}} = 0.19$ ;  $p < .05$ ). Further, Chronbach's alpha reliability measures were above 0.70 for all subscales of prototypical viability both in the pre-test and post-test, except for manageable risk (Cronbach's alphas reliability measures ranged between 0.25 and 0.54 for both experimental and control groups in the pre-test and post-test). Since the dimension manageable risk showed poor reliability, we excluded it from further analysis.

To test H1 we performed a paired-samples t-test to determine whether the training had an effect on the average number of prototypical dimensions of viability identified in the business opportunity. This procedure is analogous to that used by DeTienne and Chandler (2004) to analyze the effect of training in opportunity recognition. We observed in the post-test that the experimental group characterized the business opportunity much more accurately according to the general measure of the business opportunity's viability ( $t_{(180)} = 2.68$ ;  $p < .05$ ). An analysis of the dimensions of prototypical viability (see Table 3) showed that, after the training, participants on average recognized significantly more characteristics of the business opportunity related to solving customers' problems ( $t_{(180)} = 2.95$ ;  $p < .05$ ) and positive net cash-flow ( $t_{(180)} = 2.63$ ;  $p < .01$ ). The results support H1, showing that the experimental group displayed a more accurate business opportunity prototypical viability after the training.

To test H2 we used an independent samples t-test to check whether the experimental group described the business opportunity's viability more accurately than the control group. We concluded that, in the pre-test, there were no differences between the two groups in recognizing the two dimensions of business opportunity viability. In the post-test, the experimental group scored significantly higher and characterized the business opportunity more accurately than

the control group on the dimensions solves customers' problems ( $t_{(281)} = 3.21$ ;  $p < .05$ ) and positive net cash-flow ( $t_{(281)} = 3.60$ ;  $p < .01$ ). These results fully support H2, showing that, after the training, the experimental group displayed a more accurate business opportunity prototype than the control group.

### The Moderating Effect of Entrepreneurial Passion on the Efficacy of Cognitive Entrepreneurial Training in Opportunity Recognition

We started by analyzing the scores on the two dimensions of entrepreneurial passion in the experimental and the control groups. The reliability measures show an adequate fit, with all subscales evidencing Cronbach's alphas above 0.70. Further, we found no differences between the experimental and control groups regarding intense positive feelings and identity centrality subscales (IPF inventing  $t_{(83)} = 1.02$ ;  $p > .05$ ; IPF founding  $t_{(83)} = 1.18$ ,  $p > .05$ ; IPF developing  $t_{(83)} = 1.18$ ,  $p > .05$ ; IC inventing  $t_{(83)} = -0.69$ ,  $p > .05$ ; IC founding  $t_{(83)} = 0.23$ ,  $p > .05$ ; IC developing  $t_{(83)} = 0.30$ ,  $p > .05$ ). These results show that there were no differences between the two groups regarding their score on entrepreneurial passion in the pre-test. This is important, since the groups were not truly randomly assigned. It could be the case that the students enrolled in the training would demonstrate significantly higher entrepreneurial passion levels simply for being interested in the entrepreneurship topic. Since this was not the case, we can assume that the changes in the business opportunity prototype are a result of the training and explore entrepreneurial passion's moderating role.

To test H3 we conducted a hierarchical regression analysis and tested a three-way interaction effect. We re-coded the variable representing training into a dummy variable, where 1 referred to the presence of training (experimental group) and 0 to its absence (control group). The two dimensions of entrepreneurial passion (moderators) were centered so as to avoid multicollinearity problems.

In regression Model I, we included gender, age, and number of business opportunities previously identified as control variables. None of these variables were a significant predictor of the accurate identification of the business opportunity prototypical characteristics of viability.

In Model II, we added the predictor (i.e., the training), as well as both dimensions of passion

**Table 3**  
**Comparison of the Business Opportunity Prototype's Viability Dimensions on the Pre-test and Post-test (H1) and between the Experimental Group and Control Group (H2)**

Variables	T1			T2			H1		H2		
	Exp. group <sup>a</sup>		Cont. group <sup>b</sup>	Exp. group <sup>a</sup>		Cont. group <sup>b</sup>	$\Delta(T2 - T1)$ exp. group		$\Delta T1$ exp. - T1cont. <sup>c</sup>	$\Delta T2$ exp. - T2cont. <sup>d</sup>	
	M	S.D.	M	S.D.	M	S.D.	M	S.D.	M	S.D.	
Solves Customers' Problems	3.58	0.72	3.65	0.89	3.79	0.71	3.44	0.74	0.21; $t(180) = 2.95^*$	-0.07; $t(281) = -0.75$	0.35; $t(281) = 3.21^*$
Positive Net Cash Flow	3.55	0.77	3.68	0.70	3.73	0.71	3.38	0.95	0.19; $t(180) = 2.63^*$	-0.13; $t(281) = -1.42$	0.36; $t(281) = 3.60^{**}$

\* $p < .05$ ; \*\* $p < .01$ .

<sup>a</sup>Exp. Group, experimental group; <sup>b</sup>Cont. group, control group; <sup>c</sup> $\Delta T1$ exp. - T1cont, difference between pre-test scores of experimental and control groups; <sup>d</sup> $\Delta T2$ exp. - T2cont, difference between post-test scores of experimental and control groups.



**Table 4**  
**Multiple Regression Results to Test the Interaction Effect of Training and Entrepreneurial Passion on the Development of the Business Opportunity Prototype**

Variables	Model I $\beta$	Model II $\beta$	Model III $\beta$	Model IV $\beta$
Gender	0.01	0.07	0.05	0.04
Age	-0.18	-0.09	-0.07	-0.07
Number of Previously Identified Business Opportunities	0.13	0.05	0.04	0.04
Cognitive Entrepreneurial Training in Opportunity Recognition		0.40**	0.46**	0.43*
Passion IPF Dimension		0.24	-0.30	-0.33
Passion IC Dimension		-0.10	0.35	0.36
Training $\times$ Passion IPF			0.66*	0.71*
Training $\times$ Passion IC			-0.45	-0.47
Passion IPF $\times$ Passion IC			0.20	0.13
Training $\times$ Passion IPF $\times$ Passion IC				0.09
$R^2$	0.05	0.24**	0.32**	0.33**
$\Delta R^2$	-	0.19*	0.08*	0.01

\* $p < .05$ ; \*\* $p < .01$ .

$\beta$  = standardized regression coefficient;  $R^2$  = explained variance.

as predictors. In this model, the training was a significant predictor of the accurate identification of the business opportunity's prototypical viability ( $\beta = 0.40$ ,  $p < .01$ ). In contrast, neither of the dimensions of passion were a significant predictor of accurate identification of viability prototypical characteristics.

In Model III, we added the interaction effects of both dimensions of passion with each other, and both dimensions of passion with training. This model explained significantly more variance of the accurate identification of the business opportunity's viability ( $R^2 = 0.32$ ,  $\Delta R^2 = 0.08$ ,  $p < .05$ ). In this model, the training is a significant predictor of accurate identification of the business opportunity's viability ( $\beta = 0.46$ ,  $p < .01$ ), as well as the interaction effect between the passion dimension intense positive feelings and the training ( $\beta = 0.66$ ,  $p < .05$ ). Again, neither the dimensions of passion per se, nor the interaction between both dimensions, were a significant predictor of an accurate identification of prototypical viability characteristics.

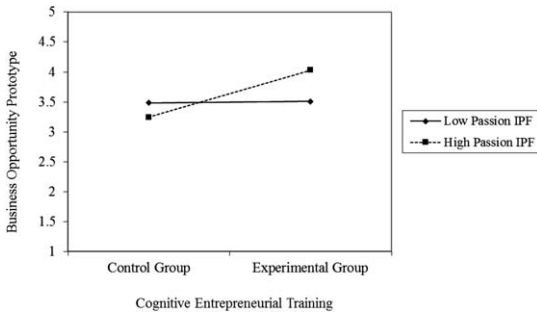
In Model IV, we added the triple interaction between the training and the two dimensions of

passion. This model did not significantly explain more variance of the accurate identification of viability prototypical characteristics ( $R^2 = 0.33$ ,  $\Delta R^2 = 0.01$ ,  $p > .05$ ); the triple interaction was not a significant predictor either ( $\beta = 0.09$ ,  $p > .05$ ). In this model, the interaction between intense positive feelings and training was also a significant predictor ( $\beta = 0.71$ ,  $p < .01$ ), similar to Model III. Therefore, we proceeded with a slope analysis of this interaction effect.

The results show a significant interaction effect of training and the passion dimension intense positive feelings (see Model III, Table 4) on the accurate identification of prototypical viability of the business opportunity. To further explore the interaction effect, we conducted a simple slope analysis, by re-coding intense positive feelings into two levels: low and high, ranging from one standard deviation below and above the mean, respectively, for both experimental and control groups, according to the procedure recommended by Aiken and West (1991) and Dawson (2014).

With the simple slopes analysis, we observed (see Figure 3) that participants from the experimental group who scored high on the

**Figure 3**  
**Interaction between Cognitive Entrepreneurial Training and Intense Positive Feelings toward Entrepreneurship**



entrepreneurial passion subscale intense positive feelings best demonstrated higher accuracy in identifying the prototypical viability of the business opportunity ( $b = 1.18$ ,  $t = 4.24$ ,  $p < .001$ ). Within participants who scored low on intense positive feelings, the relationship between training and an accurate business opportunity prototype is not significant ( $b = 0.03$ ,  $t = 0.12$ ,  $p > .05$ ).

Concerning the passion dimension identity centrality, our results suggest that this dimension of entrepreneurial passion does not strengthen the positive relationship between training and the accurate identification of prototypical viability of the business opportunity. Further, no interaction effects between identity centrality and intense positive feelings were observed, also not in the triple interaction between all independent variables. These results partially support H3.

## Discussion

Our quasi-experimental study on the effects of Cognitive Entrepreneurial Training in Opportunity Recognition on the accurate assessment of business opportunities' prototypical viability demonstrated that participants who were enrolled in the training were able to recognize business opportunity prototypical viability more accurately after the training than the control group. These results suggest that the program has positive and significant effects on potential entrepreneurs' accurate use and effectiveness of

the business opportunity prototype, in line with H1 and H2. Since the analyzed business opportunities were the same for the experimental and control groups and since there were no differences between the two groups on the pre-test, we can infer that the experimental group's finding more viability characteristics in the post-test is a result of the training.

We also analyzed the moderator role of entrepreneurial passion on the process of learning how to recognize the prototypical viability of a business opportunity. Considering this moderating effect of entrepreneurial passion, our study provides the following insights. We demonstrated that the effect of training is significantly higher for participants who have high intense positive feelings in entrepreneurial passion. Thus, we have not only demonstrated a relationship between training and opportunity recognition accuracy, we also underline the importance of individual affective variables in this relationship, such as entrepreneurial passion, to understand how these internal personal variables influence learning.

Overall, our results are in line with two primary lines of thought in the entrepreneurship literature. First, we contribute to opportunity recognition literature, providing further evidence that opportunity recognition can be learnt and developed as an entrepreneurial competence (e.g., DeTienne and Chandler 2004; Morris et al. 2013). Although we are aware that a prototype is difficult to assess because it is a mental structure, we operationalized its characteristics into a number of objective observable features, so we could get a clear idea of the training effects in the recognition of these characteristics. This represents an effort to assess the business opportunity prototype and how it changes after the training. Second, our results provide support to earlier findings that experiential learning has positive effects on students' cognitive development (Corbett 2007; DeTienne and Chandler 2004; Karimi et al. 2016).

Concerning the viability dimensions of the business opportunity we studied, our results suggest that students in our intercultural sample did not view manageable risk as an internally consistent construct. This might be attributed to the fact that, conceptually, manageable risk is a fairly complex notion to identify at an early stage of entrepreneurial activity. Our participants, university students without entrepreneurial experience, may not consider risk as a key characteristic of a business opportunity

prototype. This is consistent with Baron's (2006) suggestion that less experienced individuals focus less on analyzing risk than experienced entrepreneurs. Further, individuals that tend to identify high risk levels in general situations may be reluctant to identify any opportunity as a good one (Baron 2006). Other scholars have provided evidence that the analysis of risk not only differs among entrepreneurs and non-entrepreneurs, but can also differ between entrepreneurs, underlining the complexity of risk analysis (Block, Sandner, and Spiegel 2015). This leads us to believe that university students, as potential entrepreneurs, have a simplified perception of the prototypical viability of business opportunities, composed of customer-related and profit-related components. This raises the question whether training on risk might be more appropriate in the later stages of entrepreneurship education, that is, within the business opportunity evaluation stage rather than within opportunity recognition.

Our study also contributes to affective theory in entrepreneurship, since we addressed entrepreneurial passion as a key internal variable that is expected to play a role in potential entrepreneurs' learning processes. The relationship between individuals' cognitive features and affective and emotional aspects is hardly empirically explored in the literature (e.g., Shepherd 2015). We sought to shed light on this relationship—a first step to better understand how specific affective states toward entrepreneurship impact entrepreneurial learning. Building on the nature of entrepreneurial passion and on its influence on cognitive processes and creative problem-solving, we hypothesized that entrepreneurial passion is a moderator of the learning process in the development of cognitive structures responsible for opportunity recognition. Our results partially supported this hypothesis. The empirical models we tested suggest that Cognitive Entrepreneurial Training in Opportunity Recognition has a significant overall positive effect on the accuracy of a business opportunity's prototypical viability. In contrast, entrepreneurial passion alone was not a significant predictor of business opportunity prototype development. Remarkably, when participation in Cognitive Entrepreneurial Training in Opportunity Recognition was investigated in combination with entrepreneurial passion, we found this interaction effect to be significantly related to business opportunity recognition. In particular, the training had a significantly higher effect on

individuals with high levels of intense positive feelings toward entrepreneurial activities prior to the training. This shows that individuals who are passionate toward entrepreneurship derive greater benefit from cognitive training.

It is also interesting to note that only one dimension of entrepreneurial passion, intense feelings, interacted with participation in the training. The interaction with identity centrality of entrepreneurial activities did not have a significant effect on training outcomes. Such results suggest a more important role of intense positive feelings toward entrepreneurial activities, rather than being central to an individual's identity, to be a relevant condition that increases the effects of training. It is possible that university students can identify positive feelings when engaged in entrepreneurial activities, but still have not incorporated this into their identity, which may require a longer process and more experience. Entrepreneurial passion has been mainly validated and studied with experienced entrepreneurs (Cardon et al. 2009), who perceive entrepreneurship as central to their identity. In the case of university students and potential entrepreneurs, this may be still a process of ongoing self-discovery, and entrepreneurship may not yet be (as) central to their identity.

Our study also contributes to the recent discussion on the nature and ontology of entrepreneurial opportunities (Ramoglou and Tsang 2016). In line with the realist perspective, we conceptualize business opportunities as objective, while recognizing the subjectivity of the recognition process, and including entrepreneurial passion as a feature that can be attributed to agency. In addition, since we found that not all three components of opportunity prototypical viability were recognized by students, we suggest that the existence of opportunities depends on individual perceptions, which are affected by individual factors, for instance, expertise and experience.

### **Implications for Entrepreneurship Education across Campus**

Our results have interesting implications for both the theory and practice of entrepreneurship education; we list three ways in which they can contribute to expand entrepreneurship transversally across university campuses. First, our results support the notion that experiential learning is an appropriate method for entrepreneurship education (e.g., Corbett 2005, 2007).

We provide empirical evidence that experiential learning methods applied to cognitive training have significant, positive effects on the ways students recognize business opportunities and assess their viability. In our program Cognitive Entrepreneurial Training in Opportunity Recognition, we sought to create a dynamic training setting and provided students with tools and exercises that enabled them to think entrepreneurially and to develop an entrepreneurial mindset (Cope 2005; Kuratko 2005; Pfeifer, Šarlija, and Zekić Sušac 2016). We ensured that students were confronted with examples (entrepreneurial case studies) and were stimulated to think critically about them, so as to create knowledge based on relevant experiences (Cope 2005; Kuratko 2005). Drawing on these considerations about entrepreneurship education, our study offers important empirical support to the fact that entrepreneurship is deeply rooted in cognitive mechanisms. The teaching approach we applied in this study emphasizes the importance of understanding one's surroundings entrepreneurially, as a means to develop cognitive structures responsible for opportunity recognition from an experiential learning perspective. Further, Cognitive Entrepreneurial Training in Opportunity Recognition focuses on the development of entrepreneurial cognition and targeted students across two campuses. Such a teaching approach, which focuses on providing students with meaning for their entrepreneurial experiences, can be carried out regardless of students' scientific backgrounds or colleges. It provides a place in which students can make sense of their surroundings based on their own experiences and by receiving insights from fellow students with different backgrounds and experiences. We do not presume that all entrepreneurial competencies can be fully developed in a classroom setting. Nonetheless, our training provided participants with tools to critically observe the world around them, to identify changes in it, and to reflect on what opportunities and entrepreneurship are. All these efforts were reflected in more accurate perceptions of business opportunities' viability. Beyond empirical testing, we expect that these activities help students to observe the world around them in a more entrepreneurial way and to promote entrepreneurship as a transversal competence for developing their careers at, and after, university.

A second way our study informs practice is by considering the expectations and motivations of participants in entrepreneurship education

programs. As Jack and Anderson (1999) note, not all individuals who attend an entrepreneurship course wish to launch companies, but they may be interested in developing relevant entrepreneurial competencies for their professional paths. Participants' expectations, motivations, and feelings toward entrepreneurship should be considered in a program's design, and its evaluation outcomes should be considered accordingly (Béchar and Grégoire 2005; Fayolle and Gailly 2015). Although entrepreneurial passion alone is not sufficient to develop cognitive competencies, when combined with significant experiences and training, it has a positive effect on cognitive development. As our results show, intense positive feelings strengthen the relationship between training and its outcomes, measured in terms of business opportunity recognition accuracy and perceived prototypical viability. This is also important from a potential entrepreneur perspective, since it can motivate individuals to pursue training that can increase their motivations toward entrepreneurship. Although entrepreneurship is currently widespread in the academic context, and universities are seen as privileged fields in which to develop entrepreneurial awareness, we call attention to the fact that students' affective states must be considered when an entrepreneurship program is being designed. Especially when designing programs aiming at a wide range of students with different backgrounds and expectations about entrepreneurship, it is important to assess how they feel about the activities typically involved in becoming an entrepreneur. Though this can help enhance the effects of training in entrepreneurial cognition, it can also help students who may not be aware of what entrepreneurship is or do not identify entrepreneurship as something that they experience intensively and positively to reassess their willingness to become involved in such activities. It is crucial to consider affective predispositions in entrepreneurship education, to guarantee that individual-centered approaches are used and that entrepreneurial learning is a personal process based on the transformation of individual experiences into knowledge.

A third contribution from our study refers to the fact that entrepreneurship education demands shared efforts from educators, practitioners, and researchers. We do not presume that the program Cognitive Entrepreneurial Training in Opportunity Recognition, as an isolated episode in participants' lives, can transform them in

entrepreneurs who are able to launch ventures immediately thereafter. Kwong and Thompson (2016) demonstrate that students seeking to launch ventures immediately after their studies show more self-confidence in relation to success but may lack the relevant industry experience. In our view, the training provides students with tools to analyze their surroundings and environments with an entrepreneurial mindset. Entrepreneurship education programs must offer theoretical insights to individuals, enabling them to make sense of their relevant experiences and to transform them into knowledge (e.g., Bae et al. 2014). This represents a challenge that every entrepreneurship actor must embrace: entrepreneurship education is a dynamic setting, in which the expectations of individuals must be considered and in which stimulation through up-to-date examples and real experiences are provided. Entrepreneurship education is best developed through nontraditional pedagogic methods, but cannot be detached from strong theoretical grounds, which are fundamental to guide individuals in their learning process. Strong theoretical grounds through which students can make sense of their experiences and can transform them into entrepreneurial knowledge are fundamental to developing educational activities aimed at cross-campus audiences.

### **Limitations and Directions for Future Research**

Although there are various limitations inherent to quasi-experimental designs with a pre-test and a post-test (Shadish, Cook, and Campbell 2002), we made all efforts to control them and to consider possible limitations in our analysis. Future research should for instance analyze risk, since we were unable to include manageable risk as a viability dimension in the analysis, owing to its low internal consistency reliability. Future research should also measure the sustainability of the effects of training over time, several months after the training, as well as the impact of different instructors on training outcomes. We put effort into collecting data three weeks after the training with the experimental group. However, the subjects' dropout after this period meant an inadequate sample size to statistically observe the training's impact over time. Additionally, given that we used a quasi-experimental design, we cannot rule out effects of self-selection bias (Aronson, Wilson, and Brewer 1998), although we made all efforts to minimize them by using a control group and

checking for groups' equivalence in terms of demographic characteristics (Shadish, Cook, and Campbell 2002).

We tested entrepreneurial passion as a moderator in the learning process. It is interesting to consider other possible moderators in this process, such as entrepreneurial self-efficacy, risk perceptions, context, and previous entrepreneurial experience, since they are often referred to in the literature to influence entrepreneurial awareness and success (Arkan 2010; Politis 2008). Further, exploring the effects of such training on the development of entrepreneurial orientation may represent a more feasible construct than entrepreneurial mindset (Anderson et al. 2015). Testing other models that integrate moderation and mediation relationships may also deepen our understanding of the learning process (Aguinis, Edwards, and Bradley 2016). For instance, one could test motivation's role as a mediator in the learning process according to different levels of entrepreneurial passion as a moderator.

We consider that our study opens three avenues for future research. First, we consider relevant to explore the stability of cognitive structures across different backgrounds and cultures. As pointed out by several scholars, prototypes find overwhelming agreement between individuals in the same context or culture (Mitchell et al. 2000; Rosch 1978). Therefore, it would be interesting to explore the variance in the abstract representations of business opportunities across cultures. Second, it is relevant to explore how experiential learning can bridge different ways to identifying opportunities. For example, it would be interesting to explore whether accurate prototypes evolve into opportunity-creation mechanisms as individuals have more entrepreneurial experiences and develop their entrepreneurial cognition through experiential learning. Third, there is great potential in exploring experiential approaches at other stages of the entrepreneurial process after opportunity recognition. Beyond the opportunity recognition stage, experiential learning could be paired with other established practices in entrepreneurship education, such as the lean startup approach, to train students at later stages of the entrepreneurial process, such as testing assumptions about their business opportunities (Ries 2011).

### **Conclusion**

We have provided evidence that the program Cognitive Entrepreneurial Training in

Opportunity Recognition has a significant, positive effect on accurately identifying prototypical characteristics of business opportunities' viability. Further, we provided evidence that experiencing high intense positive feelings toward entrepreneurship increases the effects of training in the development of cognitive structures responsible for opportunity recognition. We addressed several issues identified in the literature on entrepreneurship education by exploring the potential of cognitive training, by focusing on experiential learning, and by exploring the moderating roles of affective variables toward entrepreneurship. Our work is an effort to explain how potential entrepreneurs learn and to provide researchers and educators in entrepreneurship education who are interested in promoting entrepreneurial awareness across a university with insightful information.

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## **Appendix 1: Pre-test and Post-test Scenarios (in English)**

### **Pre-test Scenario: The Creation of a Low-Cost Airline, Based on the History of a De Facto Low-Cost Airline (Rae 2007)**

On your most recent business trip to the United States of America, you traveled with InCountry Airlines, an airline that offers domestic flights. Its business model is based on a low-cost method, using cost reduction, fewer transactions, and savings on services provided on board. InCountry Airlines practices staff maximization on land and on board; it subcontracts all staff and uses secondary airports.

*Solving customers' problems:* In your country, no such airline exists. National long-distance trips, which are increasingly common, often occur using air transport, but the prices are too high. The traditional alternatives such as traveling by car is becoming increasingly difficult owing to the volume of traffic and safety concerns; also, like the train alternative, it is expensive and slow. However, flying is known to be safer and faster. In this sense, the existence of an airline like InCountry Airlines could solve these problems and could present a good alternative to current national travel habits.

*Positive cash-flow:* All this allows for a low-price strategy compared to other companies and for a rapid and large profit margin, in some cases higher than other airlines. Although the creation of a business of this kind implies a low investment, in your country, no airline operates this way. The entire business model is oriented toward minimizing costs and maximizing profits.

*Manageable risk:* This airline business model is very well accepted in the United States. Although it is not available in your country, you quickly realize in conversation with friends that it would be. If you put together the right team, building a company of this kind would be simple in terms of technological and legal

liabilities. Since air transport is the safest and fastest means of transportation, success would be guaranteed.

### **Post-test Scenario: A Situation Favorable to the Production and Installation of Piezo-Electric Devices in Shopping Centers, Based on a Real Business Idea Presented at a Venture Competition (Duarte and Casimiro 2010)**

You are in charge of the electric maintenance of a shopping center group. On your last visit to one of the group's shopping centers, you met the usual crowded scenario so typical of these places. While talking to the shopping center manager about this, he says that, although there are lots of people, they are buying less and less. Electricity costs are rising every month and the profit margin to pay for it is smaller. With your knowledge of electricity, you quickly realize that the energy produced by people walking around the shopping center could be transformed into electricity. You imagine a device that covers the floor of the entire shopping center.

*Solving customers' problems:* Making people's visits count even if they spend no money, solving the company's problem. The same idea could be applied to other clients to lower their energy consumption costs. Thus, in a long-term perspective, the shopping centers would be autonomous in their energy production, lowering their dependence. This would be a renewable energy source and would be socially responsible—something shopping centers would want to be connected with.

*Positive cash-flow:* These devices are inexpensive to mass-produce and the profit return would be very swift—less than a year. The general commercialization of these devices would further increase your profit margin. Thus, you would consider applying this idea to other contexts to increase your profit.

*Manageable risk:* The production of these devices hold few risks. Placing them on shopping centers would involve no technological or legal liabilities, because administrations are willing to use this technology. This would also definitely solve the problem of energy dependence.