

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

## Journal of Business Venturing Insights

journal homepage: [www.elsevier.com/locate/jbvi](http://www.elsevier.com/locate/jbvi)

## Entrepreneurial alertness: A meta-analysis and empirical review

Clécio Falcão Araujo<sup>a,\*</sup>, Masoud Karami<sup>b</sup>, Jintong Tang<sup>c</sup>, Lucas Bonacina Roldan<sup>a</sup>, Julia Aita dos Santos<sup>a</sup><sup>a</sup> PUCRS | Business School, Pontifical Catholic University of Rio Grande Do Sul, Av. Ipiranga, 6681, Partenon, Porto Alegre, RS, 90619-900, Brazil<sup>b</sup> Otago Business School, University of Otago, PO Box 45, Dunedin, 9054, New Zealand<sup>c</sup> Richard A. Chaijezt School of Business, Saint Louis University, 3674 Lindell Blvd, St. Louis, MO, 63108, USA

## ARTICLE INFO

## Keywords:

Entrepreneurial alertness  
Meta-analysis  
Empirical review

## ABSTRACT

Entrepreneurial alertness (EA) has attracted increasing attention in scholarly work, and a multitude of empirical studies have examined the antecedents and outcomes of entrepreneurial alertness. Although there is consistent evidence for significant associations, ambiguities exist concerning the directions and magnitude of the relationships. The purpose of this study is to meta-analytically assess the antecedents and outcomes of EA. A total of 125 empirical studies were analyzed with 597 effect sizes derived from 18 different constructs and a sample of 1,820,331 individuals. We advance understanding of the critical role of alertness in generating entrepreneurial outcomes, its antecedents, and the directions and magnitude of the associations. We also provide several directions for further theorizing the role of alertness in entrepreneurship.

## 1. Introduction

Given the increasing number of studies and equivocal empirical findings on entrepreneurial alertness, it is critical and timely to compile and contrast existing findings regarding the antecedents as well as the outcomes of entrepreneurial alertness for entrepreneurs and entrepreneurial ventures. In addition, although several conceptual reviews have recently been published that provide invaluable insights into the past, present, and future of alertness research (Chavoushi et al., 2021; Lanivich et al., 2022; Sharma, 2019), no empirical review exists to thoroughly analyze the directions as well as the magnitudes of the various antecedents and consequences of alertness. Accordingly, the purpose of this study is to provide meta-analytically derived population estimates for the relationships between alertness and antecedent and outcome variables. Our study enhances our understanding of the critical role of alertness in generating entrepreneurial outcomes, the key antecedents of alertness, the directions and magnitude of these associations, and key areas for further research.

## 2. Literature review and theoretical foundation

Rooted in Austrian economics, entrepreneurial alertness was conceptualized as entrepreneurs' ability to identify and make sense of market disequilibrium for market-level opportunity recognition (Kirzner, 1973). Kirzner (2009) argued that entrepreneurs' alertness to changing demand patterns, prices, technological advancements, and other changes in the marketplace is the key for entrepreneurship. Kirzner (2009: 148) clearly stated that he is not interested in explaining "the determinants of individual entrepreneurial alertness," although Kirzner (1999: 12) emphasized that "entrepreneurial alertness, in this essentially uncertain, open-ended, multi-

\* Corresponding author.

E-mail addresses: [clecio.araujo@pucrs.br](mailto:clecio.araujo@pucrs.br) (C.F. Araujo), [m.karami@otago.ac.nz](mailto:m.karami@otago.ac.nz) (M. Karami), [jintong.tang@slu.edu](mailto:jintong.tang@slu.edu) (J. Tang), [Lucas.roldan@pucrs.br](mailto:Lucas.roldan@pucrs.br) (L.B. Roldan), [julia.aita@hotmail.com](mailto:julia.aita@hotmail.com) (J.A. dos Santos).<https://doi.org/10.1016/j.jbvi.2023.e00394>

Received 4 November 2022; Received in revised form 4 April 2023; Accepted 12 April 2023

Available online 21 April 2023

2352-6734/© 2023 Elsevier Inc. All rights reserved.

period world must unavoidably express itself in the qualities of boldness, self-confidence, creativity, and innovative ability.” By stressing individual factors and highlighting the central role of imagination and creativity in fulfilling entrepreneurial alertness, Kirzner keeps the door open for a more comprehensive view of entrepreneurial alertness and new opportunity development (Tang et al., 2012; Valliere, 2013).

The Kirznerian view was later developed by scholars who argue that alertness without actions to pursue a new opportunity is not entrepreneurial (McMullen and Shepherd, 2006). Such emphasis on action and pursuit of opportunities motivated alertness research to focus on individuals’ cognitive capabilities (Lvasseur et al., 2022; Pidduck et al., 2020; Tang et al., 2021a, 2021b, 2021c). Drawing upon social cognition theory, Tang et al. (2012) reconceptualized alertness at the individual level as consisting of three key dimensions: information scanning and search, information association and connection, and evaluation and judgment. This framework is in line with Kirzner (1999) where he considered creativity and imagination in all aspects of alertness, embedding the active process of judgement and action in the concept of entrepreneurial alertness.

Tang et al. (2012) also developed and validated a robust measurement for alertness. Since then, the alertness concept has attracted increasing attention in scholarly work, and a multitude of empirical studies have examined the antecedents and outcomes of entrepreneurial alertness. Existing literature has investigated the antecedents of alertness at different levels of analysis, enabling scholars to paint a more complete and comprehensive picture of the origins of alertness. For example, research examining the environmental antecedents of alertness found that environmental factors such as feedback, collaboration offers, and awards received have a positive impact on alertness (Kadile and Biraglia, 2020). Ardichvili et al. (2003) considered three different categories of antecedents, including personality traits, social networks, and prior knowledge, which activate alertness in the process of new opportunity development. Valliere (2013) argued that schematic richness, association, and priming enable the entrepreneur to assign meaning to environmental conditions, and thus are the main mechanisms that develop entrepreneurial alertness. Valliere (2013) further theorized that entrepreneurial expertise, practice, and intention are the antecedents of the schemata. Digging deeper into the individual psychological and cognitive processes of opportunity recognition, recent research has explored the roles of entrepreneurs’ positive affect (Lvasseur et al., 2022), self-efficacy and optimism (Tang et al., 2021a), cross-cultural experience (Pidduck et al., 2020), cognitive cultural intelligence (Yang et al., 2022), time perspective (Tang et al., 2021b), and education (Bueckmann-Diegoli et al., 2021).

With regard to the outcomes of entrepreneurial alertness, opportunity recognition has been the dominant outcome variable in alertness research. Kirzner (1999) argued that alertness is the main mechanism that enables entrepreneurs to identify and fill the gaps in the marketplace as new opportunities for wealth creation. Two primary perspectives exist for the nature of opportunities. The discovery theory argues for the exogenous nature of opportunities that are developed as a result of technological, sociocultural, or other macro changes in the marketplace (McMullen et al., 2007). The creation theory, on the other hand, argues that opportunities are endogenous to entrepreneurs and highlights the importance of creativity and imagination (Sarvasvathy, 2001). There are other views in between arguing for elements of both creation and discovery in new opportunity development (e.g., Ardichvili et al., 2003).

Regardless of the type of opportunity, entrepreneurial alertness seems to be an important factor in opportunity development (Valliere, 2013). In opportunity discovery theory, alertness plays a more direct role by enabling individuals with higher alertness to identify exogenous opportunities. In opportunity creation theory, alertness plays a more indirect role by keeping entrepreneurs mindful of changes in their environment and enabling them to transform their personal traits, social networks, and prior knowledge into new opportunities (Read et al., 2016). Besides new opportunities, the extant body of research has established associations between entrepreneurial alertness and other important organizational outcomes, such as firm financial performance (Adomako et al., 2018; Roundy et al., 2018; Tang et al., 2021a) and innovation (Adomako, 2021; Lvasseur et al., 2022; Tang et al., 2021a).

Although there is consistent evidence for significant associations for both the antecedents and outcomes of alertness, ambiguities exist concerning the directions and magnitude of the relationships. For example, some studies report a positive influence of entrepreneurs’ age on entrepreneurial alertness (Patel, 2019; Sirén et al., 2019), whereas others have found the relationship to be negative (Kadile and Biraglia, 2020). With regard to entrepreneur education, some studies have found a positive relationship between education and alertness (Zhao et al., 2021), yet others have found the relationship to be negative (Obschonka et al., 2018; Tang et al., 2008). Similarly, although some studies have reported a positive relationship between entrepreneurial experience and alertness (Patel, 2019; Zhao et al., 2021), others have reported negative results (Kadile and Biraglia, 2020). Conflicting findings were also reported regarding the relationship between risk-taking propensity and alertness, with some reporting positive relationships (Asenge et al., 2018; Westhead and Solesvik, 2016) and others reporting negative results (Tang et al., 2008). These contradictory findings call for a comprehensive empirical review to address important questions such as: how alertness has been measured, which firm-level and individual-level factors are associated with alertness, what are the directions and magnitudes of the relationships, whether and how the design of empirical studies have impacted the findings, etc. Addressing such critical questions requires conducting a comprehensive empirical meta-analysis.

Research Question: What are the directions and magnitudes of associations between antecedents and outcomes of entrepreneurial alertness?

Examining this research question with meta-analysis provides an empirical and quantitative foundation for future research and theoretical development on entrepreneurial alertness. We also conduct a series of supplemental analyses to provide finer-grained analyses concerning different effect size types, different study designs, different measures of alertness, and different measures for antecedents and outcomes to offer further insights into the substantive associations.

### 3. Methods

#### 3.1. Literature search and inclusion criteria

To ensure the comprehensiveness of our literature review, we conducted a computerized bibliographical search across three major databases (Scopus, Web of Science and Google Scholar) with the Publish or Perish software (Harzing, 2010). We followed the Meta-Analytics Reporting Standards (MARS) protocol (Kepes et al., 2013). In the databases searches, the following search terms were used for title, abstract and keywords: "Entrepreneurial Alertness" OR "Alertness" OR "Entrepreneur\*Alert\*." In addition, we searched the websites of the Financial Times top 50 journals. Third, to safeguard the inclusiveness of our literature search, the search was completed in July 2021. Finally, we analyzed the references of papers identified in this process to seek additional relevant papers on alertness.

Next, the articles were screened based on title and abstract. After eliminating duplications, the authors were left with 398 quantitative papers, some of which included more than one independent sample. Thereafter, each paper was further scrutinized. Following this, a spreadsheet was created for all papers, detailing the author, sample size, research method, effect sizes, antecedents, and consequences of entrepreneurial alertness. This procedure was carried out by a team of three to eliminate any selection bias. We excluded 273 papers with insufficient effect sizes between entrepreneurial alertness (EA) and antecedents or consequences. Table 1 reports our final sample of 125 papers, 129 independent sample with 597 effect sizes derived from 18 different constructs (with at least 14 independent effect sizes per variable) and 1,820,331 individuals. We coded all papers that presented zero-order correlations. If no zero-order correlations were reported, we followed Peterson and Brown (2005) and converted statistical data such as  $\beta$ -values or F-tests into an  $r$  correlation coefficient. Table 2 summarizes the definitions of key constructs.

#### 3.2. Meta-analytic procedures

We estimated our results using three different procedures. First, we calculated the effect size (ES) and corrected it for measurement error, as follows:  $ES = \left( \frac{r_0}{\sqrt{a_1 a_2}} \right)$  where  $r_0$  is the original correlation and  $a_1$  and  $a_2$  are the respective Cronbach alpha or compositional reliability. (Hunter and Schmidt, 2004). For studies that did not report reliability, we calculated the mean construct reliability. The calculation of average  $\rho$  between studies is based on z-Fisher =  $\frac{1}{2} \ln \left( \frac{1+r_j}{1-r_j} \right)$ , where  $r_j$  is the sample of correlations, then the z-Fisher is transformed into Pearson's  $r$  coefficient. In addition, we estimated the Q-test for heterogeneity (Borenstein et al., 2009). We used the open-source software R (R Core Team, 2016) through metafor package (Viechtbauer, 2010) to estimate the mean correlation corrected by sample-size-weighted in order to provide information for the random effects model. All analysis is described in greater depth in the Online Appendix.

To ensure the stability of  $\rho$  with no publication bias, we used three different methods.<sup>1</sup> First, the fail-safe number estimates the hypothetical number of unpublished studies that would be necessary to statistically alter the result obtained for the relationship under analysis (Orwin, 1983; Rosenthal, 1979). We calculated the classic fail-safe N (Rosenthal, 1979) and Orwin's fail-safe N (1983). Second, the rank correlation tests (Begg and Mazumdar, 1994) using the standard error of the observed outcomes as predictors, were used to check for funnel plot asymmetry. Third, we created funnel plots to test for symmetry using Egger's test. Significant asymmetry in the funnel plot would indicate a publication bias in the dataset (Egger and Smith, 1998).

### 4. Results

#### 4.1. Meta-analysis results

Table 3 contains the results of the pairwise meta-analysis. EA was not significantly correlated with entrepreneurs' age ( $\rho = 0.021$ ; s. e. = 0.017,  $p = n. s.$ ) or firm age ( $\rho = 0.135$ ; s. e. = 0.098,  $p = n. s.$ ). The following antecedents were significantly and positively correlated with EA: education ( $\rho = 0.105$ ; s. e. = 0.026,  $p < 0.001$ ), creativity ( $\rho = 0.313$ ; s. e. = 0.063,  $p < 0.001$ ), entrepreneurial attitude ( $\rho = 0.408$ ; s. e. = 0.074,  $p < 0.001$ ), entrepreneurial experience ( $\rho = 0.121$ ; s. e. = 0.033,  $p < 0.01$ ), entrepreneurial passion ( $\rho = 0.453$ ; s. e. = 0.072,  $p < 0.001$ ), entrepreneurial self-efficacy ( $\rho = 0.454$ ; s. e. = 0.038,  $p < 0.001$ ), network ( $\rho = 0.422$ ; s. e. = 0.082,  $p < 0.001$ ), openness ( $\rho = 0.382$ ; s. e. = 0.047,  $p < 0.001$ ), prior knowledge ( $\rho = 0.533$ ; s. e. = 0.133,  $p < 0.01$ ), risk-taking ( $\rho = 0.245$ ; s. e. = 0.056,  $p < 0.001$ ), norms ( $\rho = 0.402$ ; s. e. = 0.068,  $p < 0.001$ ), and firm size ( $\rho = 0.061$ ; s. e. = 0.022,  $p < 0.05$ ). In addition, EA was statistically and positively correlated with such consequences as entrepreneurial intentions ( $\rho = 0.480$ ; s. e. = 0.041,  $p < 0.001$ ), innovation ( $\rho = 0.287$ ; s. e. = 0.046,  $p < 0.001$ ), opportunity recognition ( $\rho = 0.430$ ; s. e. = 0.067,  $p < 0.001$ ), and performance ( $\rho = 0.293$ ; s. e. = 0.037,  $p < 0.001$ ). The Q-statistic, which represents the total weighted deviation of each individual effect size from the mean, is significant. Most observed effect size variance thus is systematic rather than due to sampling error (Borenstein et al., 2009).

#### 4.2. Meta-regression analysis

When the Q-statistic corresponding to the heterogeneity of the effect size is greater than 25% (Hunter and Schmidt, 2004) and when the number of effect sizes is greater than 10, it is generally considered useful to conduct Meta-regression analysis. Smaller samples will be insufficient to establish a moderating relationship, with a low statistical power of the sample threatening the confidence

<sup>1</sup> We present all R code, dataset, and supplementary analyses on web appendix: [https://osf.io/267jn/?view\\_only=55398d5eaf5d4dd5a35b8f36019fa8c9](https://osf.io/267jn/?view_only=55398d5eaf5d4dd5a35b8f36019fa8c9).

**Table 1**  
Studies included in meta-analysis.

Authors	N	Antecedents	Consequences
Adomako (2021)	385	Firm age, firm size	Innovation, opportunity recognition
Adomako et al. (2018)	203	Age, education, network, firm age, firm size	Performance
Agarwal and Selen (2009)	380	–	Innovation
Alvi et al. (2017)	250	Education, creativity, network, risk-taking	Intentions, opportunity recognition
Amato et al. (2017)	120	Age, education, firm age, firm size	Performance
Aparicio et al. (2021)	880,576	Age, education	–
Asenge et al. (2018)	250	Creativity, risk-taking	Innovation, Performance
Awwad and Al-Aseer (2021)	323	Openness	Intentions
Ben Amara et al. (2020)	365	Prior knowledge, network	Innovation
Bhatt et al. (2020)	100	Creativity	–
Biswas and Verma (2021)	880	Attitude, risk-taking, self-efficacy	Innovation, intention
Boso et al. (2019)	240	Network, experience	Performance
Boudreaux et al. (2019)	721,581	Age, education, self-efficacy	–
Campos (2016)	244	Age, creativity, experience, passion	–
Ceptureanu et al. (2020)	354	Network	Opportunity recognition
Chen and Tseng (2021)	318	Creativity	Performance
Chen et al. (2020)	214	Prior knowledge	Performance, Opportunity recognition
Cox (2016)	112	Network	Opportunity recognition
Crespo et al. (2014)	416	Experience, firm size	Performance
Cui et al. (2021)	1428	Self-efficacy	–
Dai et al. (2020)	3284	Education, firm size, experience	Performance
Drnovšek et al. (2018)	55	Experience, risk-taking	Intentions
Faia et al. (2014)	123	Age, experience, firm size	–
Fatima and Bilal (2020)	189	–	Performance
Fuentelsaz et al. (2018)	143,167	Age, education, experience, risk-taking	Innovation, Opportunity recognition
Ghasemi and Rowshan (2016)	115	Education, network, prior knowledge, self-efficacy	–
Gill et al. (2021)	486	Self-efficacy	Intentions
Glover (2017)	150	Education, experience, self-efficacy	Opportunity recognition
Gomez and Rangus (2018)	188	–	Innovation, performance
González et al. (2017)	190	–	Opportunity recognition
Gozukara and Colakoglu (2016)	226	–	Intentions, Innovation
Hajizadeh and Zali (2016)	64	Prior knowledge	Opportunity recognition
Hou (2008)	147	Age, education, experience	Performance
Hu et al. (2018)	735	Age, creativity	Intentions
Jaroensutiyotin et al. (2019)	248	–	Innovation
Jiao et al. (2014)	168	Network	Innovation
Jiatong et al. (2021)	486	Self-efficacy	Intentions
Kadile and Biraglia (2020)	205	Age, experience	–
Kao et al. (2012)	204	–	Performance
Karabey and Bingol (2015)	246	Education, experience, network	–
Karabulut (2016)	480	–	Intentions
Karam (2017)	33	Age, education, firm age, norms, self-efficacy, size	–
Khalid and Sekiguchi (2018)	120	Age, experience, creativity, self-efficacy	Innovation, intentions, Opportunity recognition
Khalid and Sekiguchi (2018)	131	Age, experience, creativity, self-efficacy	Innovation, intentions, Opportunity recognition
Klyver et al. (2012)	7067	Age, education	Performance
Lee et al. (2016)	101	Size	–
Lee et al. (2016)	57	Size	–
Levasseur et al. (2022)	152	–	Innovation
Li (2013)	1080	–	Performance
Y. Li et al. (2015)	208	Prior knowledge	Performance
C. Li et al. (2020)	346	Passion	Intentions
Liao and Long (2016)	1020	–	Performance
Lim (2019)	255	–	Opportunity recognition
Lim and Lee (2019)	255	–	Opportunity recognition
Lim et al. (2014)	212	Age, experience, openness	Intentions
Lin et al. (2016)	194	Norms	Performance
Lu and Wang (2018)	451	Age, education, experience, norms, attitude	Intentions
Lucas et al. (2009)	494	self-efficacy	Intentions
Ma and Huang (2016)	138	Age, experience, firm size, experience	Opportunity recognition, Innovation
Machado et al. (2016)	180	Age, education, experience, firm size	–
Mamun (2016)	407	Education	Performance
Mehdizadeh et al. (2020)	127	–	Opportunity recognition
Miao and Liu (2010)	327	–	Opportunity recognition

(continued on next page)

Table 1 (continued)

Authors	N	Antecedents	Consequences
Miao and Yu (2009)	207	–	Opportunity recognition
Mohamad (2020)	230	–	Performance
Montiel-Campos (2017)	112	Experience, age	–
Montiel-Campos (2018a)	406	Age, education, experience, creativity, passion	–
Montiel-Campos (2018b)	278	Age, creativity	–
Montiel-Campos (2019)	274	Age, attitude, firm age, size	–
Murugesan and Dominic (2014)	320	Norms	Intentions
Ndeveni et al. (2019)	135	Network, Prior knowledge	Opportunity recognition
Neneh (2019)	533	Age, education, experience	Entrepreneurial intentions
Nikraftar and Hosseini (2016)	220	Network, prior knowledge, self-efficacy	Opportunity recognition
Njeru and Bwisa (2012)	220	–	Performance
Obschonka et al. (2018)	267	Age, education, risk-taking, self-efficacy	Entrepreneurial intentions
OdebunmiTunde et al. (2020)	202	–	Opportunity recognition
Olatoye et al. (2020)	600	Creativity, Prior knowledge	–
Ozgen and Baron (2007)	201	Age, education, network, self-efficacy	–
Park et al. (2017)	177	Prior knowledge	Opportunity recognition
Patel (2019)	93	Age, experience	Opportunity recognition
Peter (2018)	85	Network, prior knowledge	Opportunity recognition
Pidduck et al. (2020)	581	Age, education, experience	Intentions
Roundy et al. (2018)	633	Firm age, education, Firm size	Opportunity recognition, Performance
Roza et al. (2020)	86	Passion	–
Rungsisawat and Sutdewan (2019)	269	Creativity, network, prior knowledge	Opportunity recognition
Sambasivan et al. (2009)	243	Prior knowledge	Opportunity recognition
Samo and Hashim (2016)	499	–	Attitudes, intentions
Sang and Lin (2019)	672	Education,	Intention
Sargani et al. (2019)	640	Creativity, risk-taking	Intentions
Saulo (2016)	39	–	Performance
Scheepers and Kerr (2013)	109	–	Performance
Sirén et al. (2019)	92	Age, experience	–
Slavec et al. (2017)	269	Openness, self-efficacy	–
Slavec et al. (2017)	547	Openness, self-efficacy	–
Slavec et al. (2017)	688	Openness, self-efficacy	–
Soelaiman and Liediana (2021)	80	Network, Prior knowledge, self-efficacy	Opportunity recognition
Solano et al. (2017)	276	–	Opportunity recognition, intentions
Solesvik et al. (2013)	189	Education, risk-taking	Intentions
Srivastava et al. (2021)	271	Age, education, experience	Innovation
Stanić (2020)	206	Experience, self-efficacy	Intentions
Tang (2008)	365	Age, education, self-efficacy	–
Tang (2009)	365	Age, education	–
Tang (2016)	108	Age, education, creativity, experience, prior knowledge	–
Tang et al. (2008)	381	Age, education, risk	–
Tang et al. (2012)	109	Age, education, creativity, experience, prior knowledge	Innovation
Tang et al. (2021a)	132	Self-efficacy	Innovation, performance
Tejima and Yuliana (2019)	30	–	Opportunity recognition
Troise and Tani (2020)	97	Networking	–
Tsou and Cheng (2018)	170	–	Innovation
Turner and Gianiodis (2018)	223	Passion	Intentions
Urban (2017)	784	Firm age, firm size	Innovation
Urban (2019c)	120	Age, norms, firm size	Performance
Urban (2019a)	164	Attitude, norms, self-efficacy	–
Urban (2019b)	175	Age, firm size, self-efficacy	Performance
Urban (2020)	145	Age, self-efficacy	Intentions
Urban and Msimango-Galawe (2020)	1112	Norms	Performance
Urban and Wood (2017)	748	Age, education, firm age, firm size, creativity	–
Uy et al. (2015)	750	Attitude	–
van Gelderen et al. (2008)	1235	Creativity, norms, self-efficacy	Intentions
Wang et al. (2017)	500	Norms, self-efficacy, attitude	Intentions
Westhead and Solesvik (2016)	218	Education, self-efficacy	Intentions
Xie and Lv (2016)	316	Firm age, network, firm size	Performance
Yan et al. (2018)	316	–	Opportunity recognition, intentions
Yasir et al. (2017)	622	–	Intentions
Yasir et al. (2020)	500	Age, creativity, self-efficacy	Intentions, Opportunity recognition
You et al. (2020)	387	–	Opportunity recognition

(continued on next page)

Table 1 (continued)

Authors	N	Antecedents	Consequences
Zanella et al. (2019)	627	–	Opportunity recognition, innovation
Zhao et al. (2020)	25,283	Age, education, firm age, risk-taking, firm size	Opportunity recognition, performance
Zhao et al. (2021)	150	Education, experience, risk-taking, firm size	–

of the results (Hunter and Schmidt, 2004). Therefore, we performed meta-regression to evaluate whether potential moderators explained the variation in effect sizes.

We treated the effect sizes as dependent factors and the moderating variables as independent variables in the meta-regression (Hedges and Olkin, 2014). We analyzed three potential moderators: national culture (Hofstede, 1994); the year of publication because the field of knowledge changes over the years and so does the perception of individuals (Hansen and Block, 2020); and the respondents (students vs. entrepreneurs) (Martin et al., 2013; Schlaegel and Koenig, 2014). Results did not indicate any specific pattern for the examined relationships. The only observation with respect to the year of publication is that EA has received significantly more attention in higher educational settings in recent years.

#### 4.3. Post hoc analysis

We conducted five post hoc analyses<sup>2</sup> to examine factors that might account for the magnitudes of the associations: (1) effect size type (r-Pearson vs. beta-converted correlations); (2) primary studies' research designs (e.g., survey vs. experiment); (3) different measures of alertness (Tang et al., 2012 vs. others); (4) different measures of antecedents; and (5) different measures of performance (objective vs. subjective). We performed Fisher-z test (1925) and Zou's (2007) confidence interval, a procedure similar to O'Boyle et al. (2012, p.7), and results were summarized in Table 4.

## 5. Discussion

This study contributes to entrepreneurial alertness research by meta-analytically assessing the antecedents, and outcomes of entrepreneurial alertness and the key associations between them. Our results provide meta-analytically derived population estimates for the relationships between alertness and its antecedent and outcome variables. As such, our findings facilitate replications and inform theoretical extensions of EA research. Our findings identify several key antecedents of alertness both at the individual and firm levels, such as firm size, entrepreneur's education, creativity, entrepreneurial attitude, entrepreneurial experience, passion, self-efficacy, networking, openness, prior knowledge, risk-taking, and norms. Contrarily, we did not find evidence for entrepreneur age or firm age as significant antecedents of EA. Our findings also indicate that consistent with existing research, entrepreneurial intentions, opportunity recognition, firm innovation, and firm performance represent significant outcomes of alertness.

### 5.1. Theoretical implications

Our meta-analysis provides several directions for further theorizing the role of alertness in entrepreneurship. First, entrepreneurial opportunity lies at the heart of alertness research. As discussed by Kirzner (1999, p. 6), the essence of entrepreneurship is the discovery of errors made by other actors in "the course of market exchange." Kirzner (1999) argues for the importance of creativity in constructing the future by the entrepreneur, which requires imagination and boldness in actualizing the new opportunity. However, the extant research has not adequately theorized the role of alertness in developing different types of opportunities. Our findings, with regard to creativity as a key antecedent of alertness, provide a promising ground for further development of opportunity theory by integrating the opportunity creation view into alertness theory. This line of theorizing introduces the Schumpeterian perspective into alertness research, which is aligned with Kirzner's (1999, p. 13) proposition that "in the multi-period, uncertain world, alertness must indeed express itself in the boldness, self-confidence, and daring of the Schumpeterian leader" to aggressively and actively initiate change.

Studying alertness in the process of new opportunity creation provides a theoretical framework for understanding the role of creativity and alertness as a channel through which creativity leads to new ventures in uncertain conditions. Creativity thus serves to bring two deeply separated opportunity streams in terms of ontology and epistemologies together under a more pragmatist epistemology (Zellweger and Zenger, 2021). Pragmatically, entrepreneurs are more concerned about the actions to develop and exploit opportunities (McMullen and Shepherd, 2006), than the origins of the opportunities, i.e., whether opportunities are discovered or created (Karami and Read, 2021). In this sense, alertness can be regarded as a mechanism activating entrepreneurial creativity to either identify exogenous opportunities or to develop an imagined opportunity. Further, the integration of alertness and creativity enables entrepreneurship research to better theorize the role of both factors in unpacking uncertainty as a boundary condition for entrepreneurship theories (e.g., Townsend et al., 2018).

Second, we identified networking as another important antecedent of EA. As an important concept in entrepreneurship, networking enables complementary resources and knowledge sharing among different stakeholders in order to decompose the uncertainty and develop a new opportunity (Pollack et al., 2016). Integrating EA and networking can help theorize collective entrepreneurial alertness which enables a constellation of stakeholders to become collectively alert to new opportunities for learning, resource shar-

<sup>2</sup> We extend appreciation to one anonymous reviewer and guest editor for this insight.

**Table 2**  
Definitions of key constructs.

Construct	Definition	Common aliases
Entrepreneurial alertness	Scanning and searching for new information, connecting previously disparate information, and evaluating whether the new information represents an opportunity (Tang et al., 2012).	Alertness (Kirzner, 1973, 1979)
Antecedents		
Age	Demographic information about the entrepreneur	Age Ranking (Tang, 2016; Yasir et al., 2020), Years (Tang, 2008, 2012)
Creativity	A generation of ideas that are both novel and useful (Amabile, 1996).	Creative potential (Montiel-Campos, 2018b) Practiced creativity (Montiel-Campos, 2018b 8), Self-Perceived Creativity (Khalid and Sekiguchi, 2018)
Education	Having the concepts and skills necessary to recognize opportunities (McIntyre, 2000).	Entrepreneurial education (Sang and Lin, 2019), Education experience (Lu and Wang 2018), Entrepreneurship-specific education (Solevik et al., 2013)
Entrepreneurial Attitude	An individual's personal positive or negative assessment of being an entrepreneur, including the emotional factor and assessable items (Liñán and Chen, 2009).	Dispositional attitude (Folta et al., 2010), Attitude (Ajzen, 2001), Personal attitude (Liñán and Chen, 2009)
Entrepreneurial Experience	Years of experience in a certain industry/sector (Montiel-Campos, 2017).	Work experience (Hou, 2008), Industry experience (Sirén et al., 2019), Family business background (Neneh, 2019), Metacognitive experience (Stanić, 2020)
Entrepreneurial Passion	Conscious state that can be accessed by intense positive feelings experienced through involvement in entrepreneurial activities related to a meaningful role for the entrepreneur's identity (Cardon et al., 2013).	Passion (Cardon et al., 2013)
Firm Age	Years of operation since the creation of a certain firm	Firm age (Roundy et al., 2018; Amato et al., 2017).
Firm Size	Number of current employees in the firm	Venture age (Adomako et al., 2018), Company Age (Karam, 2017) Organizational size (Lee et al., 2016), Size (Karam, 2017), Firm size (Adomako 2021)
Network	An individual's interpersonal network, including the weak-tie and strong-tie network, which facilitate the access to diverse information that benefits from the learning and information dissemination processes in order to further discover the opportunities (Busenitz et al., 2003)	Social networks (Ghasemi and Rowshan, 2016), Networking Ability (Alvi et al., 2017), Business networking capacity (Adomako et al., 2018), Institutional networks (Ben Amara et al., 2020), Informal industry networks (Ozgen and Baron, 2007)
Norms	Social pressure to perform a specific pattern of behavior, subjected to groups approval or disapproval according to their expectation and beliefs (Ajzen, 2001).	Subjective norms (Lu and Wang 2018), Social Norms (Wang et al., 2017), Normative commitment (Karam, 2017)
Openness	An individual's fascination with novelty and their range of interests (Slavec et al., 2017).	Entrepreneurial openness (Slavec et al., 2017), Openness to experience (Awwad and Al-Aseer, 2021), Emotional openness (Lim et al., 2014)
Prior Knowledge	Information about a particular topic which can enable opportunities recognition (Shepherd and Patzelt, 2018).	Prior Knowledge (Shane, 2000)
Risk taking	Tendency of utilizing new opportunities and being proactive despite uncertainties and risks (Nieß and Biemann, 2014)	Risk propensity (Westhead and Solevik 2016), Risk perception (Zhao et al., 2021), Risk Taking Capacity (Alvi et al., 2017), Risk Tolerance (Fuentelsaz et al., 2018)
Entrepreneurial Self-efficacy	An individual's belief in his/her own capacity to execute behaviors necessary to produce specific performance (Bandura, 1977).	Perceived self-efficacy (GEM, 2022), Self-efficacy (Obschonka et al., 2018), Perceived behavioural control (Ajzen, 2001), Venturing self-efficacy (Lucas et al., 2009)
Outcomes		
Entrepreneurial Intentions	Cognitive and risk-intensive processes, including beliefs, perceptions, and actions where creation is the necessary premise of entrepreneurial behavior (Ajzen, 1991).	Intention to invest (Drnovšek et al., 2018), Intention toward entrepreneurship (Yasir et al., 2017), Social entrepreneurial intentions (Urban, 2020)
Performance	Organizational performance is the organization's capability to accomplish its goals effectively and efficiently using resources (Daft, 2000).	Growth (Ndeveni et al., 2019), Business performance (Ndeveni et al., 2019), Firm performance (Srivastava et al., 2021), Financial performance (Tang et al., 2021), Perceived Firm Success (Amato et al., 2017), Market performance (Njeru and Bwisa, 2012), Satisfaction (Chen & Tseng, 2020), International performance (Crespo et al., 2014)
Opportunity Recognition	Ability to find new business opportunities based on existing information (You et al., 2020).	Opportunity entrepreneurship (GEM, 2022), Opportunities (Lim 2019), Opportunity discovery (González et al., 2017), Perceived opportunity (Chen et al., 2020), Opportunity novelty (Cox, 2016), Opportunity development (Cox, 2016)
Innovation	Creation of new products, services, or work practices (Van de Ven, 1986).	Entrepreneurs' innovativeness (Jiao et al., 2014), Firm innovativeness (Ma and Huang 2016), Open innovation mindset (Gomez and Rangus, 2018)

ing, new product development, etc. Our results provide empirical support for such multilevel theoretical extension and open the door to theorizing EA beyond individuals as a firm-level construct.

Third, we found several significant dispositional antecedents of EA including entrepreneurial attitude, experience, prior knowledge, passion, self-efficacy, openness, and risk-taking. These are important theoretical extensions to the alertness theory which is in line with Kirzner's later work (1999) permitting "explicit attention to the psychological characteristics of entrepreneurs" in theorizing alertness. Experience and prior knowledge are important factors in the opportunity creation theories (e.g., Alvarez and Barney, 2007;

**Table 3**  
Meta-analysis results.

Relationship	k	N	ES	$\rho$	s.e.	CI.lb	CI.ub	Qtest	FSN <sup>1</sup>	FSN <sup>2</sup>
Demographic antecedents										
Age → EA	54	1,797,203	.018	.021	.017	-.012	.053	3703.09	N/C	N/C
Education → EA	48	1,793,466	.102	.105***	.026	.056	.154	2396.93	126	7353
Firm age → EA	18	30536	.090	.135	.098	-.055	.317	1064.26	N/C	N/C
Firm size → EA	25	34944	.063	.061*	.022	.017	.103	127.23	39	63
Dispositional antecedents										
Creativity → EA	31	9150	.277	.313***	.063	.198	.420	1233.32	1240	11894
Entrepreneurial Attitude → EA	14	6716	.384	.408***	.074	.281	.521	259.26	546	5695
Entrepreneurial Experience → EA	46	156172	.113	.121**	.033	.057	.184	644.14	1	2757
Entrepreneurial Passion → EA	12	3070	.432	.453***	.072	.334	.557	221.96	623	3341
Entrepreneurial Self-efficacy → EA	62	746107	.427	.454***	.038	.394	.511	3988.38	1216	198038
Network → EA	24	4897	.372	.422***	.082	.282	.544	911.86	1186	9204
Norms → EA	14	6528	.371	.402***	.068	.284	.508	287.82	515	4947
Openness → EA	29	14071	.363	.382***	.047	.300	.458	851.78	1131	23298
Prior knowledge → EA	17	3210	.441	.533***	.133	.321	.694	739.93	959	6202
Risk-taking → EA	27	176971	.216	.245***	.056	.139	.345	2625.86	289	12486
Outcomes										
EA → Entrepreneurial Intentions	46	17145	.456	.480***	.041	.416	.540	1066.27	2247	68560
EA → Innovation	27	149924	.276	.287***	.046	.203	.367	850.15	179	7836
EA → Opportunity recognition	51	757590	.361	.430***	.067	.318	.530	3982.59	686	95752
EA → Performance	52	54799	.274	.293***	.037	.225	.357	1575.71	915	34664
Total study and sample	125	1,820,331								

Notes. K = Number of studies; N = accumulated sample size; ES = mean of effect-size;  $\rho$  = effect-size corrected by sample and reliability fitting random effects; s.e. = standard error; CI.lb = lower bound of the confidence interval 95%; CI.ub = upper bound of the confidence interval 95%; Q<sub>test</sub> = test for heterogeneity; FSN<sup>1</sup> = Orwin's fail safe number at 0.01 trivial level; FSN<sup>2</sup> = Rosenthal's fail safe number, using the classic fail-safe N larger than 5 k + 10; N/C = not calculated; Significant of p-value = \*\*\*p < 0.001; \*\*p < 0.01; \*p < 0.05.

Ardichvili et al., 2003) because they provide better decision-making heuristics to entrepreneurs (Gigerenzer and Gaissmaier, 2011). Risk-taking provides an interesting line of theorizing both at the individual level and firm level. At the individual level, it can connect alertness research with prospect theory (Kahneman and Tversky, 2013), and at the firm level, it can be considered as an element of firm-level entrepreneurial orientation and help theorize alertness. In line with Kirzner's emphasis on "self-confidence" in developing opportunities in the real world, self-efficacy is another well-developed construct which can help further theorize psychological qualities as alertness enablers.

Fourth, with regard to the outcomes of alertness, we identified innovation as an important outcome, which is aligned with Kirzner's (1999) explanation on how innovative entrepreneurship sees "better ways of using resources" in different industries in coordination with the emerging patterns of consumer behaviors and technological advancements. Future research can draw upon our findings to provide a finer-grained examination on how alertness enables different aspects of innovation such as service, product, process, strategy, business practices, and technology (Tang et al., 2012). Firm performance, reflecting whether the new opportunity results in expected return for entrepreneurs, is another important outcome of alertness. Kirzner (1999) argued that "seers" who imagine an opportunity have not really discovered a new opportunity if they do not exploit the opportunity. Along this line of thinking, our findings on the association between alertness and firm performance confirm theorizing entrepreneurial actions along with alertness in explaining the performance of alert entrepreneurs (McMullen and Shepherd, 2006).

Finally, we identified that EA is influenced by firm size and impacts firm-level innovation and performance. Tang et al.'s (2012) reconceptualization of EA was built upon social cognition theory (Fiske and Taylor, 1984), which asserts that individuals' cognitive structure is an organized representation of their prior experience and knowledge. Considering that learning can occur both at the individual and organizational level, entrepreneurial alertness, as an important entrepreneurial mechanism at the individual level, has the great potential to link individual and firm-level antecedents and outcomes, and to lead to collective learning and sharing of resources and situations (Karami and Read, 2021). Using alertness to explain both individual-level and firm-level variables enables researchers to design multi-level studies (Shepherd, 2011) and enrich our understating of alertness within organizations.

## 5.2. Effect sizes discussions

It is worth mentioning that the effect sizes reported in our study are comparable<sup>3</sup> to the effect sizes reported in previous meta-analytical studies examining the relationship between micro entrepreneurial characteristics and entrepreneurial firm performance. For example, Zhao et al. (2010) reported that the effect sizes between Big-Five personalities and firm performance ranged from .05 to .21. Our study revealed a stronger effect size of  $\rho = 0.293$  between entrepreneurial alertness and firm performance. Our post hoc analysis further illustrated alertness as a stronger predictor of subjective performance ( $\rho = 0.354$ ) than objective performance ( $\rho = 0.121$ ). Zhao et al. (2010) also reported that while the effect size between risk-taking and entrepreneurial intentions was  $\rho = 0.40$ , the effect sizes between the Big-Five personalities and entrepreneurial intentions were  $\rho = 0.24$  or below ( $\rho = 0.19$  for

<sup>3</sup> We extend appreciation to one anonymous reviewer and guest editor for this insight.



**Table 4**  
Post hoc Analysis.

Construct	Variable	Group	ES <sub>n</sub>	N	ES	Fisher's z (1925)	Zou's (2007) confidence interval
Age	EA scale	Others	17	1787468	-0.003	z = -3.099	-0.051 to -0.011
		<a href="#">Tang et al. (2012)</a>	37	9735	0.027	p < 0.001	
	Design	Survey	52	1796952	0.015	z = -0.884	-0.178 to 0.068
		Experiment	2	251	0.071	p = 0.376	
Entrepreneurial Attitude	EA scale	Years	14	17485	0.069	z = 9.133	0.054 to 0.084
		<a href="#">Ranking</a>	40	1779718	-0.001	p < 0.001	
	Design	Others	2	1380	0.267	z = -5.124	-0.191 to -0.083
		<a href="#">Tang</a>	12	5336	0.404	p < 0.001	
Creativity	EA scale	Others	11	3301	0.350	z = 5.714	0.074 to 0.151
		<a href="#">Tang et al. (2012)</a>	20	5849	0.237	p < 0.001	
	Design	Survey	29	8899	0.286	z = 2.331	0.022 to 0.267
		Experiment	2	251	0.143	p = 0.019	
Education	EA scale	Others	21	1928823	0.083	z = 0.423	-0.018 to 0.028
		<a href="#">Tang et al. (2012)</a>	27	7142	0.078	p = 0.671	
	Design	Survey	42	1934744	0.066	z = -3.983	-0.166 to -0.057
		Experiment	6	1221	0.179	p < 0.001	
Entrepreneurial Experience	EA scale	Years	18	4065	0.372	z = 0.001	-0.062 to 0.065
		<a href="#">Ranking</a>	6	837	0.372	p = 0.999	
	Design	Others	13	148333	0.030	z = -10.034	-0.137 to -0.093
		<a href="#">Tang et al. (2012)</a>	33	7839	0.146	p < 0.001	
Firm age	EA scale	Survey	44	155921	0.107	z = -2.243	-0.250 to -0.017
		Experiment	2	251	0.245	p = 0.024	
	Scale IV	Years	15	7666	0.061	z = -6.616	-0.099 to -0.053
		<a href="#">Dummy</a>	31	148506	0.138	p < 0.001	
Firm size	EA scale	Others	3	26549	-0.030	z = -8.558	-0.177 to -0.111
		<a href="#">Tang et al. (2012)</a>	15	3987	0.114	p < 0.001	
	Scale IV	Years	5	2354	0.216	z = 8.293	0.134 to 0.214
		<a href="#">Ranking</a>	13	28182	0.041	p < 0.001	
Innovation	EA scale	Others	5	29971	0.021	z = -3.416	-0.082 to -0.022
		<a href="#">Tang et al. (2012)</a>	20	4973	0.073	p < 0.001	
	Scale IV	N employee	10	2840	0.093	z = 2.583	0.012 to 0.088
		<a href="#">Dummy</a>	15	32104	0.043	z = 0.05	
Entrepreneurial Intention	EA scale	Others	12	146076	0.213	z = -6.660	-0.129 to -0.072
		<a href="#">Tang et al. (2012)</a>	15	3848	0.314	p < 0.001	
	Design	Others	14	6151	0.378	z = -8.701	-0.138 to -0.086
		<a href="#">Tang et al. (2012)</a>	32	10994	0.490	p < 0.001	
Network	EA scale	Survey	38	15673	0.468	z = 3.095	0.024 to 0.114
		Experiment	8	1472	0.400	p < 0.001	
	Scale IV	Others	11	2045	0.535	z = 12.334	0.253 to 0.346
		<a href="#">Tang et al. (2012)</a>	13	2857	0.235	p < 0.001	
Norms	EA scale	Others	18	4065	0.372	z = 0.001	-0.062 to 0.065
		<a href="#">Ozgen and Baron (2007)</a>	6	837	0.372	p = 0.998	
	Design	Others	2	820	0.539	z = 6.564	0.141 to 0.248
		<a href="#">Tang et al. (2012)</a>	12	5708	0.343	p < 0.001	
Openness	EA scale	Others	27	13536	0.358	z = -1.648	-0.130 to 0.012
		<a href="#">Tang et al. (2012)</a>	2	535	0.420	p = 0.099	
	Design	Survey	46	899682	0.336	z = -10.189	-0.293 to -0.210
		Experiment	5	974	0.589	p < 0.001	
Opportunity recognition	EA scale	Others	30	896624	0.349	z = -2.015	-0.053 to -0.001
		<a href="#">Tang et al. (2012)</a>	21	4032	0.377	p = 0.043	
	Design	Survey	49	900405	0.381	z = 8.392	0.388 to 0.631
		Experiment	2	251	-0.131	p < 0.001	
Performance	ES-convert	r-Pearson	47	52235	0.276	z = 1.337	-0.011 to 0.062
		<a href="#">Beta</a>	5	2564	0.251	p = 0.180	
	Scale DV	Objective	18	10795	0.121	z = -23.191	-0.254 to -0.213
		<a href="#">Subjective</a>	34	44004	0.354	p < 0.001	
Prior knowledge	EA scale	Others	25	46563	0.218	z = -9.605	-0.127 to -0.085
		<a href="#">Tang et al. (2012)</a>	27	8236	0.325	p < 0.001	
	ES-convert	r-Pearson	15	2402	0.484	z = 10.992	0.328 to 0.478
		<a href="#">Beta</a>	2	808	0.081	p < 0.001	
EA scale	Others	11	2277	0.397	z = -3.702	-0.172 to -0.054	
	<a href="#">Tang et al. (2012)</a>	6	933	0.511	p < 0.001		

(continued on next page)

Table 4 (continued)

Construct	Variable	Group	ES <sub>n</sub>	N	ES	Fisher's z (1925)	Zou's (2007) confidence interval
Risk taking	Scale IV	Others	9	1811	0.497	z = 4.418	0.070 to 0.184
		Shane (2000)	8	1399	0.369	p < 0.001	
	EA scale	Others	7	170851	0.122	z = -7.020	-0.124 to -0.070
		Tang et al. (2012)	20	4986	0.220	p < 0.001	
Entrepreneurial Self-efficacy	Design	Survey	15	173395	0.098	z = -11.118	-0.251 to -0.179
		Experiment	12	2442	0.314	p < 0.001	
	EA scale	Others	18	726947	0.409	z = -4.284	-0.037 to -0.014
		Tang et al. (2012)	44	19160	0.434	p < 0.001	
	Design	Survey	58	745605	0.429	z = 0.679	-0.045 to 0.101
		Experiment	4	502	0.403	p = 0.496	
Scale IV	Others		32	731808	0.484	z = 16.971	0.102 to 0.131
		Liñán and Chen (2009)	30	14299	0.366	p < 0.001	

Notes. ES<sub>n</sub> = Number effect sizes; N = accumulated sample size; ES = mean of effect-size; EA scale = Entrepreneurial Alertness scale vs. others scale measurement; Scale IV = antecedent variables measurement; Design = study design research (survey vs. experiment methods); ES-convert = study reported correlations "r-Pearson" vs. beta coefficients; Scale DV = type Performance (subjective vs. objective indicators).

conscientiousness;  $\rho = 0.24$  for openness to experience;  $\rho = 0.22$  for emotional stability;  $\rho = 0.16$  for extraversion;  $\rho = 0.04$  for agreeableness). Our meta-analysis revealed an effect size of  $\rho = 0.48$  between entrepreneurial alertness and entrepreneurial intentions, which doubled the effect sizes of the Big-Five personalities as predictors of entrepreneurial intentions. Thus, our study provided empirical evidence for entrepreneurial alertness as a relatively stronger antecedent of entrepreneurial intentions and firm performance, compared to the effect of personalities.

### 5.3. Limitations

Our study suffers from several limitations. First, the opportunity literature theoretically distinguishes between discovery and creation opportunities, and Kirzner (1999) appreciates both creation and discovery views of opportunities. Unfortunately, in our meta-analysis, out of the 51 papers that explored the opportunity outcomes of alertness, only 2 explored opportunity creation. Therefore, we will not have the statistical power to conduct finer-grained analyses to distinguish between internally (the opportunity creation view) and externally (the opportunity discovery view) developed opportunities. Then, previous meta-analyses have analyzed the effect sizes of entrepreneur gender on entrepreneurial intention (Haus et al., 2013), on seeking funding (Geiger 2020), on entrepreneurial career success (Zhao et al., 2021), and others. Despite several studies investigating the effect of gender on entrepreneurial alertness, the literature shows that the results are inconsistent, partly due to the way the gender data are collected or reported. Although we have collected this data, it is not reliable enough to perform the meta-analytic analysis on this relationship. Regardless of these limitations, our meta-analysis provides valuable insights into the relationship between antecedents and outcomes of entrepreneurial alertness and highlights the need for further research in this area. Our meta-analysis contributes to the broader literature on entrepreneurship and provides a foundation for future research in this field.

## 6. Conclusion

Our study represents the first meta-analysis that consolidates and synthesizes the empirical assessment of entrepreneurial alertness and identifies the variables that have been significantly associated with alertness. Our primary contribution lies in providing strong empirical evidence for the major antecedents and outcomes of entrepreneurial alertness and the directions and magnitudes of these associations. The results of our study enable entrepreneurship scholars to compare and contrast alertness studies and gain a comprehensive understanding of the alertness research to date. As such, our study informs future EA research to constructively replicate EA studies, further conceptualize the construct, and advance EA and entrepreneurship research.

### Credit author statement

Clécio Araujo: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing – review & editing. Masound Karami: Conceptualization, Writing – original draft, Writing – review & editing. Jintong Tang: Supervision, Conceptualization, Validation, Writing – original draft, Writing – review & editing. Lucas Roldan: Conceptualization, Investigation, Data curation, Writing – original draft preparation, Writing – review & editing. Julia dos Santos: Investigation, Data curation.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

We present all R code, dataset, and supplementary analyses on web appendix: [https://osf.io/267jn/?view\\_only=55398d5eaf5d4dd5a35b8f36019fa8c9](https://osf.io/267jn/?view_only=55398d5eaf5d4dd5a35b8f36019fa8c9)

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jbvi.2023.e00394>.

## References

- Adomako, S., 2021. Entrepreneurial alertness and product innovativeness: firm-level and environmental contingencies. *Int. J. Innovat. Manag.* 25 (2), 1–25. <https://doi.org/10.1142/S1363919621500237>.
- Adomako, S., Danso, A., Boso, N., Narteh, B., 2018. Entrepreneurial alertness and new venture performance: facilitating roles of networking capability. *Int. Small Bus. J. Res. Entrep.* 36 (5), 453–472. <https://doi.org/10.1177/0266242617747667>.
- Agarwal, R., Selen, W., 2009. Dynamic capability building in service value networks for achieving service innovation. *Decis. Sci. J.* 40 (3), 431–475. <https://doi.org/10.1111/j.1540-5915.2009.00236.x>.
- Ajzen, I., 1991. The theory of planned behavior. *Organ. Behav. Hum. Decis. Process.* 50 (2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T).
- Ajzen, I., 2001. Nature and operation of attitudes. *Annu. Rev. Psychol.* 52 (1), 27–58. <https://doi.org/10.1146/annurev.psych.52.1.27>.
- Alvarez, S., Barney, J., 2007. Discovery and creation: alternative theories of entrepreneurial action. *Strateg. Entrep. J.* 1 (1), 11–26. <https://doi.org/10.1002/sej.4>.
- Alvi, I., Sharma, A., Alvi, T.-R., 2017. Influence of entrepreneurial alertness of professional students on entrepreneurial intentions and determinants of entrepreneurial intentions. *Amity Journal of Entrepreneurship* 2 (1), 32–46.
- Amabile, T.M., 1996. *Creativity and Innovation in Organizations*, vol. 5. Harvard Business School, Boston.
- Amato, C., Baron, R.A., Barbieri, B., Bélanger, J.J., Pierro, A., 2017. Regulatory modes and entrepreneurship: the mediational role of alertness in small business success. *J. Small Bus. Manag.* 55, 27–42. <https://doi.org/10.1111/jsbm.12255>.
- Aparicio, S., Urbano, D., Stenholm, P., 2021. Attracting the entrepreneurial potential: a multilevel institutional approach. June 2020. *Technol. Forecast. Soc. Change* 168, 120748. <https://doi.org/10.1016/j.techfore.2021.120748>.
- Ardichvili, A., Cardozo, R., Ray, S., 2003. A theory of entrepreneurial opportunity identification and development. *J. Bus. Ventur.* 18 (1), 105–123. [https://doi.org/10.1016/S0883-9026\(01\)00068-4](https://doi.org/10.1016/S0883-9026(01)00068-4).
- Asenge, E.L., Diaka, H.S., Soom, A.T., 2018. Entrepreneurial mindset and performance of small and medium scale enterprises in makurdi metropolis, benue state-Nigeria. *International Journal of Innovation* 6 (2), 124–146. <https://doi.org/10.5585/iji.v6i2.223>.
- Awad, M.S., Al-Aseer, R.M.N., 2021. Big Five personality traits impact on entrepreneurial intention: the mediating role of entrepreneurial alertness. *Asia Pacific Journal of Innovation and Entrepreneurship* 15 (1), 87–100. <https://doi.org/10.1108/apjie-09-2020-0136>.
- Bandura, A., 1977. Self-efficacy: toward a unifying theory of behavioral change. *Psychol. Rev.* 84 (2), 191. <https://doi.org/10.1037/0033-295X.84.2.191>.
- Begg, C.B., Mazumdar, M., 1994. Operating characteristics of a rank correlation test for publication bias. *Biometrics* 50 (4), 1088. <https://doi.org/10.2307/2533446>.
- Ben Amara, D., Chen, H., Hafeez, M., 2020. Role of entrepreneurial opportunity identification factors in the eco-innovation of agribusiness. *Business Strategy and Development* 3 (4), 435–448. <https://doi.org/10.1002/bsd2.107>.
- Bhatt, R.K., Ubharadka, A., Kiranbabu, N.C., Veer, T., 2020. Creative behaviour and entrepreneurial alertness among Indian students. *The International Journal of Indian Psychology* 8 (1), 718–725. <https://doi.org/10.25215/0801.089>.
- Biswas, A., Verma, R.K., 2021. Attitude and alertness in personality traits: a pathway to building entrepreneurial intentions among university students. *J. Entrepren.* 30 (2), 367–396. <https://doi.org/10.1177/09713557211025656>.
- Borenstein, M., Cooper, H., Hedges, L., Valentine, J., 2009. Effect sizes for continuous data. In: *The Handbook of Research Synthesis and Meta-Analysis*. pp. 221–235.
- Boso, N., Adeleye, I., Donbesuur, F., Gyensare, M., 2019. Do entrepreneurs always benefit from business failure experience? February 2018. *J. Bus. Res.* 98, 370–379. <https://doi.org/10.1016/j.jbusres.2018.01.063>.
- Boudreaux, C.J., Nikolaev, B.N., Klein, P., 2019. Socio-cognitive traits and entrepreneurship: the moderating role of economic institutions. *J. Bus. Ventur.* 34 (1), 178–196. <https://doi.org/10.1016/j.jbusvent.2018.08.003>.
- Bueckmann-Diegoli, R., García de los Salmones Sánchez, M. del M., San Martín Gutiérrez, H., 2021. The development of entrepreneurial alertness in undergraduate students. *Education and Training* 63 (7–8), 1015–1026. <https://doi.org/10.1108/ET-03-2019-0042>.
- Busenitz, L.W., West, III, G.P., Shepherd, D., Nelson, T., Chandler, G.N., Zacharakis, A., 2003. Entrepreneurship research in emergence: past trends and future directions. *J. Manag.* 29 (3), 285–308. [https://doi.org/10.1016/S0149-2063\\_03\\_00013-8](https://doi.org/10.1016/S0149-2063_03_00013-8).
- Campos, H.M., 2016. O papel da criatividade na mediação do relacionamento entre a paixão empreendedora e a prontidão empreendedora. *Revista Brasileira de Gestão de Negócios* 18 (61), 457–472. <https://doi.org/10.7819/rbgn.v18i61.3010>.
- Cardon, M.S., Gregoire, D.A., Stevens, C.E., Patel, P.C., 2013. Measuring entrepreneurial passion: conceptual foundations and scale validation. *J. Bus. Ventur.* 28 (3), 373–396. <https://doi.org/10.1016/j.jbusvent.2012.03.003>.
- Ceptureanu, S.I., Ceptureanu, E.G., Cristescu, M.P., Dhesi, G., 2020. Analysis of social media impact on opportunity recognition. A social networks and entrepreneurial alertness mixed approach. *Entropy* 22 (3), 343. <https://doi.org/10.3390/e22030343>.
- Chavoushi, Z.H., Zali, M.R., Valliere, D., Faghini, N., Hejazi, R., Dehkordi, A.M., 2021. Entrepreneurial alertness: a systematic literature review. *J. Small Bus. Entrepren.* 33 (2), 123–152. <https://doi.org/10.1080/08276331.2020.1764736>.
- Chen, M.H., Tseng, M., 2021. Creative entrepreneurs' artistic creativity and entrepreneurial alertness: the guanxi network perspective. *Int. J. Entrepreneurial Behav. Res.* 27 (4), 1082–1102. <https://doi.org/10.1108/IJEBR-05-2020-0306>.
- Chen, P.C., Chan, W.C., Hung, S.W., Lin, D.Z., 2020. How entrepreneurs recognize entrepreneurial opportunity and its gaps: a cognitive theory perspective. *Technol. Anal. Strateg. Manag.* 32 (2), 223–238. <https://doi.org/10.1080/09537325.2019.1648790>.
- Cox, K.C., 2016. *Entrepreneurial Alertness, Metacognition, and Opportunity Identification*. Florida Atlantic University.
- Crespo, N., Simões, V., Fontes, M., 2014. A process view of new ventures internationalization: capabilities, alertness and the moderating role of technological turbulence. In: *The 10th Iberian International Business Conference*, September. pp. 363–369. <http://repositorio.lneg.pt/handle/10400.9/2779>.
- Cui, J., Sun, J., Bell, R., 2021. The impact of entrepreneurship education on the entrepreneurial mindset of college students in China: the mediating role of inspiration and the role of educational attributes. *Int. J. Manag. Educ.* 19 (1), 100296. <https://doi.org/10.1016/j.ijme.2019.04.001>.
- Daft, R.L., 2000. *Organization Theory and Design*, seventh ed. U.S.A: South-Western College Publishing, Thomson Learning, U.S.A.
- Dai, W., Arndt, F., Liao, M., 2020. Hear it straight from the horse's mouth: recognizing policy-induced opportunities. *Enterpren. Reg. Dev.* 32 (5–6), 408–428. <https://doi.org/10.1080/08985626.2019.1640452>.
- Drnovšek, M., Franič, S., Slavec, A., 2018. Exploring antecedents of business angels' intention to invest. *Zbornik Radova Ekonomskog Fakulteta Au Rijeci* 36 (2), 701–734. <https://doi.org/10.18045/zbfri.2018.2.701>.
- Egger, M., Smith, G.D., 1998. Meta-analysis bias in location and selection of studies. *Bmj* 316 (7124), 61–66. <https://doi.org/10.1136/bmj.316.7124.61>.
- Faia, V. da S., Rosa, M.A.G., Machado, H.P.V., 2014. Alerta Empreendedor e as abordagens de avaliação e effectuation sobre empreendedorismo. *Revista de Administração Contemporânea* 18 (2), 196–216. <https://doi.org/10.1590/s1415-65552014000200006>.
- Fatima, T., Bilal, A.R., 2020. Individual entrepreneurial orientation, access to finance, and SME performance: fortifying role of entrepreneurial alertness. *Abasyn University Journal of Social Sciences* 13 (1), 233–248. <https://doi.org/10.34091/AJSS.13.1.17>.
- Fisher, R.A., 1925. *Statistical Methods for Research Workers*. Oliver and Boyd, Edinburgh, Scotland. Retrieved from. <http://psychclassics.yorku.ca/>.
- Fiske, S.T., Taylor, S.E., 1984. *Social Cognition*. Addison-Wesley Publishing Company, Reading, MA.
- Folta, T.B., Delmar, F., Wennberg, K., 2010. Hybrid entrepreneurship. *Manag. Sci.* 56 (2), 253–269. <https://doi.org/10.1287/mnsc.1090.1094>.
- Fuentelsaz, L., Maicas, J.P., Montero, J., 2018. Entrepreneurs and innovation: the contingent role of institutional factors. *Int. Small Bus. J. Res. Entrep.* 36 (6), 686–711. <https://doi.org/10.1177/0266242618766235>.
- Geiger, M., 2020. A meta-analysis of the gender gap (s) in venture funding: funder- and entrepreneur-driven perspectives. *J. Bus. Ventur. Insights* 13, e00167. <https://doi.org/10.1016/j.jbvi.2020.e00167>.
- Ghasemi, B., Rowshan, A., 2016. The factors contributing to entrepreneurial alertness. *Journal of Economy and Entrepreneurship* 10 (3–2), 158–164.

- Gigerenzer, G., Gaissmaier, W., 2011. Heuristic decision making. *Annu. Rev. Psychol.* 62 (1), 451–482. <https://doi.org/10.1146/annurev-psych-120709-145346>.
- Gill, S.A., Bencheva, N., Karayel, S., Usman, M., 2021. Does entrepreneurial self-efficacy moderate effects of cognitive flexibility and entrepreneurial alertness on entrepreneurial intentions? *Entrepreneurial Business and Economics Review* 9 (3), 25–41. <https://doi.org/10.15678/EBER.2021.090302>.
- Glover, D.C., 2017. Opportunity Recognition: A Comparative Analysis of Nascent Student Entrepreneurs and Non-Nascent Students [Honors Theses. The University of Southern Mississippi Opportunity]. [https://aquila.usm.edu/honors\\_theses/534%0AThis](https://aquila.usm.edu/honors_theses/534%0AThis).
- Gomezel, A.S., Rangus, K., 2018. An exploration of an entrepreneur's open innovation mindset in an emerging country. *Manag. Decis.* 56 (9), 1869–1882. <https://doi.org/10.1108/MD-04-2017-0382>.
- González, M.F., Husted, B.W., Aigner, D.J., 2017. Opportunity discovery and creation in social entrepreneurship: an exploratory study in Mexico. *J. Bus. Res.* 81, 212–220. <https://doi.org/10.1016/j.jbusres.2016.10.032>.
- Gozukara, I., Colakoglu, N., 2016. Enhancing entrepreneurial intention and innovativeness of university students: the mediating role of entrepreneurial alertness. *Int. Bus. Res.* 9 (2), 34. <https://doi.org/10.5539/ibr.v9n2p34>.
- Hajizadeh, A., Zali, M., 2016. Prior knowledge, cognitive characteristics and opportunity recognition. *Int. J. Entrepreneurial Behav. Res.* 22 (1), 63–83. <https://doi.org/10.1108/IJEBR-05-2015-0110>.
- Hansen, C., Block, J., 2020. Exploring the relation between family involvement and firms' financial performance: a replication and extension meta-analysis. *J. Bus. Ventur. Insights* 13, e00158. <https://doi.org/10.1016/j.jbvi.2020.e00158>.
- Harzing, A.W., 2010. *The Publish or Perish Book*. Tarma Software Research Pty Limited, Melbourne, Australia.
- Haus, I., Steinmetz, H., Isidor, R., Kabst, R., 2013. Gender effects on entrepreneurial intention: a meta-analytical structural equation model. *International Journal of Gender and Entrepreneurship* 5 (2), 130–156. <https://doi.org/10.1108/17566261311328828>.
- Hedges, L., Olkin, I., 2014. *Statistical Methods for Meta-Analysis*. Academic Press, Cambridge.
- Hofstede, G., 1994. The business of international business is culture. *Int. Bus. Rev.* 3 (1), 1–14. [https://doi.org/10.1016/0969-5931\(94\)90011-6](https://doi.org/10.1016/0969-5931(94)90011-6).
- Hou, S.T., 2008. Antecedents and consequence of entrepreneurial alertness in Franchise chain. Proceedings of the 4th IEEE International Conference on Management of Innovation and Technology, ICMIT 166. <https://doi.org/10.1109/ICMIT.2008.4654356>. –171. .
- Hu, R., Wang, L., Zhang, W., Bin, P., 2018. Creativity, proactive personality, and entrepreneurial intention: the role of entrepreneurial alertness. *Front. Psychol.* 9, 951. <https://doi.org/10.3389/fpsyg.2018.00951>.
- Hunter, J.E., Schmidt, F.L., 2004. *Methods of Meta-Analysis: Correcting Error and Bias in Research Findings*, second ed. Sage Publication, Inc.
- Jaroensutiyoit, J., Wang, Z., Ling, B., Chen, Y., 2019. Change leadership and individual innovative behavior in crisis contexts: an attentional perspective. *SBP (Soc. Behav. Pers.)*: *Int. J.* 47 (4), 1–12. <https://doi.org/10.2224/sbp.7773>.
- Jiao, H., Cui, Y., Zhu, Y., Chen, J., 2014. Building entrepreneurs' innovativeness through knowledge management: the mediating effect of entrepreneurial alertness. *Technol. Anal. Strateg. Manag.* 26 (5), 501–516. <https://doi.org/10.1080/09537325.2013.872774>.
- Jiatong, W., Murad, M., Li, C., Gill, S.A., Ashraf, S.F., 2021. Linking cognitive flexibility to entrepreneurial alertness and entrepreneurial intention among medical students with the moderating role of entrepreneurial self-efficacy: a second order moderated mediation model. *PLoS One* 16 (9 September). <https://doi.org/10.1371/journal.pone.0256420>.
- Kadile, V., Biraglia, A., 2020. From hobby to business: exploring environmental antecedents of entrepreneurial alertness using fsQCA. *J. Small Bus. Manag.* 60 (3), 580–615. <https://doi.org/10.1080/00472778.2020.1719846>.
- Kahneman, D., Tversky, A., 2013. Prospect Theory: an Analysis of Decision under Risk. In *Handbook of the Fundamentals of Financial Decision Making: Part I*. pp. 99–127.
- Kao, H.Y., Hung, Y.H., Kuo, Y.H., Chen, L.S., Chien, Y.K., Liu, C.K., 2012. Evolving the business model to improve care performance for remote patient management: a case study. Proceedings of the Annual Hawaii International Conference on System Sciences 2860. <https://doi.org/10.1109/HICSS.2012.260>. –2868. .
- Karabey, C., Bingol, D., 2015. Entrepreneurial alertness in Turkey: human and social capital perspectives. *Int. J. Bus. Soc. Res.* 5 (4), 34–51. <https://doi.org/10.18533/ijbsr.v5i4.758>.
- Karabulut, A.T., 2016. Personality traits on entrepreneurial intention. *Procedia - Social and Behavioral Sciences* 229, 12–21. <https://doi.org/10.1016/j.sbspro.2016.07.109>.
- Karam, A., 2017. CEO Entrepreneurial Characteristics and the Entrepreneurial Orientation of. Concordia University Montreal. Quebec, Canada, September. [https://spectrum.library.concordia.ca/983010/1/Karam\\_MSc\\_S2017.pdf](https://spectrum.library.concordia.ca/983010/1/Karam_MSc_S2017.pdf).
- Karami, M., Read, S., 2021. Co-creative entrepreneurship. *J. Bus. Ventur.* 36 (4), 106125. <https://doi.org/10.1016/j.jbusvent.2021.106125>.
- Kepes, S., McDaniel, M.A., Brannick, M.T., Banks, G.C., 2013. Meta-analytic reviews in the organizational sciences: two meta-analytic schools on the way to MARS (the meta-analytic reporting standards). *J. Bus. Psychol.* 28 (2), 123–143. <https://doi.org/10.1007/s10869-013-9300-2>.
- Khalid, S., Sekiguchi, T., 2018. The role of empathy in entrepreneurial opportunity recognition: an experimental study in Japan and Pakistan. March 2017. *J. Bus. Ventur. Insights* 9, 1–9. <https://doi.org/10.1016/j.jbvi.2017.11.001>.
- Kirzner, I.M., 1973. Competition and entrepreneurship. In: *University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship*.
- Kirzner, I.M., 1979. Perception, opportunity and profit. In: *Studies in the Theory of Entrepreneurship*. University of Chicago Press.
- Kirzner, I.M., 1999. Creativity and/or alertness: a reconsideration of the Schumpeterian entrepreneur. *Rev. Austrian Econ.* 11 (1–2), 5–17.
- Kirzner, I.M., 2009. The alert and creative entrepreneur: a clarification. *Small Bus. Econ.* 32 (2), 145–152. <https://doi.org/10.1007/s11187-008-9153-7>.
- Klyver, K., Hunter, E., Watne, T., 2012. Entrepreneurial ties and innovativeness in the start-up decision. *Int. J. Enterpren. Innovat.* 13 (3), 153–163. <https://doi.org/10.5367/ijei.2012.0084>.
- Lanivich, S.E., Smith, A., Levasseur, L., Piddock, R.J., Busenitz, L., 2022. Advancing entrepreneurial alertness: review, synthesis, and future research directions. *J. Bus. Res.* 139 (October 2021), 1165–1176. <https://doi.org/10.1016/j.jbusres.2021.10.023>.
- Lee, K., Kim, Y., Koh, D., 2016. Organizational learning, top management team's entrepreneurial alertness, and corporate entrepreneurship in high-tech firms. *Asian J. Technol. Innovat.* 24 (3), 338–360. <https://doi.org/10.1080/19761597.2016.1249381>.
- Levasseur, L., Tang, J., Karami, M., Busenitz, L., Kacmar, K.M., 2022. Increasing alertness to new opportunities: the influence of positive affect and implications for innovation. *Asia Pac. J. Manag.* 39 (1), 27–49. <https://doi.org/10.1007/s10490-020-09724-y>.
- Li, Z., 2013. Entrepreneurial alertness. In: *Paper Knowledge. Toward a Media History of Documents*. Springer Berlin Heidelberg. <https://doi.org/10.1007/978-3-642-31098-0>.
- Li, Y., Wang, P., Liang, Y.J., 2015. Influence of entrepreneurial experience, alertness, and prior knowledge on opportunity recognition. *SBP (Soc. Behav. Pers.)* 43 (9), 1575–1584. <https://doi.org/10.2224/sbp.2015.43.9.1575>.
- Li, C., Murad, M., Shahzad, F., Khan, M.A.S., Ashraf, S.F., Dogbe, C.S.K., 2020. Entrepreneurial passion to entrepreneurial behavior: role of entrepreneurial alertness, entrepreneurial self-efficacy and proactive personality. *Front. Psychol.* 11 (August), 1–19. <https://doi.org/10.3389/fpsyg.2020.01611>.
- Liao, Z., Long, S., 2016. Cognitive diversity, alertness, and team performance. *SBP (Soc. Behav. Pers.)* 44 (2), 209–220. <https://doi.org/10.2224/sbp.2016.44.2.209>.
- Lim, W., 2019. Ideas and opportunities: impact of technology knowledge through entrepreneurial alertness. In: *IEEE International Symposium on Innovation and Entrepreneurship (TEMS-ISIE)*. IEEE, pp. 1–5. <https://doi.org/10.1109/TEMS-ISIE46312.2019.9074308>.
- Lim, W.L., Lee, Y., 2019. The Impact of Social Networks on Technology Entrepreneurs' Opportunity Recognition Process. *ICoICT 2019*. In: 7th International Conference on Information and Communication Technology, vols. 1–7. <https://doi.org/10.1109/ICoICT.2019.8835289>.
- Lim, W.L., Lee, Y.L.-E., Ramasamy, R., 2014. Personality, prior knowledge, social capital and entrepreneurial intentions: entrepreneurial alertness as mediator. *GATR. Global Journal of Business Social Sciences Review* 2 (1), 68–78. [https://doi.org/10.35609/gjbsr.2014.2.1\(8\)](https://doi.org/10.35609/gjbsr.2014.2.1(8)).
- Lin, Y.-L., Liu, H.-W., Xu, F., Wang, H., 2016. Environmental conditions, entrepreneur alertness and social capital on performance. *Int. Bus. Res.* 9 (8), 1. <https://doi.org/10.5539/ibr.v9n8p1>.
- Liñán, F., Chen, Y.W., 2009. Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrep. Theory Pract.* 33 (3), 593–617. <https://doi.org/10.1111/j.1540-6520.2009.00318.x>.
- Lu, H., Wang, J., 2018. Entrepreneurial intention of two patterns of planned behavior and alertness: empirical evidence in China. *Journal of Asian Finance, Economics*

- and Business 5 (2), 63–72. <https://doi.org/10.13106/jafeb.2018.vol5.no2.63>.
- Lucas, W.A., Cooper, S.Y., Rodriguez-Falcon, E.M., 2009. On the recognition of venturing opportunities in science and technology. In: *New Technology Based Firms in the New Millennium*, vol. 7. Elsevier. [https://doi.org/10.1108/s1876-0228\(2009\)000007004](https://doi.org/10.1108/s1876-0228(2009)000007004).
- Ma, R., Huang, Y.C., 2016. Opportunity-based strategic orientation, knowledge acquisition, and entrepreneurial alertness: the perspective of the global sourcing suppliers in China. *J. Small Bus. Manag.* 54 (3), 953–972. <https://doi.org/10.1111/jsbm.12222>.
- Machado, H.P.V., Faia, V. da S., Silva, J. D. da, 2016. Alerta empreendedor: estudo da influência de características do indivíduo e do empreendimento. *Brazilian Business Review* 13 (5), 87–110. <https://doi.org/10.15728/bbr.2016.13.5.4>.
- Mamun, A. al, 2016. Access to credit, education and entrepreneurial competencies: a study among women micro-entrepreneurs in Malaysia. *Vision* 20 (3), 159–168. <https://doi.org/10.1177/0972262916651510>.
- Martin, B.C., McNally, J.J., Kay, M.J., 2013. Examining the formation of human capital in entrepreneurship: a meta-analysis of entrepreneurship education outcomes. *J. Bus. Ventur.* 28 (2), 211–224. <https://doi.org/10.1016/j.jbusvent.2012.03.002>.
- McIntyre, J.R., 2000. *University Education for Entrepreneurs in the United States: a Critical and Retrospective [sic] Analysis of Trends in the 1990's*. Georgia Tech Center for International Business Education and Research, Dupree School of Management, Georgia Institute of Technology.
- McMullen, J., Shepherd, D., 2006. Entrepreneurial action and the role of uncertainty in the theory of the entrepreneur. *Acad. Manag. Rev.* 31 (1), 132–152. <https://doi.org/10.5465/amr.2006.19379628>.
- McMullen, J., Plummer, L., Acs, Z., 2007. What is an entrepreneurial opportunity? *Small Bus. Econ.* 28, 273–283. <https://doi.org/10.1007/s11187-006-9040-z>.
- Mehdizadeh, H., Gholami, H., Shiri, N., Khoshmaram, M., 2020. Predicting entrepreneurial opportunity recognition in higher education: a case from Iran. *J. Appl. Res. High Educ.* <https://doi.org/10.1108/JARHE-04-2020-0109>.
- Miao, Q., Liu, L., 2010. A psychological model of entrepreneurial decision making. *SBP (Soc. Behav. Pers.)* 38 (3), 357–364. <https://doi.org/10.2224/sbp.2010.38.3.357>.
- Miao, Q., Yu, C., 2009. The micro mechanism of entrepreneurial decision making: causal model validation. 0–3. Proceedings - International Conference on Management and Service Science, MASS 2009, 70702020. <https://doi.org/10.1109/ICMSS.2009.5303646>.
- Mohamad, M., 2020. Does work-family conflict moderates the relationship between alertness, self-efficacy and Malay women entrepreneurs' success? *Hamdard Islam.* 43 (2), 2662–2673.
- Montiel-Campos, H., 2017. Impact of entrepreneurial passion on entrepreneurial orientation with the mediating role of entrepreneurial alertness for technology-based firms in Mexico. *J. Small Bus. Enterprise Dev.* 24 (2), 353–374. <https://doi.org/10.1108/JSBED-10-2016-0166>.
- Montiel-Campos, H., 2018a. The entrepreneurial passion-entrepreneurial alertness relationship: the moderating role of a creative personality. *Serbian Journal of Management* 13 (2), 263–280. <https://doi.org/10.5937/sjm13-16021>.
- Montiel-Campos, H., 2018b. Understanding employees' entrepreneurial alertness: the role of creativity and support for creativity. *Acad. Enterpren. J.* 24 (2).
- Montiel-Campos, H., 2019. Capitalizing on women's entrepreneurial alertness: the role of human, social and psychological capital. *International Journal of Gender and Entrepreneurship* 11 (3), 248–272. <https://doi.org/10.1108/IJGE-03-2019-0051>.
- Murugesan, R., Dominic, P.D.D., 2014. Socio, economic and psychological determinants of entrepreneurial intentions: a structural equation model. *Global Bus. Econ. Rev.* 16 (4), 396–415. <https://doi.org/10.1504/GBER.2014.065363>.
- Ndeveni, O.K., Wanjau, K.L., Kariuki, G.M., Muchiri, J., 2019. Entrepreneurial opportunity discovery dimensions and growth of non-governmental organizations in Kenya. *International Journal of Research in Business and Social Science* 8 (5), 18–26. <https://doi.org/10.20525/ijrbs.v8i5.300>.
- Neneh, B.N., 2019. From entrepreneurial alertness to entrepreneurial behavior: the role of trait competitiveness and proactive personality. *Pers. Individ. Differ.* 138, 273–279. <https://doi.org/10.1016/j.paid.2018.10.020>.
- Nieß, C., Biemann, T., 2014. The role of risk propensity in predicting self-employment. *J. Appl. Psychol.* 99 (5), 1000. <https://doi.org/10.1037/a0035992>.
- Nikrafter, T., Hosseini, E., 2016. Factors affecting entrepreneurial opportunities recognition in tourism small and medium sized enterprises. *Tourism Rev.* 71 (1), 6–17. <https://doi.org/10.1108/TR-09-2015-0042>.
- Njeru, P.W., Bwisa, H.M., 2012. Assessing the relationship between perceived business alertness and business performance. *Int. J. Bus. Commer.* 1 (9), 52–66.
- O'Boyle, Jr, E.H., Pollack, J.M., Rutherford, M.W., 2012. Exploring the relation between family involvement and firms' financial performance: a meta-analysis of main and moderator effects. *J. Bus. Ventur.* 27 (1), 1–18. <https://doi.org/10.1016/j.jbusvent.2011.09.002>.
- Obschonka, M., Hahn, E., Bajwa, N. ul H., 2018. Personal agency in newly arrived refugees: the role of personality, entrepreneurial cognitions and intentions, and career adaptability. *J. Vocat. Behav.* 105, 173–184. <https://doi.org/10.1016/j.jvb.2018.01.003>. February 2017.
- Odebunmi Tunde, A., Kee, D.M.H., Jimoh, Lukman, A., 2020. A perfect couple: entrepreneurial alertness and opportunity identification - a study of nascent entrepreneurs in Nigeria. *J. Southwest Jiaot. Univ.* 55 (5). <https://doi.org/10.35741/issn.0258-2724.55.5.2>.
- Olatoye, A.O., Dosunmu, M.M., Bukki, A.O., 2020. Prior knowledge, creativity and entrepreneurial alertness of undergraduate students in ogun state-owned universities. *KIU Journal of Social Sciences* 6 (2), 245–251.
- Orwin, R.G., 1983. A fail-safe N for effect size in meta-analysis. *J. Educ. Stat.* 8 (2), 157–159. <https://doi.org/10.3102/10769986008002157>.
- Ozgen, E., Baron, R.A., 2007. Social sources of information in opportunity recognition: effects of mentors, industry networks, and professional forums. *J. Bus. Ventur.* 22 (2), 174–192. <https://doi.org/10.1016/j.jbusvent.2005.12.001>.
- Park, J.Y., Sung, C.S., Im, I., 2017. Does social media use influence entrepreneurial opportunity? A review of its moderating role. *Sustainability* 9 (9), 1–16. <https://doi.org/10.3390/su9091593>.
- Patel, P.C., 2019. Opportunity related absorptive capacity and entrepreneurial alertness. *Int. Enterpren. Manag. J.* 15 (1), 63–73. <https://doi.org/10.1007/s11365-018-0543-2>.
- Peter, J.W., 2018. *Entrepreneurial Determinants of Opportunity Recognition Among the Dairy Farmers within Makueni County, Kenya*. Doctoral dissertation, University of Nairobi.
- Peterson, R.A., Brown, S.P., 2005. On the use of beta coefficients in meta-analysis. *J. Appl. Psychol.* 90 (1), 175. <https://doi.org/10.1037/0021-9010.90.1.175>.
- Pidduck, R.J., Busenitz, L.W., Zhang, Y., Ghosh Moulick, A., 2020. Oh, the places you'll go: a schema theory perspective on cross-cultural experience and entrepreneurship. *J. Bus. Ventur. Insights* 14 (June), e00189. <https://doi.org/10.1016/j.jbvi.2020.e00189>.
- Pollack, J.M., Rutherford, M.W., Seers, A., Coy, A.E., Hanson, S., 2016. Exploring entrepreneurs' social network ties: quantity versus quality. *J. Bus. Ventur. Insights* 6, 28–35. <https://doi.org/10.1016/j.jbvi.2016.09.001>.
- R Core Team, 2016. *R Development Core Team, vol. 55. R: A Language and Environment for Statistical Computing*.
- Read, S., Sarasvathy, S.D., Dew, N., Wiltbank, R., 2016. Response to arend, saroghi, and burkemper (2015): Co-creating effectual entrepreneurship research. *Acad. Manag. Rev.* 41 (3), 528–556. <https://doi.org/10.5465/amr.2015.0180>.
- Rosenthal, R., 1979. The “file drawer problem” and tolerance for null results. *Psychol. Bull.* 86 (3), 638–641. <https://doi.org/10.1037/0033-2909.86.3.638>.
- Roundy, P.T., Harrison, D.A., Khavul, S., Pérez-Nordtvedt, L., McGee, J.E., 2018. Entrepreneurial alertness as a pathway to strategic decisions and organizational performance. *Strat. Organ.* 16 (Issue 2). <https://doi.org/10.1177/1476127017693970>.
- Roza, S., Sriayudha, Y., Octavia, A., 2020. Entrepreneurial passion, entrepreneurial alertness and islamic entrepreneurial orientation: its application to the muslimah entrepreneur. *Dinasti International Journal of Education Management and Social Science* 2 (2), 254–265. <https://doi.org/10.31933/dijemss.v2i2.654>.
- Rungsrisawat, S., Sutduan, C., 2019. Entrepreneurial alertness, social network, creativity and entrepreneurial opportunity recognition among the university students of Thailand: does the prior knowledge of the students' matter. *International Journal of Innovation, Creativity and Change* 6 (10), 402–419.
- Sambasivan, M., Abdul, M., Yusop, Y., 2009. Impact of personal qualities and management skills of entrepreneurs on venture performance in Malaysia: opportunity recognition skills as a mediating factor. *Technovation* 29 (11), 798–805. <https://doi.org/10.1016/j.technovation.2009.04.002>.
- Samo, A.H., Hashim, N., 2016. The impact of entrepreneurial alertness on entrepreneurial intentions. *J. Int. Bus. Res. Market.* 1 (6), 7–11. <https://doi.org/10.18775/jibrm.1849-8558.2015.16.3001>.
- Sang, D., Lin, J., 2019. How does entrepreneurial education influence the entrepreneurial intention of college students: the moderating and mediating effects of entrepreneurial alertness. *International Journal of Emerging Technologies in Learning* 14 (8), 139–157. <https://doi.org/10.3991/ijet.v14i08.10408>.
- Sarasvathy, S., 2001. Causation and effectuation: toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Acad. Manag. Rev.* 26 (2),

- 243–263. <https://doi.org/10.5465/amr.2001.4378020>.
- Sargani, G.R., Zhou, D., Mangan, T., Rajper, H., 2019. Determinants of personality traits influence on entrepreneurial intentions among agricultural students evidence from two different economies. *European Journal of Business and Management Research* 4 (5), 1–10. <https://doi.org/10.24018/ejbm.2019.4.5.105>.
- Saulo, C.A., 2016. Factors Influencing Successful Opportunity Recognition and Exploitation Among Small Scale Manufacturers in Kariobangi Light Industries. Doctoral dissertation, University of Nairobi.
- Scheepers, M.V., Kerr, D., 2013. Entrepreneurial alertness and digital commerce adoption in small firms. In: *Proceedings of the 2013 Australian Centre for Entrepreneurship Research Exchange ACERE*. pp. 1–16.
- Schlaegel, C., Koenig, M., 2014. Determinants of entrepreneurial intent: a meta-analytic test and integration of competing models. *Entrep. Theory Pract.* 38 (2), 291–332. <https://doi.org/10.1111/etap.12087>.
- Shane, S., 2000. Prior knowledge and the discovery of entrepreneurial opportunities. *Organ. Sci.* 11 (4), 448–469. <https://doi.org/10.1287/orsc.11.4.448.14602>.
- Sharma, L., 2019. A systematic review of the concept of entrepreneurial alertness. *Journal of Entrepreneurship in Emerging Economies* 11 (2), 217–233. <https://doi.org/10.1108/jee-05-2018-0049>.
- Shepherd, D.A., 2011. Multilevel entrepreneurship research: opportunities for studying entrepreneurial decision making. *J. Manag.* 37 (2), 412–420. <https://doi.org/10.1177/0149206310369940>.
- Shepherd, D.A., Patzelt, H., 2018. Prior knowledge and entrepreneurial cognition. In: *Entrepreneurial Cognition*. Palgrave Macmillan, Cham, pp. 7–49. [https://doi.org/10.1007/978-3-319-71782-1\\_2](https://doi.org/10.1007/978-3-319-71782-1_2).
- Sirén, C., Parida, V., Patel, P.C., Wincent, J., 2019. Rushed and short on time: the negative effects of temporal planning and flexible pacing style on the entrepreneurial alertness–effectuation relationship. *J. Bus. Res.* 101, 555–560. <https://doi.org/10.1016/j.jbusres.2018.11.025>. November 2018.
- Slavec, A., Drnovšek, M., Hisrich, R.D., 2017. Entrepreneurial openness: concept development and measure validation. *Eur. Manag. J.* 35 (2), 211–223. <https://doi.org/10.1016/j.emj.2016.09.003>.
- Soelaiman, L., Liediana, L., 2021. Factors affecting entrepreneurial opportunity recognition among food and beverage SMEs. *Proceedings of the Ninth International Conference on Entrepreneurship and Business Management (ICEBM 2020)* 174 (Icebm 2020), 501–507. <https://doi.org/10.2991/aebmr.k.210507.074>.
- Solano, D.B.C., Hallam, C., Zanella, G., 2017. Technological opportunity detection and SMEs: a mix of individual and organizational factors. 2017-Janua. In: *PICMET 2017 - Portland International Conference on Management of Engineering and Technology: Technology Management for the Interconnected World*. Proceedings, pp. 1–5. <https://doi.org/10.23919/PICMET.2017.8125314>.
- Solesvik, M.Z., Westhead, P., Matlay, H., Parsyay, V.N., 2013. Entrepreneurial assets and mindsets: benefit from university entrepreneurship education investment. *Educ + Train* 55, 748–762. <https://doi.org/10.1108/ET-06-2013-0075>.
- Srivastava, S., Sahaym, A., Allison, T.H., 2021. Alert and Awake: role of alertness and attention on rate of new product introductions. *J. Bus. Ventur.* 36 (4), 106023. <https://doi.org/10.1016/j.jbusvent.2020.106023>.
- Stanić, M., 2020. Decoding the entrepreneurial capacity: the case of entrepreneurial alertness. *Zagreb Int. Rev. Econ. Bus.* 23 (s1), 1–12. <https://doi.org/10.2478/zireb-2020-0019>.
- Tang, J., 2008. Environmental munificence for entrepreneurs: entrepreneurial alertness and commitment. *Int. J. Entrepreneurial Behav. Res.* 14 (3), 128–151. <https://doi.org/10.1108/13552550810874664>.
- Tang, J., 2009. Exploring the constitution of entrepreneurial alertness: the regulatory focus view. *J. Small Bus. Enterpren.* 22 (3), 221–238. <https://doi.org/10.1080/08276331.2009.10593452>.
- Tang, J., 2016. Linking personal turbulence and creative behavior: the influence of scanning and search in the entrepreneurial process. *J. Bus. Res.* 69 (3), 1167–1174. <https://doi.org/10.1016/j.jbusres.2015.09.017>.
- Tang, J., Tang, Z., Lohrke, F.T., 2008. Developing an entrepreneurial typology: the roles of entrepreneurial alertness and attributional style. *Int. Entrepren. Manag. J.* 4 (3), 273–294. <https://doi.org/10.1007/s11365-007-0041-4>.
- Tang, J., Kacmar, K.M.M., Busenitz, L., 2012. Entrepreneurial alertness in the pursuit of new opportunities. *J. Bus. Ventur.* 27 (1), 77–94. <https://doi.org/10.1016/j.jbusvent.2010.07.001>.
- Tang, J., Baron, R.A., Yu, A., 2021a. Entrepreneurial alertness: exploring its psychological antecedents and effects on firm outcomes. *J. Small Bus. Manag.* 0 (0), 1–30. <https://doi.org/10.1080/00472778.2021.1945071>.
- Tang, J., Levasseur, L., Karami, M., Busenitz, L., 2021b. Being alert to new opportunities: it is a matter of time. *J. Bus. Ventur. Insights* 15, e00232. <https://doi.org/10.1016/j.jbvi.2021.e00232>.
- Tang, J., Zhang, S., Lin, S., 2021c. To reopen or not to reopen? How entrepreneurial alertness influences small business reopening after the COVID-19 lockdown. *J. Bus. Ventur. Insights* 16, e00275. <https://doi.org/10.1016/j.jbvi.2021.e00275>.
- Tejima, K.P., Yuliana, E., 2019. Entrepreneurial opportunity recognition: an empirical study of an ICT enterprise. *eProceedings of Management* 6 (2), 3725–3731.
- Townsend, D.M., Hunt, R.A., McMullen, J.S., Sarasvathy, S.D., 2018. Uncertainty, knowledge problems, and entrepreneurial action. *Acad. Manag. Ann.* 12 (2), 659–687.
- Troise, C., Tani, M., 2020. Exploring entrepreneurial characteristics, motivations and behaviours in equity crowdfunding: some evidence from Italy. *Manag. Decis.* 59 (5), 995–1024. <https://doi.org/10.1108/MD-10-2019-1431>.
- Tsou, H.T., Cheng, C.C.J., 2018. How to enhance IT B2B service innovation? An integrated view of organizational mechanisms. *J. Bus. Ind. Market.* 33 (7), 984–1000. <https://doi.org/10.1108/JBIM-07-2017-0175>.
- Turner, T., Gianiodis, P., 2018. Entrepreneurship unleashed: understanding entrepreneurial education outside of the business school. *J. Small Bus. Manag.* 56 (1), 131–149. <https://doi.org/10.1111/jsbm.12365>.
- Urban, B., 2017. Corporate entrepreneurship in South Africa: the role of organizational factors and entrepreneurial alertness in advancing innovativeness. *J. Dev. Entrepren.* 22 (3). <https://doi.org/10.1142/S1084946717500157>.
- Urban, B., 2019a. Academic entrepreneurship: a focus on entrepreneurial alertness, attitudes, norms and beliefs. *S. Afr. J. High Educ.* 33 (3), 192–204. <https://doi.org/10.20853/33-3-2800>.
- Urban, B., 2019b. Entrepreneurial alertness and self-efficacy: a focus on social values and innovation performance. *SA J. Hum. Resour. Manag.* 17, 1–9. <https://doi.org/10.4102/sajhrm.v17i0.1132>.
- Urban, B., 2019c. Institutional influence on entrepreneurial alertness and business growth in an emerging market context. *Inst. Econ.* 11 (3), 93–117.
- Urban, B., 2020. Entrepreneurial alertness, self-efficacy and social entrepreneurship intentions. *J. Small Bus. Enterprise Dev.* 27 (3), 489–507. <https://doi.org/10.1108/JSBED-08-2019-0285>.
- Urban, B., Msimango-Galawe, J., 2020. A focus on female entrepreneurs in South Africa: the role of alertness and institutions on venture performance. *J. Dev. Entrepren.* 25 (4), 2050022. <https://doi.org/10.1142/S1084946720500223>.
- Urban, B., Wood, E., 2017. The innovating firm as corporate entrepreneurship. *Eur. J. Innovat. Manag.* 20 (4), 534–556. <https://doi.org/10.1108/EJIM-10-2016-0100>.
- Uy, M.A., Chan, K.-Y., Sam, Y.L., Ho, M.R., Chernysenko, O.S., 2015. Proactivity, adaptability and boundaryless career attitudes: the mediating role of entrepreneurial alertness. *J. Vocat. Behav.* 86, 115–123. <https://doi.org/10.1016/j.jvb.2014.11.005>.
- Valliere, D., 2013. Towards a schematic theory of entrepreneurial alertness. *J. Bus. Ventur.* 28 (3), 430–442. <https://doi.org/10.1016/j.jbusvent.2011.08.004>.
- Van de Ven, A.H., 1986. Central problems in the management of innovation. *Manag. Sci.* 32 (5), 590–607. <https://doi.org/10.1287/mnsc.32.5.590>.
- van Gelderen, M., Brand, M., van Praag, M., Bodewes, W., Poutsma, E., van Gils, A., 2008. Explaining entrepreneurial intentions by means of the theory of planned behaviour. *Career Dev. Int.* 13 (6), 538–559. <https://doi.org/10.1108/13620430810901688>.
- Viechtbauer, W., 2010. Conducting meta-analyses in R with the metafor package. *J. Stat. Software* 36 (3). <https://doi.org/10.18637/jss.v036.i03>.
- Wang, S., Hsu, C., Hung, W., 2017. The moderating effect of multiple groups between entrepreneurial intention and its influencing. *Working Paper Series No.2017.1*.
- Westhead, P., Solesvik, M.Z., 2016. Entrepreneurship education and entrepreneurial intention: do female students benefit? *Int. Small Bus. J. Res. Entrep.* 34 (8), 979–1003. <https://doi.org/10.1177/0266242615612534>.
- Xie, X., Lv, J., 2016. Social networks of female tech-entrepreneurs and new venture performance: the moderating effects of entrepreneurial alertness and gender discrimination. *Int. Entrepren. Manag. J.* 12 (4), 963–983. <https://doi.org/10.1007/s11365-016-0413-8>.

- Yan, X., Gu, D., Liang, C., Zhao, S., Lu, W., 2018. Fostering sustainable entrepreneurs: evidence from China college students' "Internet Plus" innovation and entrepreneurship competition (CSIPC). *Sustainability* 10 (9). <https://doi.org/10.3390/su10093335>.
- Yang, J., Yu, M., Tang, J., Ma, J., 2022. Cognitive cultural intelligence and entrepreneurial alertness: evidence from highly educated, employed immigrants in the USA. *Cross Cult. Strateg. Manag.* 29 (2), 427–447. <https://doi.org/10.1108/CCSM-03-2021-0048>.
- Yasir, M., Majid, A., Yasir, M., 2017. Entrepreneurial knowledge and start-up behavior in a turbulent environment. *J. Manag. Dev.* 36 (9), 1149–1159. <https://doi.org/10.1108/jmd-10-2016-0193>.
- Yasir, N., Mahmood, N., Jutt, A.A., Babar, M., Irfan, M., Jamil, F., et al., 2020. How can entrepreneurial self-efficacy, proactivity and creativity enhance sustainable recognition opportunity? The effect of entrepreneurial alertness is to mediate the formation of sustainable entrepreneurial intention. *Rev. Argent. Clin. Psicol.* XXIX, 1004–1023. <https://doi.org/10.24205/03276716.2020.1097>.
- You, Y., Xiu, D., Wang, C., Wu, S., 2020. The impact of social capital on university students' entrepreneurial opportunity recognition. In: *Fifth International Conference on Economic and Business Management (FEBM 2020)*. Atlantis Press, pp. 542–547. <https://doi.org/10.2991/aebmr.k.201211.092>.
- Zanella, G., Castro Solano, D.B., Hallam, C.R.A., Guda, T., 2019. The role of the organization in the entrepreneur–opportunity nexus. *Int. J. Entrepreneurial Behav. Res.* 25 (7), 1537–1562. <https://doi.org/10.1108/IJEER-03-2018-0169>.
- Zellweger, T.M., Zenger, T.R., 2021. Entrepreneurs as scientists: a pragmatist approach to producing value out of uncertainty. *Acad. Manag. Rev.* <https://doi.org/10.5465/amr.2020.0503>.
- Zhao, H., Seibert, S.E., Lumpkin, G.T., 2010. The relationship of personality to entrepreneurial intentions and performance: a meta-analytic review. *J. Manag.* 36 (2), 381–404. <https://doi.org/10.1177/0149206309335187>.
- Zhao, W., Li, J., Li, X., Schött, T., 2020. Implications of network diversity for venture growth: the mediation effect of entrepreneurial alertness. *Sustainability* 12 (22), 1–15. <https://doi.org/10.3390/su12229762>.
- Zhao, W., Yang, T., Hughes, K.D., Li, Y., 2021. Entrepreneurial alertness and business model innovation: the role of entrepreneurial learning and risk perception. *Int. Entrepren. Manag. J.* 17 (2), 839–864. <https://doi.org/10.1007/s11365-020-00637-2>.
- Zou, G.Y., 2007. Toward using confidence intervals to compare correlations. *Psychol. Methods* 12, 399–413. <https://doi.org/10.1037/1082-989X.12.4.399>.