

Matt C. Howard* and Andrea Floyd

Reassessing Passion and Perseverance as Dimensions of Individual Entrepreneurial Orientation: A Conceptual and Empirical Investigation into Theory and Measurement

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Abstract: Santos, G., C. S. Marques, and J. J. Ferreira. 2020. “Passion and Perseverance as Two New Dimensions of an Individual Entrepreneurial Orientation Scale.” *Journal of Business Research* 112: 190–9 proposed a five-dimensional conceptualization of individual entrepreneurial orientation (IEO), but more evidence is needed before authors can reliably apply their conceptualization and operationalization. We provide a theoretical critique of their conceptualization and continue their scale development process. Four of five dimensions converged with other scales of the same constructs, but their passion dimension did not. The factor structure and predictive validity evidence also suggested that passion should not be included within the scope of IEO, and we assert that Santos et al.’s conceptualization of IEO is better represented with a hierarchical structure. Proactiveness and perseverance as well as risk-taking and innovativeness load onto two separate second-order factors, and these two second-order factors load onto the broader factor of IEO. We suggest that the construct measured by Santos et al.’s passion dimension may instead be a mediator between IEO and entrepreneurial outcomes, and we provide further insights into the measurement of IEO.

Keywords: conceptualization, entrepreneurial personality, individual entrepreneurial orientation, measurement, operationalization

Individual entrepreneurial orientation (IEO) is conceptualized as the capacity to recognize, create, and develop viable business opportunities, and it most commonly includes the three personality dimensions of risk-taking, innovation, and proactiveness (Bolton and Lane 2012; Koe 2016; Kollmann, Christofor, and Kuckertz 2007). Since its conceptualization, IEO and its dimensions have been repeatedly supported to predict entrepreneurial attitudes, intent, behaviors, and

*Corresponding author: Matt C. Howard, University of South Alabama, 36688-0002 Mobile, AL, USA, E-mail: MHoward@SouthAlabama.edu

Andrea Floyd, University of South Alabama, 36688-0002 Mobile, AL, USA

performance (Bolton 2012; Ferreira et al. 2015; Goktan and Gupta 2015), both establishing IEO as an important aspect of the entrepreneurial process and encouraging its further study.

Santos, Marques, and Ferreira (2020) expanded the construct of IEO to include two additional dimensions, passion and perseverance, and they provided initial empirical support for this five-dimensional conceptualization by producing a 12-item measure. If valid, their expansion poses many implications for the study of IEO. The five-dimensional conceptualization may more strongly predict outcomes as well as predict more outcomes than the three-dimensional conceptualization, suggesting that researchers should expand upon relations studied in prior investigations. Also, passion and perseverance may be associated via different theoretical perspectives than the prior three dimensions, broadening the theoretical scope of IEO. Lastly, the original conceptualization of IEO brought its three dimensions to the forefront of entrepreneurship research, and much is now known regarding the role of risk-taking, innovation, and proactiveness in the entrepreneurial process. Adding passion and perseverance likewise brings these two dimensions into the spotlight, calling for future researchers to integrate passion and perseverance as central elements in the study of entrepreneurship. By incorporating two additional dimensions, each of these implications significantly builds upon the prior three-dimension conceptualization of IEO.

Despite these benefits, Santos et al. did not provide all theoretical and empirical support expected in the development of a novel conceptualization, and researchers cannot reliably apply their operationalization until this support is provided (DeVellis 2016; Hinkin 1995, 1998; Hulland, Baumgartner, and Smith 2018). This assertion is not critical of Santos et al., as their implications are significant and page counts are limited; however, important aspects are still unknown regarding their conceptualization and operationalization that may hamper future applications.

First, the conceptual justifications for including the two additional dimensions were based on research of international entrepreneurial orientation, not IEO, and the construct definition for passion also notably differed from extant research. Both factors cause uncertainty regarding the theoretical underpinnings of their conceptualization. Second, psychometric evidence expected in novel operationalizations was not provided. The authors present a confirmatory factor analysis (CFA), but it was conducted in an exploratory manner (e.g. removing seven of 19 items) without replicating the results in a separate sample. This draws the psychometric properties of their scale into question. Third, evidence of convergent validity has yet to be produced by assessing the relations of their scale dimensions with prior measures of the same constructs. This is especially necessary for their dimension of passion, given the atypical construct definition. Fourth, evidence of

predictive validity regarding their two additional dimensions has yet to be provided by assessing their relations with entrepreneurial outcomes beyond the original three dimensions, which is particularly noteworthy because Santos et al. argued that the dimensions' predictive abilities justify their inclusion. Fifth, the inclusion of passion is precarious given conflicts with widespread definitions of IEO, and the authors did not conceptually or empirically assess the validity of a four-dimension conceptualization excluding passion. Thus, significant uncertainty surrounds both the nominal and empirical meanings of Santos's conceptualization of IEO.

To address these uncertainties, the current article reinvestigates the conceptualization and operationalization of Santos et al. We begin by reviewing theoretical support for including passion and perseverance, noting that passion has stark differences with widespread definitions of IEO. We argue that passion may instead be an outcome of IEO, given dissimilarities with both IEO and its typical dimensions. Then, we conduct a CFA using a broadly representative sample to determine whether Santos et al.'s scale is best represented by five or four dimensions (excluding passion), which provides insights regarding the measure's psychometric properties. In doing so, we assess the fit of untested latent structures (e.g. three-level hierarchical models), and we retest the discriminant validity of their scale using more robust analyses (Henseler, Ringle, and Sarstedt 2015). Next, we evaluate the scale's convergent validity by assessing relations of Santos et al.'s dimensions with established measures of the same constructs (Bolton and Lane 2012; Duckworth et al. 2007; Vallerand et al. 2003). Lastly, we test the effects of the two additional dimensions beyond the original three in predicting entrepreneurial attitudes, intent, and behaviors. This indicates whether the additional dimensions satisfy an inclusion criterion of Santos et al.

From these efforts, the current article provides many benefits for research. Santos et al.'s conceptualization can substantially advance IEO research if supported to be valid, and our results can provide confidence in future research applying this conceptualization and encourage the continued study of IEO as a five-dimensional construct. At the same time, Santos et al.'s conceptualization may not be valid, and our results may instead support the three- or four-dimensional conceptualization. Even if the original three-dimensional conceptualization is supported, our results could prevent future research from derailing extant progress by shifting focus back to this conceptualization. Therefore, whether the current results support or do not support the conceptualization of Santos et al., they provide many benefits for future research.

1 Background

1.1 Conceptualization of IEO

Entrepreneurial orientation originated as an organizational-level construct representing, “a set of organizational processes from which strategic decisions evolve. These take the form of patterns or modes that can be characterized and identified across organizations” (Lumpkin and Dess 1996, p. 138), and more specifically, “strategy making processes that provide organizations with a basis for entrepreneurial decisions and actions” (Rauch et al., 2009, p. 762). From this conceptual basis, Miller (1983) sought to identify the necessary qualities for a firm to be referred to as entrepreneurial (i.e. entrepreneurial orientation), which resulted in the identification of three dimensions: risk-taking, innovativeness, and proactiveness. Subsequently, Lumpkin and Dess (1996) added two additional dimensions, autonomy and competitive aggressiveness, resulting in a five-dimensional conceptualization. Throughout these years, this organizational-level construct steadily grew in popularity (Anderson et al. 2015; Covin and Slevin 1986; Miller 1983, 2011), in part because it was robustly supported to predict beneficial organizational-level outcomes – notably firm performance (Lumpkin and Dess 2001; Wang 2008; Wiklund 1999).

Due to the popularity of entrepreneurial orientation, researchers began to study the construct at the individual-level and bestowed the label of IEO (Bolton 2012; Bolton and Lane 2012; Kollmann, Christofor, and Kuckertz 2007; Padilla-Meléndez, Fernández-Gámez, and Molina-Gómez 2014). While sometimes outright stated, researchers studying IEO have often implied that (a) organizational processes are analogous to personality (Bolton and Lane 2012; Koe 2016; Kollmann, Christofor, and Kuckertz 2007) and (b) businesses’ entrepreneurial strategic decisions are analogous to individuals’ entrepreneurial outcomes of attitudes, intentions, and behaviors (Bolton 2012; Ferreira et al. 2015; Goktan and Gupta 2015). IEO is thereby be considered the necessary qualities for a person to be referred to as entrepreneurial, which are often supported – but not defined – by the dimensions’ associations with the attraction to and aptitude for entrepreneurship. These characteristics can be seen in applied definitions of IEO. For instance, Goktan and Gupta (2015) consider IEO to be, “a holistic assessment of individual proclivity towards entrepreneurship” (p. 99), whereas Joardar and Wu (2011) defined it as, “an individual’s orientation toward entrepreneurial activities” (p. 331). To initiate the study of IEO, researchers conceptualized the same five dimensions of entrepreneurial orientation at the individual-level, indicating that the identified processes underlying organizations’ entrepreneurial strategic decisions were valid conceptualizations of personality traits that relate to the attraction to and aptitude for entrepreneurship (Bolton and Lane 2012; Joardar and Wu 2011).

In operationalizing IEO, Bolton and Lane (2012) removed two dimensions from Lumpkin and Dess's (1996) conceptualization of entrepreneurial orientation (autonomy, competitive aggressiveness), resulting in a three-dimensional construct composed of risk-taking, innovation, and proactiveness that has become widespread in research. Studies often assess IEO in entrepreneurs, founders, and CEOs, showing that the IEO of organizational leaders often predicts the same organizational outcomes as entrepreneurial orientation, such as firm performance (Fernet et al. 2016; Jelenc and Pisapia 2015; Joardar and Wu 2011; Zhang, Wang, and Jia 2020). Many researchers also assess IEO in non-entrepreneurs, supporting that the construct predicted entrepreneurial intent and even subsequent entrepreneurial behaviors (Awang et al. 2016; Howard 2020; Koe 2016; Zollo et al. 2020). More recent research has begun to assess the relations of IEO in general employees (Covin et al. 2020; DeGennaro, Wright, and Panza 2016; Fellnhofer, Puumalainen, and Sjögrén 2016), and these studies supported that IEO may be beneficial for all types of employees, not just upper management. For instance, Kollmann et al. (2017) supported that IEO diversity in teams is related to performance outcomes, whereas Kraus et al. (2019) demonstrated that IEO predicts exploration activities of municipality employees that can improve cities' abilities to discover important innovations. From this cumulative research, IEO has been established as an influential construct of study for all members of the organizational hierarchy.

Santos, Marques, and Ferreira (2020) recently expanded the construct of IEO to include the two additional dimensions. In developing their conceptualization, the authors drew from recent research on a separate construct, international entrepreneurial orientation (Covin and Miller 2014; Gerschewski, Lindsay, and Rose 2016). International entrepreneurial orientation is typically conceptualized in one of two forms. First, it may refer to the entrepreneurial orientation of multinational entities, and researchers measure the construct by administering entrepreneurial orientation measures and modifying instructions and/or items to include "international verbiage of various specific types (e.g. abroad, international markets, international business, international decision-making situations)" (Covin and Miller 2014, p. 14). In this instance, international entrepreneurial orientation is conceptualized as entrepreneurial orientation in an international context. Second, international entrepreneurial orientation may refer to a subcategory or subtype of entrepreneurial orientation (Covin and Miller 2014). In this other instance, it typically includes the same core dimensions as entrepreneurial orientation, but it may include additional dimensions to distinguish the construct from entrepreneurial orientation and include international elements. In either case, international entrepreneurial orientation is conceptualized at the organizational level (Clark 2016, 2018), as authors have only just begun to study individual international entrepreneurial orientation (as international entrepreneurial orientation disposition; Clark and Covin 2021).

In following this latter tradition, Gerschewski, Lindsay, and Rose (2016) performed a qualitative study wherein the authors sought to expand the construct of entrepreneurial orientation in born global firms, effectively reconceptualizing international entrepreneurial orientation. In these firms, their work reemphasized the importance of proactiveness and innovativeness, failed to support the role of risk-taking, and identified a newfound support for two new dimensions: passion and perseverance. Gerschewski, Lindsay, and Rose (2016) noted that both novel dimensions play a pivotal role in the goal striving process by ensuring sustained motivation toward outcome(s) (Duckworth et al. 2007; Vallerand et al. 2003), which they argued were necessary characteristics to be considered entrepreneurial in international firms. The authors called for future research to further integrate these two dimensions into the concept of entrepreneurial orientation in born global firms.

Without addressing that Covin and Miller (2014) and Gerschewski, Lindsay, and Rose (2016) discussed international entrepreneurial orientation, Santos et al. utilized these results as justification to include passion and perseverance in the scope of IEO. The authors defined passion as, “a set of intense positive feelings experienced when engaging in entrepreneurial activities associated with roles that entrepreneurs feel are meaningful” (Santos, Marques, and Ferreira 2020, p. 191), whereas they defined perseverance as, “the continued pursuit of goals despite adversity, ensuring actions and energy are directed towards the achievement of objectives even in the face of obstacles” (Santos, Marques, and Ferreira 2020, p. 191). The definition for latter, perseverance, matches broader research on the construct (Duckworth et al. 2007; Howard and Crayne 2019), but the definition for the former, passion, does not match quite as well (Cardon et al. 2013; Murnieks, Mosakowski, and Cardon 2014; Vallerand et al., 2003). Santos et al. consider passion to be a set of emotions, but most research on passion considers it to encompass more than emotion. Instead, passion often includes motivational and cognitive components (Cardon 2008; Cardon et al. 2009, 2013; Murnieks, Mosakowski, and Cardon 2014; Vallerand 2015). For instance, Vallerand et al. (2003) define passion as “a strong inclination toward an activity that people like, that they find important, and in which they invest time and energy” (p. 757), which almost entirely reflects motivational mechanisms rather than emotion. Thus, Santos et al.’s treatment of passion conflicts with prior research.

Further, the inclusion of passion does not adhere to widespread definitions for IEO. As mentioned, IEO is often considered the necessary qualities for a person to be considered entrepreneurial, which is often conceptualized as a set of personality traits associated with an attraction to and aptitude for entrepreneurship (Bolton and Lane 2012; Koe 2016; Kollmann, Christofor, and Kuckertz 2007). Perseverance fits this criterion; prior research has supported that certain individuals are habitually more likely to demonstrate goal-directed effort than others

(e.g. trait) (Duckworth et al. 2007; Howard and Crayne 2019), and the tendency to remain goal-oriented relates to entrepreneurial status and success (Covin and Miller 2014; Gerschewski, Lindsay, and Rose 2016). On the other hand, passion does not fit this criterion. While those passionate about entrepreneurship are more likely to become entrepreneurs and succeed, passion is not a trait or individual difference, especially when conceptualized via the emotion-focused approach of Santos et al. Despite their relevance to entrepreneurship, states are not included within the scope of IEO because they are not considered qualities of individuals. For example, intrinsic motivation is known to predict entrepreneurial outcomes (Carree and Verheul 2012; Yamini, Soloveva, and Peng 2020), but no author has suggested that intrinsic motivation should be conceptualized as a dimension of IEO because it does not fit its widespread criterion. Thus, passion does not fit common inclusion criteria for IEO, indicating conceptual concerns with the nominal meaning of IEO when passion is included.

We argue that passion, whether conceptualized traditionally or as done by Santos et al., is instead an outcome of IEO. IEO has already been shown to relate to positive emotions towards entrepreneurship (Bernoster, Mukerjee, and Thurik 2020; Corrêa, Queiroz, and Shigaki 2021; Howard 2020), indicating that the other four dimensions may predict Santos et al.'s conceptualization of passion. Even when conceptualized more traditionally, theoretical support can be provided for IEO predicting passion. People are more likely to develop passion towards an activity if they have aptitude and/or self-efficacy for that activity (Cardon and Kirk 2015; Dalborg and Wincent 2015; Lex et al. 2020). Because those with greater IEO have traits that are better suited for entrepreneurship, these individuals are believed to naturally excel and develop efficacy for these activities, which will make them more likely to develop a passion for these activities. Therefore, passion may be more likely to be an outcome rather than a dimension of IEO based on prior empirical findings.

The arguments above highlight critical concerns regarding the nominal meaning of Santos et al.'s five-dimensional conceptualization of IEO; not only is passion misaligned with widespread definitions of IEO, but it can be positioned as an outcome of IEO based on prior research. Before testing the positioning of IEO and passion, we first discuss concerns regarding the empirical meaning of Santos et al.'s conceptualization, which is also assessed in our study.

1.2 Operationalization of IEO

Santos et al. justified the inclusion of their five IEO dimensions by discussing empirical evidence for the relation of passion and perseverance with

entrepreneurial outcomes, placing a greater focus on the empirical meaning of their conceptualization than its nominal meaning. The authors summarized their support by stating, “passion and perseverance should be considered new elements of EO since they are conceptually distinct from and complementary to the standard dimensions of proactivity, innovativeness, and risk taking” (Santos, Marques, and Ferreira 2020, p. 194). This justification further stresses the necessity to reassess Santos et al.’s conceptualization. Santos et al. utilize an almost wholly empirical approach wherein research observations are used as inclusion criteria, but they did not fully investigate their inclusion criteria. Notably, the authors did not assess the relation of IEO with entrepreneurial outcomes, leaving uncertainty regarding whether their two additional dimensions should be considered a part of IEO. Thus, the empirical meaning of Santos et al.’s conceptualization is unclear given their empirical assessments.

These potential issues can be appropriately assessed by continuing the scale development process for their measure (Hinkin 1995, 1998). We believe it is necessary to (1) conduct a new CFA, (2) reassess their dimensions’ discriminant validity, (3) test the convergent validity of their dimensions, (4) investigate the predictive validity of their dimensions beyond each other, and (5) assess the validity of our proposed alternative model that excludes passion. By doing so, we more robustly determine whether their new dimensions are distinct and predict entrepreneurial outcomes beyond other dimensions, which can provide much-needed assessments of Santos et al.’s empirical meaning for their construct. Equally important, we also assess a four-dimensional conceptualization of IEO without passion, which can provide evidence whether the empirical meaning of this alternative conceptualization is valid. Below, we expand on these objectives.

In operationalizing their new conceptualization of IEO, Santos et al. administered an initial 19-item list to 249 agri-food employees. To create their scale, the authors based their items on prior measures (Bolton and Lane 2012; Duckworth et al. 2007), qualitative research (Gerschewski, Lindsay, and Rose 2016), and reviews (Covin and Miller 2014). They subjected their 19-items to CFA, but initially obtained poor model fit. The authors then removed seven items to meet or approach model fit cutoffs typically expected when performing CFA, and they reported adequate internal consistency for their dimensions. Lastly, Santos et al. tested the discriminant validity of their measure by assessing the dimensions’ inter-relations, supporting that they are distinct.

Despite these encouraging results, the scale development process was left incomplete based on most contemporary guides (Colquitt et al. 2019; DeVellis 2016; Hinkin 1995, 1998; Hulland, Baumgartner, and Smith 2018; MacKenzie, Podsakoff, and Podsakoff 2011). First, although Santos et al. performed a CFA, it was not conducted in a confirmatory manner. Pairing an item list by a third is

typically considered an exploratory endeavor, and their procedures more resemble exploratory structural equation modeling (ESEM) (Marsh et al. 2020; Morin, Arens, and Marsh 2016; Morin, Myers, and Lee 2020). Most scale development guides recommend following a preliminary CFA with a confirmatory CFA, preferably utilizing an alternative sample and without removing a substantial number of items (Flora and Flake 2017; Hurley et al. 1997; Orcan 2018). Thus, the psychometric properties of their measure cannot be firmly supported, as a true confirmatory analysis was never conducted.

Second, Santos et al. assessed the discriminant validity of their measure, but this was performed in their CFA. A more robust test would be to assess their scale's discriminant validity in an alternative sample using the finalized measure. The authors also applied the F-L criterion as their assessment of discriminant validity, although more robust approaches exist (Henseler, Ringle, and Sarstedt 2015). While the authors provided initial support for discriminant validity, a reinvestigation would be preferred – especially due to the use of discriminant validity as an inclusion criterion.

Third, Santos et al. did not provide evidence for the convergent validity of their scale's dimensions, which refers to the extent that measures of the same construct are related (Hinkin 1995, 1998). There is good reason to believe that the original three IEO dimensions within Santos et al.'s scale converge with other measures, as the authors based their items on the supported measures of Bolton and Lane (2012), Lumpkin, Cogliser, and Schneider (2009), and Lumpkin and Dess (1996). The same can be said for the dimension of perseverance, in which the items were based on the widely supported scale of Duckworth et al. (2007). Their dimension of passion, however, consisted of self-created items based on the review of Cardon et al. (2009) and the qualitative work of Gerschewski, Lindsay, and Rose (2016). While convergent validity for none of Santos et al.'s dimensions can be guaranteed, their dimension of passion poses the greatest uncertainty.

Fourth, including passion and perseverance pose great potential for the study of IEO, but, at this point, researchers can only speak toward the potential of their inclusion and not any actual benefits. Most scale development guides assert that researchers should investigate the predictive validity of new measures to provide evidence of their utility, turning potential into actual benefits (Colquitt et al. 2019; DeVellis 2016; Hinkin 1995, 1998; Hlland, Baumgartner, and Smith 2018; MacKenzie, Podsakoff, and Podsakoff 2011). Predictive validity was also an IEO inclusion criterion of Santos et al., further stressing the need to produce predictive evidence to support the empirical meaning of their conceptualization. This step was not performed by Santos et al., however. These added dimensions should be shown to predict outcomes beyond the original dimensions to support the merits of their inclusion. As research is guided by the parsimony principle, the two

additional dimensions should not be included in IEO if they do not predict beyond the original three dimensions, as the three-dimensional conceptualization would provide the same explanatory benefits while being more parsimonious (Marsh and Hau 1996; Preacher 2006). Thus, the unexplored predictive validity of Santos et al.'s scale provides particularly noteworthy barriers.

Fifth, it is necessary for researchers to assess plausible alternative models when testing novel conceptualizations (Hinkin 1995, 1998). Based on prior research, we suggested that passion is instead an outcome of IEO rather than a dimension, and therefore we assess an alternative model with a four-dimensional conceptualization of IEO that excludes passion. We also investigate construct covariances to assess whether the four remaining dimensions produce a hierarchical latent structure. Prior research has solely assessed whether the dimensions of IEO can be modeled with a single second-order factor; however, it is possible that Santos et al.'s measure of IEO is best modeled by second- and third-order factors, which have yet to be identified in extant research. Supporting such a model could provide initial evidence for a more complex structure to IEO than identified in prior research.

Due to these uncertainties with current evidence regarding the scale of Santos et al., research cannot progress in a reliable manner when studying their five-dimensional conceptualization of IEO. At the same time, the inclusion of the two additional dimensions does pose notable benefits to current theory and practice, and the work of Santos et al. could significantly progress our understanding of IEO. To address these uncertainties and allow a reliable study of Santos et al.'s conceptualization, we perform a reanalysis of their scale.

We reassess the psychometric properties of Santos et al.'s scale via CFA, which assesses whether it produces an adequate factor structure and item loadings in a confirmatory manner. We then test the convergent validity of Santos et al.'s dimensions with Bolton and Lane's (2012) and Duckworth et al.'s (2007) scales, as Santos et al.'s items were based on these measures. We test the convergent validity of Santos et al.'s passion dimension with perhaps the most popular measure of passion, Vallerand et al.'s (2003) scale. This scale includes two dimensions, harmonious passion and obsessive passion. The former refers to an autonomous passion that is controlled by the person, whereas the latter refers to a domineering passion that controls the person. By using Vallerand et al.'s (2003) scale as an indicator of convergent validity, we not only provide insights into the validity of Santos et al.'s scale, but we also determine which type of passion that their measure gauges. We also assess whether the dimensions of passion and perseverance in Santos et al.'s scale predict entrepreneurial attitudes, intent, and behaviors beyond the dimensions of risk-taking, innovation, and proactiveness. Lastly, we test our alternative model wherein passion is excluded. Together, the current study addresses many unknowns regarding Santos et al.'s scale, which can

determine whether the empirical meanings of their conceptualization as well as the proposed alternative conceptualization are valid.

2 Method

2.1 Participants

Participants ($n = 567$, $M_{\text{age}} = 36.97$, $SD_{\text{age}} = 12.14$, 45% female, 85% American) were recruited from MTurk and provided monetary compensation. Researchers have supported the validity of results obtained from MTurk samples using the precautions taken in the current study, such as the time-separated research design and attention checks (Chambers and Mimon 2019; Engle, Talbot, and Samuelson 2019; Hunt and Scheetz 2019). We included three timepoints (described below) and included seven attention checks (e.g. “Please mark agree to show that you are paying attention”). Responses were removed if participants failed any attention checks, and all statistics, including the reported sample sizes, reflect the sample after removing these responses.

2.2 Procedures

Participants enrolled into the study via the MTurk platform. They provided their consent and completed the first survey online, which solely included demographic items ($n = 567$). One week following the first survey, they completed the second survey, which included all measures of personality ($n = 317$). One week following the second survey, they completed the third survey, which included the outcomes of entrepreneurial attitudes, intentions, and behaviors ($n = 251$). Afterwards, they were thanked for their time and disclosed the purpose of the study.

3 Measures

3.1 Personality

3.1.1 Santos, Marques, and Ferreira’s (2020) IEO Scale

We applied Santos et al.’s 12-item IEO scale. Example items are, “I have a passion for envisioning, growing and expanding my business” (passion), and, “I always finish what I start” (perseverance). The Cronbach’s alphas and composite reliabilities of the dimensions were 0.83 and 0.92 (risk-taking), 0.80 and 0.88

(innovativeness), 0.67 and 0.85 (proactiveness), 0.88 and 0.94 (passion), as well as 0.80 and 0.89 (perseverance).

3.1.2 Bolton and Lane's (2012) IEO Scale

We applied Bolton and Lane's (2012) 10-item, three-dimension IEO scale. Example items are, "I like to take bold action by venturing into the unknown" (risk-taking), and, "I tend to plan ahead on projects" (proactiveness). The Cronbach's alphas and composite reliabilities of the subscales were 0.82 and 0.89 (risk-taking), 0.83 and 0.89 (innovativeness), as well as 0.79 and 0.88 (proactiveness).

3.1.3 Passion

Passion was measured via the 14-item scale of Vallerand et al. (2003). This scale includes two 7-item subscales, one for harmonious passion and the other for obsessive passion. Participants were given the instructions, "Please indicate the extent that you disagree to agree for the following statements regarding entrepreneurship, which refers to creating and operating a business." Example items are, "I am completely taken with this activity" (harmonious passion), and, "I cannot live without it" (obsessive passion). The Cronbach's alphas and composite reliabilities were 0.92 and 0.94 (harmonious passion) as well as 0.95 and 0.96 (obsessive passion).

3.1.4 Perseverance of Effort

Perseverance of effort was measured via the 6-item subscale of Duckworth et al. (2007). An example item is, "I have achieved a goal that took years of work." The Cronbach's alpha and composite reliability were 0.84 and 0.89. It should be noted that we also administered the persistence despite difficulty subscale of Howard and Crayne (2019). The two scales correlated 0.85 ($p < 0.01$), and all results regarding persistence despite difficulty were largely identical to perseverance of effort. Due to their similarity and more widespread study of perseverance of effort, we only report results regarding this scale in the current article.

3.2 Outcomes

3.2.1 Entrepreneurial Attitudes

Entrepreneurial attitudes was measured via the three-item measure of Howard (2020). These three items are, "I have a positive attitude towards owning a business",

“Owning a business does not sound bad to me”, and, “I would enjoy owning a business. The Cronbach’s alpha and composite reliability were 0.92 and 0.95.

3.2.2 Entrepreneurial Intent

Entrepreneurial intent was measured via the six-item measure of Liñán and Chen (2009). An example item is, “I am ready to do anything to be an entrepreneur.” The Cronbach’s alpha and composite reliability were 0.97 and 0.97.

3.2.3 Entrepreneurial Behaviors

Entrepreneurial behaviors was measured via two separate items that are common in prior research (Howard 2020; Laspita et al. 2012; Zhang and Arvey 2009; Zhao and Seibert 2006). These items ask participants to respond with No (0) or Yes (1). The first represents lifetime entrepreneurial behaviors, and it asks participants “Have you ever started your own business?”. The second represents current entrepreneurial behaviors, and it ask participants, “Do you currently operate your own business?” We analyze these two items separately, respectively labeled as “Own Ever” and “Own Current”.

4 Results

We first assessed Santos et al.’s scale via CFA using covariance-based structural equation modeling (CB-SEM) in AMOS 26. We constructed our model in an identical manner to Santos et al., wherein we modeled five sperate latent factors with each item loading onto their respective latent factor. We then covaried each of the latent factors. The initial model fit (CFI = 0.97, NFI = 0.94, GFI = 0.95, SRMR = 0.05, RMSEA = 0.06, $\chi^2/df = 2.27$) met or closely approached standard CFA cutoffs (CFI > 0.95, NFI > 0.95, GFI > 0.95, SRMR < 0.05, RMSEA < 0.05, $\chi^2/df < 2.00$). The largest modification indicator suggested that a cross-loading would substantially improve model fit, which was between the risk-taking latent factor and the first innovation item. When this cross-loading was added, model fit substantially improved and met all cutoffs (CFI = 0.98, NFI = 0.96, GFI = 0.96, SRMR = 0.05, RMSEA = 0.05, $\chi^2/df = 1.72$), and no modification indicator was above 10. All primary factor loadings were above 0.40. The CFA largely supported the factor structure of Santos et al.’s scale, but one possible cross-loading should be recognized.

We also tested two additional models. In the first, each first-order factor loaded onto a single second-order factor. This model produced very poor fit (CFI = 0.91, NFI = 0.88, GFI = 0.90, SRMR = 0.11, RMSEA = 0.10, $\chi^2/df = 4.34$), and an

extreme number of large modification indices indicated that many cross-loadings would be required to produce adequate fit. The second model assessed our proposed alternative model. All passion items were excluded from analyses, and we assessed a unique hierarchical structure based on the latent factor covariances observed in the initial model. The risk-taking and innovativeness factors loaded onto a second-order factor, the proactiveness and persistence factors loaded onto a separate second-order factor, and the two second-order factors loaded onto a third-order factor. This model approached adequate fit (CFI = 0.95, NFI = 0.93, GFI = 0.94, SRMR = 0.06, RMSEA = 0.08, $\chi^2/df = 3.11$), which notably improved and met cutoffs when adding the same cross-loading described above (CFI = 0.97, NFI = 0.95, GFI = 0.96, SRMR = 0.05, RMSEA = 0.07, $\chi^2/df = 2.33$). All primary factor loadings were above 0.40. This alternative model may adequately explain the factor structure of the four IEO dimensions.

Correlations and Cronbach's alphas are provided in Table 1. To assess the convergent validity of Santos et al.'s scale, we calculated a series of HTMT ratios with bias-corrected confidence intervals using SmartPLS 3. SmartPLS 3 is a program typically used to create and assess partial-least squares structural equation models (PLS-SEM), and HTMT ratios and confidence intervals are provided as a part of the results. Researchers can obtain these results without assessing the broader aspects of the PLS-SEM models, which we do in the current article. We created a PLS-SEM model wherein each of the personality constructs were modeled as separate composites, and each item loaded onto its respective composite. This resulted in 10 composites with 42 total items. Then, we created two second-order IEO composites using a repeated indicator approach. Because PLS-SEM models require casual relations between composites to be identified, we modeled the 2 s order IEO factors to predict their respective dimensions and then one second-order dimension predicted the other. HTMT ratios and their confidence intervals, however, are not affected by the casual relations of the composites, and the same results would be identical to any other modeled relation between the composites. Thus, this aspect of the model did not influence our reported results.

HTMT ratios and bias-corrected confidence intervals are provided in Table 2. The first three assessments of convergent validity were between the scales of Santos et al. and Bolton and Lane (2012). The two dimensions of risk-taking (HTMT = 1.00, 95% C.I. [0.96, 1.04]), the two dimensions of innovativeness (HTMT = 0.96, 95% C.I. [0.90, 1.00]), and the two dimensions of proactiveness (HTMT = 1.12, 95% C.I. [1.03, 1.23]) met the cutoff for convergent validity. The last two assessments of convergent validity were between Santos et al.'s scale and the measures of passion and perseverance. The dimension of passion did not meet the cutoff with either harmonious passion (HTMT = 0.72, 95% C.I. [0.64, 0.78]) or obsessive passion (HTMT = 0.59, 95% C.I. [0.49, 0.66]), whereas the dimension of

Table 1: Correlations and Cronbach's alphas.

	1	1a	1b	1c	1d	1e	2	2a	2b	2c	3a	3b	4	5	6	7	8
1) IEO-5D	0.85																
1a) Risk.	0.70	0.83															
1b) Innov.	0.72	0.61	0.80														
1c) Proact.	0.55	0.08	0.19	0.67													
1d) Passion	0.78	0.45	0.41	0.35	0.88												
1e) Persev.	0.71	0.23	0.20	0.51	0.51	0.80											
2) IEO-3D	<u>0.85</u>	0.66	0.74	0.45	0.61	0.47	0.84										
2a) Risk.	0.72	<u>0.82</u>	0.59	0.16	0.56	0.33	0.82	0.82									
2b) Innov.	0.65	0.50	<u>0.78</u>	0.20	0.46	0.25	0.86	0.57	0.83								
2c) Proact.	0.56	0.09	0.21	<u>0.82</u>	0.36	0.58	0.56	0.20	0.27	0.79							
3a) H. Pass.	0.62	0.34	0.34	0.35	<u>0.65</u>	0.47	0.49	0.42	0.35	0.36	0.92						
3b) O. Pass.	0.45	0.34	0.25	0.15	<u>0.53</u>	0.29	0.36	0.38	0.28	0.13	0.58	0.95					
4) PoE	0.64	0.19	0.18	0.57	0.44	<u>0.87</u>	0.46	0.30	0.22	0.65	0.47	0.21	0.84				
5) Ent. Att.	0.56	0.32	0.32	0.34	0.56	0.38	0.50	0.44	0.33	0.36	0.52	0.33	0.41	0.92			
6) Ent. Int.	0.57	0.43	0.36	0.16	0.66	0.33	0.49	0.51	0.36	0.20	0.51	0.51	0.28	0.71	0.97		
7) Own ever	0.11	0.10	0.03	0.06	0.16	0.05	0.12	0.11	0.06	0.11	0.15	0.20	0.10	0.28	0.36	N/A	
8) Own now	0.10	0.13	0.09	-0.05	0.19	-0.01	0.15	0.13	0.18	0.00	0.11	0.13	-0.00	0.22	0.35	0.58	N/A

Convergent correlations are underlined. Sample size of all correlations including personality alone is 317, and these correlations are statistically significant when greater than 0.11. Sample size of all correlations including outcomes is 251, and these correlations are statistically significant when greater than 0.12. * $p < 0.05$, ** $p < 0.01$. Numbers in bold represent convergent validity correlations.

Table 2: HTMT ratios and bias-corrected confidence intervals.

	1a	1b	1c	1d	1e	2a	2b	2c	3a	3b
Santos, Marques, and Ferreira (2020) IEO measure	1a) Risk.									
	1b) Innov.	<u>0.75</u>								
		<u>0.66</u> ,								
		<u>0.83</u>								
	1c) Proact.	0.17	0.28							
		0.05,	0.15,							
		0.21	0.41							
	1d) Passion	0.54	0.49	0.45						
		0.43,	0.35,	0.31,						
		0.64	0.59	0.57						
	1e) Persev.	0.29	0.26	<u>0.70</u>	0.60					
		0.17,	0.13,	<u>0.55</u> ,	0.49,					
		0.40	0.38	<u>0.81</u>	0.70					
	2a) Risk.	1.00	<u>0.73</u>	<u>0.24</u>	0.66	0.41				
		0.96 ,	<u>0.61</u> ,	0.10,	0.55,	0.27,				
	1.04	<u>0.82</u>	0.32	0.74	0.53					
2b) Innov.	0.61	<u>0.96</u>	0.34	0.49	0.31	0.69				
	0.51,	<u>0.90</u> ,	0.19,	0.35,	0.17,	0.57,				
	0.71	1.00	0.48	0.59	0.45	0.79				
2c) Proact.	0.15	0.33	1.12	0.43	0.72	0.26	0.32			
	0.07,	0.18,	1.03 ,	0.30,	<u>0.60</u> ,	0.14,	0.14,			
	0.21	0.49	1.23	0.55	<u>0.82</u>	0.36	0.40			
3a) H. Pass.	0.38	0.40	0.41	<u>0.72</u>	0.54	0.48	0.40	0.45		
	0.27,	0.26,	0.26,	<u>0.64</u> ,	0.39,	0.36,	0.26,	0.30,		
	0.49	0.53	0.56	<u>0.78</u>	0.66	0.60	0.53	0.59		
3b) O. Pass.	0.39	0.29	0.16	<u>0.59</u>	0.32	0.43	0.32	0.20	0.61	

Table 2: (continued)

	1a	1b	1c	1d	1e	2a	2b	2c	3a	3b
	0.26,	0.15,	0.08,	<u>0.49</u> ,	0.21,	0.30,	0.18,	0.10,	0.52,	
	0.50	0.42	0.26	<u>0.66</u>	0.43	0.54	0.44	0.29	0.68	
4) PoE	0.23	0.22	<u>0.75</u>	0.48	<u>1.00</u>	0.33	0.25	<u>0.78</u>	0.52	0.23
	0.14,	0.11,	<u>0.63</u> ,	0.37,	<u>0.96</u> ,	0.21,	0.13,	<u>0.67</u> ,	0.37,	0.14,
	0.30	0.32	<u>0.86</u>	0.59	<u>1.04</u>	0.45	0.37	<u>0.87</u>	0.65	0.31

HTMT ratio and confidence interval of the two IEO measures was 1.01 (0.98, 1.04). Numbers in bold represent convergent validity correlations.

perseverance met the cutoff with perseverance of effort (HTMT = 1.00, 95% C.I. [0.96, 1.04]). Therefore, Santos et al.'s scale met the appropriate cutoff for four of the five dimensions – but not passion.

Some other relations also had sizable HTMT ratios. These relations were between Santos et al.'s risk-taking and innovativeness dimensions (HTMT = 0.75, 95% C.I. [0.66, 0.83]), Santos et al.'s innovativeness dimension and Bolton and Lane's (2012) risk-taking dimension (HTMT = 0.73, 95% C.I. [0.61, 0.82]), Santos et al.'s proactiveness and perseverance dimensions (HTMT = 0.70, 95% C.I. [0.55, 0.81]), Santos et al.'s proactiveness dimension and perseverance of effort (HTMT = 0.75, 95% C.I. [0.63, 0.86]), Santos et al.'s perseverance dimension and Bolton and Lane's (2012) proactiveness dimension (HTMT = 0.72, 95% C.I. [0.60, 0.82]), and Bolton and Lane's (2012) proactiveness dimension and perseverance of effort (HTMT = 0.78, 95% C.I. [0.67, 0.87]). While these results do not suggest that these dimensions converge, it does suggest that they overlap.

We lastly assessed the predictive validity of the two added dimensions beyond the three other dimensions of Santos et al.'s scale. Table 3 presents these results. Passion predicted all outcomes beyond all other dimensions of Santos et al.'s conceptualization: entrepreneurial attitudes ($\beta = 0.42$, $t = 6.30$, $p < 0.01$), entrepreneurial intent ($\beta = 0.60$, $t = 9.83$, $p < 0.01$), ever owned business ($\beta = 0.19$, $t = 2.29$, $p < 0.05$), and currently own business ($\beta = 0.25$, $t = 3.11$, $p < 0.01$). Perseverance did not predict any outcomes beyond all other dimensions ($p > 0.05$), but it did significantly predict entrepreneurial attitude ($\beta = 0.22$, $t = 3.32$, $p < 0.01$) and intent ($\beta = 0.25$, $t = 3.81$, $p < 0.01$) when analyzed alongside the original three dimensions of IEO alone. This indicates that perseverance met the criteria of Santos et al. only when passion was not included.

Table 3: Standardized beta values of hierarchical regressions predicting entrepreneurial outcomes.

	Entrepreneurial attitude		Entrepreneurial intent		Own business ever		Own business now	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
1) Risk	0.22**	0.07	0.34**	0.14*	0.13	0.08	0.11	0.05
2) Innov.	0.14	0.08	0.13	0.06	-0.06	-0.09	0.03	-0.01
3) Proact.	0.30**	0.15*	0.11*	-0.07	0.07	0.05	-0.06	-0.07
4) Passion		0.42**		0.60**		0.19*		0.25**
5) Persev.		0.05		0.01		-0.08		-0.11
ΔR^2	0.02	0.03	0.05	0.01	0.02	0.02	0.02	0.04

Predictors are dimensions from Santos, Marques, and Ferreira's (2020) measure. * $p < 0.05$, ** $p < 0.01$.

5 Discussion

Santos et al. proposed a novel five-dimensional conceptualization of IEO that includes the additional dimensions of passion and perseverance, which may be a substantial advancement to understanding the role of personality in the entrepreneurial process. The authors justified their inclusion by claiming that these two dimensions are both (a) unique from and (b) predict outcomes beyond other IEO dimensions. Santos et al. provided initial empirical evidence to support their claims, but we argue that significant concerns surround the nominal and empirical meaning of their conceptualization. Notably, the inclusion of passion is atypical given widespread definitions of IEO, and a three- or four-dimensional conceptualization of IEO may be more appropriate. Further, the authors evaluated the psychometric properties and discriminant validity of their scale in an exploratory manner, but researchers recommend that such analyses should also be performed in a confirmatory manner. It is also necessary to investigate the convergent validity of their dimensions by assessing their relations with scales of the same constructs, and it is essential to evaluate whether their additional dimensions predict entrepreneurial outcomes beyond other IEO dimensions, as this was an untested criterion for their inclusion. Because of these uncertainties, we argued that the validity of Santos et al.'s conceptualization and operationalization is still largely unknown, and research cannot reliably apply their five-dimensional perspective although it may be a significant advancement.

To benefit research on IEO, we continued the scale development process of Santos et al. First, we reassessed the factor structure of their measure via CFA using a broadly representative sample. Their measure provided adequate model fit, but model fit was significantly improved when a single cross-loading was added between the first innovation item and the risk-taking latent factor. This item is, "I often like to try new and unusual activities." Trying new and unusual activities may be an indicator of openness, which is often associated with innovativeness (Dollinger, Urban, and James 2004; Howard and Van Zandt 2020; McCrae 1987); however, it is also a common representation of risk-taking, as trying new and unusual activities may result in negative outcomes (Bolton and Lane 2012; Nicholson et al. 2005; Tyagi et al. 2017). Santos et al.'s measure should be recognized to include a substantive cross-loading. We also supported an alternative model without passion that produced adequate model fit, which included the risk-taking and innovativeness factors loading into a second-order factor, the proactiveness and perseverance factors loading onto a separate second-order factor, and the two second-order factors loaded onto a third-order factor. Such an operationalization is notably different than the common treatment of IEO, both in theoretical

discussions and empirical studies (Bolton 2012; Bolton and Lane 2012; Ferreira et al. 2015; Goktan and Gupta 2015), and therefore this shift in perspective produces notable theoretical implications that are discussed further below.

Second, we reinvestigated the discriminant validity of Santos et al.'s dimensions. No dimensions produced strong enough results to suggest that they were entirely repetitive, but risk-taking and innovativeness as well as proactiveness and perseverance demonstrated notably large relations. The heightened association of both pairings may represent a substantive conceptual linkage, which was also reflected in our supported hierarchical model without passion.

Third, we tested the convergent validity of Santos et al.'s dimensions with measures of the same constructs. The dimensions of risk-taking, innovativeness, proactiveness, and perseverance each converged with their respective measures, but the dimension of passion did not converge with measures of either harmonious or obsessive passion. The relation of Santos et al.'s passion dimension with the two alternative measures was comparable to, or weaker than, the relation of Santos et al.'s risk-taking and innovativeness dimensions as well as proactiveness and perseverance dimensions. Based on this result, it cannot be ascertained that Santos et al.'s scale gauges passion at all, and the construct gauged by their passion subscale should be reconsidered.

We propose that their passion dimension instead gauges positive emotions toward entrepreneurial endeavors. The two items of their passion subscale are, "I am passionate about finding good business opportunities, developing new products or services, exploring business applications or creating new solutions to existing problems and needs", and, "I have a passion for envisioning, growing and expanding my business". Both items cause participants to rely on their idiosyncratic understanding of passion's definition in providing their response. Prior research has supported that participants have greatly varying understandings of similarly vague words (e.g. courage) and they rely on their general heuristic cues for interpreting such words (Howard and Alipour 2014; Howard and Murry 2020; Roediger and McDermott 1995, 2000). This causes measures including these words to not gauge their posited construct, as participants provide their responses based on general abstractions of the words rather than the posited constructs intended by the researcher (Howard and Alipour 2014; Howard and Murry 2020; Roediger and McDermott 1995, 2000). These concerns may be especially true for passion, as the construct was conceptualized by Santos et al. in a manner that was not entirely consistent with extant research (Cardon et al. 2013; Murnieks, Mosakowski, and Cardon 2014; Vallerand et al. 2003). Participants may rely on their general heuristic cues in interpreting the word, "passion", within these items, and they may associate passion with positive emotions. Thus, they may not answer based on their passion but rather their positive emotions towards entrepreneurship, suggesting

that Santos et al.'s passion dimension does not measure passion but rather an associated construct.

Fourth, we assessed the relation of all five IEO dimensions with entrepreneurial attitudes, intent, and behaviors. When analyzed together, innovativeness and perseverance did not predict any outcome; risk-taking and proactiveness intermittently predicted these outcomes; and passion predicted all outcomes. Regarding the two newly proposed dimensions of IEO, these results do not support the inclusion of perseverance on the surface; however, in a separate set of regression analyses, perseverance predicted entrepreneurial attitude and intent beyond the original three IEO dimensions when excluding passion. This indicates that perseverance may fit within the scope of IEO only when excluding passion based on Santos et al.'s inclusion criteria.

We suggest that the strong effects of passion reflect its state nature, whereas the other four dimensions are most often conceptualized as traits. While traits emerge in many manners, they are known to influence states that subsequently determine cognition and behavior (Dollinger, Urban, and James 2004; Duckworth et al. 2007; Howard and Crayne 2019; Howard and Van Zandt 2020; McCrae 1987). The strong effects of passion in the current results may reflect its more proximal nature to the studied entrepreneurial outcomes, as states, more so than traits, are immediate influences of attitudes, intent, and behavior. This is especially true given Santos et al.'s emotion-focused conceptualization of passion; traits have been repeatedly shown to be associated with emotions, and emotions have been repeatedly shown to predict entrepreneurial attitudes, intent, and behavior (Carver, Sutton, and Scheier 2000; Grichnik, Smeja, and Welpe 2010; Zampetakis et al. 2016). While outside the scope of the current article, passion may even mediate the relation between IEO and these outcomes, indicating that passion may more strongly influence outcomes because it is an explanatory mechanism for the effects of IEO. While only a proposal, it is a possibility that offers notable theoretical implications and directions for future research.

5.1 Theoretical Implications

These results provide several implications for our understanding of IEO. We first discuss the validity of perseverance as a dimension of IEO, followed by passion. Although perseverance strongly related to proactiveness, it was not entirely repetitive with any other IEO dimension. Likewise, although perseverance did not significantly relate to any outcome when all five dimensions of IEO were assessed together, it did predict outcomes when passion was excluded from analyses. If passion is included within the scope of IEO, these results fail to satisfy Santos

et al.'s inclusion criteria for integrating perseverance within IEO. If passion is not included, however, perseverance meets Santos et al.'s inclusion criteria for IEO, and the current results indicate a novel structure for IEO when perseverance is included. Proactiveness is the tendency to plan ahead and seek opportunities, whereas perseverance is the tendency to continuously pursue goals despite adversity (Bolton and Lane 2012; Santos et al. 2020). Both dimensions represent an individual difference associated with goal striving, and both are believed to play an integral role in motivational processes (Duckworth et al. 2007; Jordan et al. 2019). Due to their conceptual association and strong observed relation, it is possible – if not likely – that these two dimensions are subdimensions of a broader construct. This construct may be represented by only proactiveness and perseverance, but it may also be represented by other dimensions that have yet to be identified (e.g. persistence; Howard and Crayne 2019). Even yet, this construct may be an already well-known multidimensional facet of personality, such as conscientiousness, which likewise includes elements of planning ahead and continuous goal pursuit (Ashton and Lee 2009; Howard and Van Zandt 2020; McCrae 1987). The uncertainty in the relation of these two dimensions reflects the necessity for further research on their structure and associations.

A similar argument could be made for the association of risk-taking and innovativeness. Risk-taking is the tendency to perform actions that involve danger, whereas innovativeness is the tendency to be creative and prefer novelty (Hughes et al. 2018; Nicholson et al. 2005; Tyagi et al. 2017). The current results and prior research have supported a strong relation between these two dimensions, perhaps because creativity and novelty are often risky. People regularly put themselves at risk of ridicule and embarrassment when proposing novel ideas, which can pose substantial career risks when such ideas are proposed to supervisors. Like proactiveness and perseverance, risk-taking and innovativeness may likewise serve as two subdimensions of a broader construct. Again, this construct may only include risk-taking and innovativeness, be represented by other unknown dimensions, or be a well-known facet of personality. One such well-known facet is openness, which includes elements of risk-taking, creativity, and preference for novelty (Ashton and Lee 2009; Howard and Van Zandt 2020; McCrae 1987). Any of these proposals are again possible explanations for the role of risk-taking and innovativeness in the scope of IEO, highlighting the need for future research to address these uncertainties.

If these dimension pairings form two separate second-order constructs, their role should be considered in the scope of IEO. IEO may be a third-order construct that includes multiple second-order constructs, each of which themselves include multiple first-order constructs. In this case, proactiveness and perseverance as well as risk-taking and innovativeness would be dimensions of intermediary constructs;

these intermediary constructs would be dimensions of IEO; and IEO would be best conceptualized as a collection of multidimensional personality constructs. Such an assertion would not be unusual in the study of personality. The HEXACO is a collection of six broad personality dimensions, each of which contains four narrower facets (Ashton and Lee 2009; Howard and Van Zandt 2020). The inclusion of both broad dimensions and narrow facets enables the HEXACO to apply to a wide array of contexts and outcomes, but it can also explain the role of personality in more nuanced situations. While the HEXACO was created as a general model of personality, we suggest that IEO could achieve a similar function in the context of entrepreneurship. That is, IEO may explain the role of personality in entrepreneurship more broadly via its third and second-order dimensions, but it may also explain nuanced effects of personality in certain contexts or phases of the entrepreneurial process via its first-order dimensions. Such a conceptualization would be quite different than current perspectives of IEO, and more research is needed before this perspective can be supported. We did, however, provide initial support for this structure in our second alternative CFA model, and therefore this proposed structure should be considered a very plausible explanation for the composition of IEO.

Alternatively, passion was not repetitive with other dimensions, and it was the strongest predictor of entrepreneurial outcomes; however, it did not converge with scales of harmonious or obsessive passion (Vallerand et al. 2003). We argued that Santos et al.'s passion dimension represents positive emotions towards entrepreneurship, which is reflected in our results. Positive emotions towards entrepreneurship is a well-supported outcome of IEO, and positive emotions may be a mediator between IEO dimensions and entrepreneurial outcomes. Although we cannot sufficiently test this mediating effect with the current data due to measuring all IEO dimensions at the same timepoint, unreported supplementary analyses supported that Santos et al.'s passion dimension mediated the relation of each other IEO dimension with entrepreneurial intentions and attitudes, and it produced the same mediating effect for several IEO dimensions and entrepreneurial behaviors (analyses provided upon request). The dimensions of Santos et al. may represent a causal model of IEO, wherein the authors identified four dimensions, a mediating mechanism, and several outcomes. Thus, this alternative conceptualization may indeed advance our understanding of IEO, although it does not function as originally intended.

5.2 Future Research Directions

Given these implications, many directions for future research should be considered. Santos et al. argued that the dimensions of IEO should be unique and

significantly predict outcomes beyond each other. Researchers should assess and reassess whether the included and excluded dimensions of IEO adhere to this inclusion criteria. Specifically, in transitioning from entrepreneurial orientation to IEO, the dimensions of autonomy and competitive aggressiveness were removed. The primary cause of this exclusion is likely the development of Bolton and Lane's (2012) IEO scale, but these dimensions were not removed due to a conceptual or theoretical justification (i.e. inclusion criteria). Instead, they were removed because Bolton and Lane's (2012) original item list produced poor internal consistencies for these two dimensions. This suggests that autonomy and competitive aggressiveness may indeed be aspects of IEO, as they appear to match the inclusion criteria and nominal meaning of IEO. Unfortunately, they are currently unrecognized in most research on IEO, leaving current research incomplete.

Furthermore, in assessing the dimensions of IEO, future researchers should follow the lead of Santos et al. and seek other representative dimensions. An alternative multidimensional conceptualization of personality relevant to entrepreneurship is entrepreneurial attitude orientation (EAO), which includes the dimensions of trait self-esteem, innovation, personal control, and need for achievement (Do and Dadvari 2017; Miao 2012). While innovativeness overlaps between IEO and EAO, EAO includes three distinct dimensions. Future research should assess whether these two multidimensional personality constructs should be combined in future research to develop a six- or seven-dimensional representation of personality.

Once these dimensions have been established, future research should further consider the factor structure of IEO. IEO is often discussed and treated as a second-order construct; however, it is rarely tested as such in factor analytic models, and the current article did not support it as a second-order factor. As argued, IEO may instead be a third-order factor that represents multiple multidimensional constructs. Because such questions can still be asked, this is clear evidence that more research is needed on IEO's factor structure and empirical meaning.

Once the scope and factor structure of IEO has been solidified, researchers should persist in reassessing existing and creating new measures of IEO. Support exists for Bolton and Lane's (2012) measure (Bolton 2012), and many authors have used it in subsequent studies (Ferreira et al. 2015; Goktan and Gupta 2015). Nevertheless, some researchers consider the scale development process to never be complete, and this measure should continuously be reassessed. Likewise, whether Santos et al.'s measure is administered with or without its passion dimension, future researchers can improve upon it by addressing the potentially problematic cross-loading.

Researchers should continue developing broader models of IEO, which can be developed by extending extant models used to study three-dimensional conceptualizations of IEO. Notably, authors have begun to investigate the mediators

between IEO and traditional entrepreneurial outcomes (Koe 2016; Kollmann, Christofor, and Kuckertz 2007). The current results highlight the relevance of emotion as a mediator, and future researchers should integrate relevant theory from this domain. For instance, a host of affective science theories propose that emotions are key in initiating and sustaining subsequent motivation, as emotions signal whether an objective is worth striving towards (Reeve 2014; Weiner 1985). Researchers could apply these theories to argue that those high in IEO are more likely to have positive affective responses to entrepreneurial outcomes, and they may be more likely to strive towards these outcomes. By integrating this novel perspective, not only could new mediators and outcomes of IEO be discovered, but the construct would be linked to other frameworks associated with relevant theories. Researchers could then use these frameworks as guides for subsequent investigations, creating a ripple-effect in research.

Lastly, we urge future researchers to more closely integrate modern research on personality into the study of IEO. Most researchers adapt prior research on entrepreneurial orientation when studying IEO, which is reasonable given the origins of the construct; however, modern research on personality may be more relevant. Notably, some authors have recently developed theoretical frameworks to identify and detail the outcomes of personality traits, such as the situation, trait, outcome activation (STOA) model (Zettler et al. 2020). The STOA model has been used to identify the domains of outcomes for which HEXACO dimensions predict (e.g. exploitation, duty), and we assert that this model can be adapted to also identify the domains of outcomes that IEO predicts. Likewise, recent discussions have produced significant insights on the role of personality in research. Prior research often asserted that identifying a universal personality framework was necessary for the study of personality, but recent authors have begun to argue that such a framework is not unnecessary (Srivastava 2020; Wiernik et al. 2020). Instead, researchers should investigate the specific personality dimensions that are relevant for their interests at hand. IEO researchers should consider whether a similar argument is ideal for the study of entrepreneurship. That is, it may be unnecessary to identify all dimensions of IEO, but rather researchers should study the dimensions of personality that may be relevant to the entrepreneurial process phase for which they are investigating. For instance, risk-taking and proactiveness but not innovativeness may be pivotal to early-stage entrepreneurial outcomes (e.g. intention), whereas proactiveness and innovativeness but not risk-taking may be more important to later-stage entrepreneurial outcomes (e.g. performance). Although this perspective is not common in current research on IEO, future researchers should consider its merits.

5.3 Limitations

Limitations should be noted that can be improved upon by future researchers. We only assessed most of Santos et al.'s dimensions with one other measure; however, other measures exist for each of these constructs, and the current results may differ if these other scales were applied. We believe that the most fruitful scales to investigate would be measures of passion. We applied Vallerand et al.'s (2003) scale due to its (a) importance and precedence in the broader scheme of passion research, (b) prior psychometric and validity evidence, (c) inclusion of separate dimensions for harmonious passion and obsessive passion, and (d) ability to gauge general entrepreneurial passion. Nevertheless, important implications could be derived by assessing the relation of Santos et al.'s passion dimension with the entrepreneurial passion scale of Cardon et al. (2013). We believe that the convergent validity correlations may be even smaller with this scale, because Cardon et al.'s (2013) scale includes three narrower dimensions (inventing, founding, and developing) that aggregate to measure overall entrepreneurial passion. Items representing these three dimensions are quite different than items within Santos et al.'s measure, and investigating their relation could provide notable implications.

Although we applied modern best practices in our use of MTurk participants (e.g. time-separated design, attention checks), some researchers may be wary of this sampling source. For this reason, future researchers should replicate the current results using alternative samples.

The current study also only included three entrepreneurial outcomes: attitudes, intentions, and behaviors. Perhaps the most important entrepreneurial outcome, however, is performance. Future research should reassess the current results while including this other outcome of the entrepreneurial process, which may produce differing results from the other three outcomes.

6 Conclusion

The goal of the current article was to reassess the validity of Santos et al.'s conceptualization and operationalization of IEO, which includes the two additional dimensions of passion and perseverance. Our results supported the inclusion of perseverance, but they suggested that Santos et al.'s measure may not gauge passion. Our results also indicated that IEO may have a unique structure that has not been investigated in prior research. Based on these results, we highlighted many implications and directions for future research, which should spark many novel research streams on the multidimensional personality construct of IEO.

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