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The role of entrepreneurial imaginativeness for implementation intentions in new venture creation

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Abstract

Implementation intentions, as conceptualized in the Rubicon model of action phases, facilitate the initiation of intended action. As a self-regulatory strategy, implementation intentions avoid the shortcoming of intention models (i.e., theory of planned behavior), which are able only partially to explain the variance of action caused by entrepreneurial intention. While early studies have shown the efficacy of implementation intentions in complex settings such as entrepreneurship (inter alia), an understanding of how implementation intentions come into play is missing. We address this gap and build on a unique sample of 161 responses from entrepreneurs receiving a grant for venture creation between 2018 and 2022 to investigate the role of entrepreneurial imaginativeness in implementation intentions. We find support for a curvilinear relationship between creative and practical imaginativeness and implementation intentions. Our study contributes theoretically to all frameworks that guide it, theory of implementation intentions and the Rubicon model and mindset theory of action phases, and validates them in the entrepreneurial context. By establishing entrepreneurial imaginativeness as an antecedent of implementation intentions, we provide entrepreneurs with a recipe for implementation intentions and add to the extant research on consequents of entrepreneurial imaginativeness.

Keywords Entrepreneurial imaginativeness · Implementation intentions · Rubicon model of action phases · New venture creation

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JEL Classification L26 · M13

Introduction

> "Implementation intentions promote goal achievement (…)" (Gollwitzer, 1993, p. 141).

Implementation intentions are receiving increasing academic attention, independent of the specific domain (Gollwitzer, 2014; Keller et al., 2020), as they are essential to goal-striving in translating goals into action (Sheeran & Webb, 2016). This is also the result of scholars identifying a major limitation of socio-cognitive intention models such as the theory of planned behavior (TPB) developed by Ajzen in 1991 (Hagger & Luszczynska, 2014). These intention models regard intention purely as goal intention and contend that goal intention is the best and most immediate predictor of action (Sheeran, 2002). However, as found in a meta-analysis of entrepreneurship literature by Schlaegel and Koenig (2014), only 37% of the variance in actual entrepreneurial action can be explained by entrepreneurial intentions. There remains further potential to clarify the link between entrepreneurial intentions and entrepreneurial action, as implementation intentions, with the power of initiating and accelerating action, may bridge the intention–action gap (Fayolle & Liñán, 2014). Despite this potential for solving the link between a goal intention of becoming an entrepreneur to actually taking entrepreneurial action, implementation intentions have predominantly been investigated in experimental and field studies – a research design for which implementation intentions are induced (Hagger & Luszczynska, 2014). While early studies have validated the efficacy of implementation intentions in the entrepreneurial context, the understanding of the emergence of implementation intentions in entrepreneurship is still in its infancy (van Gelderen et al., 2018).

The purpose of this study is to shed light on this gap in literature and investigate how implementation intentions (throughout this study always referring to entrepreneurial implementation intentions) can emerge in the entrepreneurial context of new venture creation, specifically from entrepreneurial imaginativeness (Kier & McMullen, 2018). We draw on implementation intention theory (Gollwitzer, 1990) and the Rubicon model and mindset theory of action phases (Gollwitzer, 2012; Heckhausen & Gollwitzer, 1987), in which implementation intentions are embedded. Indeed, previous research hints at the ability of entrepreneurial imaginativeness to trigger implementation intentions, as "imaginativeness is a cognitive skill that combines the ability of imagination with the knowledge needed to mentally simulate various task-related scenarios in entrepreneurship" (Kier & McMullen, 2018, p. 2266). In fact, "all great ventures begin with imagination" (Seelig, 2015, p. 56) and imagination has been shown to allow for the anticipation of physical and social environments and development of strategies and tactics that lead to the achievement of goals (Gaglio, 2004). By building on responses from 161

entrepreneurs, we show that creative imaginativeness and practical imaginativeness have a curvilinear relationship with implementation intentions, whereas social imaginativeness shows no statistically significant relationship with the latter construct.

Our study offers three theoretical contributions and lists practical implications for entrepreneurs and designers of entrepreneurial programs. First, we are able to extend the original conceptualization of implementation intentions as single cue "if–then" plans from socio-psychological literature (Gollwitzer, 1990), with findings from the application in the entrepreneurial context serving multiple cues. Second, by showing that implementation intentions may appear in self-generated manner from entrepreneurial imaginativeness, we add to extant literature that sees goal intention strength as the best predictor of the occurrence of implementation intentions (Brickell et al., 2006; Churchill & Jessop, 2010). This offers a practical recipe for implementation intentions, in order to convert the intention of being an entrepreneur into entrepreneurial action for venture creation. Third, we validate the Rubicon model and mindset theory of action phases in the entrepreneurial context by showing that the governing psychological principles attributed to goal-setting and goal-striving (Gollwitzer, 1990, 1999, 2012) may also be valid in the entrepreneurial context and that entrepreneurial imaginativeness may transfer the entrepreneur from a motivational to a volitional mindset with the power of implementation intentions.

Conceptual background and hypotheses

Implementation intentions and the Rubicon model and mindset theory of action phases in entrepreneurship

Implementation intentions, a self-regulatory strategy for goal attainment, were originally defined as "if–then" plans that link a critical cue with a goal-directed behavioral response (Gollwitzer, 1999; Gollwitzer & Sheeran, 2006). Implementation intentions are embedded in Heckhausen and Gollwitzer's Rubicon model of action phases (1987), which posits that individuals' goal-setting and goal-striving comprise a process made up of distinct phases, each of which is governed by specific psychological principles. Whereas the first and fourth phase of the Rubicon model of action phases are concerned with goal-setting, the second and third phases are concerned with goal-striving and implementation (Gollwitzer, 1990, 1999, 2012). This change triggers the shift of the individuals' orientation from a deliberative and motivational mindset (i.e., phases one and four) to a volitional and implemental mindset (i.e., phases two and three), which is captured by the mindset theory of action phases (Achtziger & Gollwitzer, 2018) (see Fig. 1).

One major transition point in model and theory lies between the first phase, the predecisional phase, and the second phase, the pre-actional phase, and is referred to as the crossing of the "Rubicon", name-giving to the model (Gollwitzer & Brandstätter, 1997). Thereby, wishes and desires from the first and pre-decisional phase are turned into goals supplemented by intentions and commitment (Brandstätter et al., 2003). The volitional phase then concerns the translation of defined goal intentions into action,

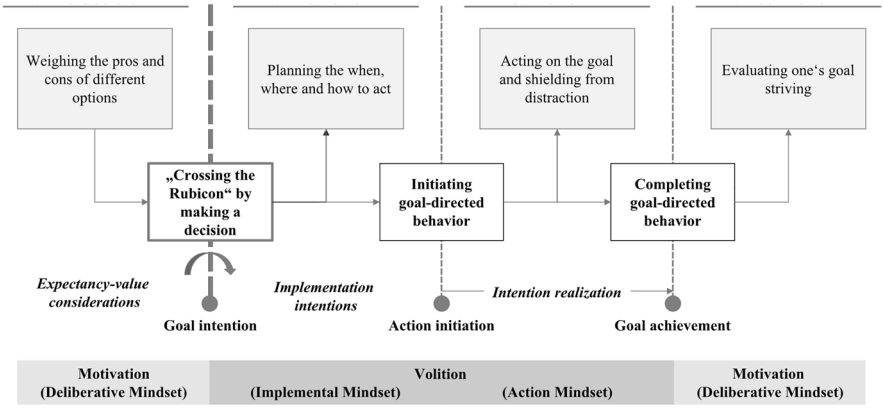


Fig. 1 Rubicon model and mindset theory of action phases

by forming implementation intentions that specify the when, where, and how to act (Achtziger & Gollwitzer, 2018).

In the entrepreneurial context, empirical support has been found for the power of implementation intentions in translating entrepreneurial intentions into action (e.g., Delanöe-Gueguen & Fayolle, 2018; van Gelderen et al., 2018). In other behavioral disciplines, implementation intentions have also been proven to be effective for the attainment of various goals, such as personal (e.g., Koestner et al., 2002), academic (e.g., Sheeran et al., 2005) and health goals (e.g., Sheeran & Orbell, 2000). Recently, scholars have broadened their focus from the formation of entrepreneurial intentions to consider the intention–action link in entrepreneurship (Gielnik et al., 2013; Goethner et al., 2012; Kautonen et al., 2013a, b). In this research, and mainly by applying the TPB, entrepreneurial intention is implicitly used as goal intention referring to entrepreneurial goals such as creating a new venture (Delanoë-Gueguen & Fayolle, 2018; Tornikoski & Maalaoui, 2019). In fact, some studies indicate a positive link between entrepreneurial intention and subsequent activity directed toward starting a business (Kautonen et al., 2013a; Kolvereid & Isaksen, 2006; Rauch & Hulsink, 2015; van Gelderen et al., 2015). However, as found in a meta-analysis of entrepreneurship studies by Schlaegel and Koenig (2014), only 37% of the variance in actual entrepreneurial action can be explained by entrepreneurial goal intentions, leading to what several scholars refer to as an intention–action gap (e.g., Armitage & Conner, 2001; Hagger, 2010; Webb & Sheeran, 2006). Additionally, as Fitzsimmons and Douglas (2011) note, individuals lacking a strong entrepreneurial intention may still become entrepreneurs and start a venture, further placing in question the role of entrepreneurial intentions in predicting subsequent action. This puts emphasis on the finding from socio-psychological literature that goal intentions, described as a motivation to perform an action, must be complemented with some volitional form of action regulation to translate intentions into action (Gollwitzer, 1990). Following this stream of research, acting on an intention requires the differentiation of an intention into goal intention and implementation intentions (Gollwitzer, 1993, 1999).

The effectiveness of implementation intentions for goal attainment is rooted in two underlying mechanisms. First, by specifying a critical cue (as defined in the "if"-component), the individual increases the detection of this cue by experiencing a heightened accessibility and alertness to it (Parks-Stamm et al., 2007; Webb & Sheeran, 2006). Second, the cue–response link, upon encountering the cue, initiates goal-directed action (according to the "then"-component) (Gollwitzer & Sheeran, 2006; Webb & Sheeran, 2004, 2006). Action initiation is then assumed to occur more promptly (Brandstätter et al., 2001; Gollwitzer & Brandstätter, 1997; Webb & Sheeran, 2004), more efficiently (Brandstätter et al., 2001; Webb & Sheeran, 2004) and without further conscious intent (Sheeran et al., 2005). Consequently, the probability of acting is increased (Sheeran & Silverman, 2003).

Implementation intentions were originally conceptualized as formulating a single "if–then" plan to set goal-directed behavior in motion (Brandstätter et al., 2001; Webb & Sheeran, 2008). More recently, studies have investigated the effects of multiple "if–then" plans, showing positive results for goal attainment, and showing that individuals tend to form multiple plans, unless they are constrained (Prestwich et al., 2012; Tam et al., 2010; Wiedemann et al., 2012). Our study is informed by findings from previous research that the more determined and engaged the entrepreneurial approach of the entrepreneur, and the more entrepreneurial activities are pursued, the more likely the entrepreneur is to be able to launch a venture (Kessler & Frank, 2009; Lichtenstein et al., 2006). In such cases, multiple activities will be pursued, requiring multiple "if–then" plans to specify the when, where, and how to act.

Despite the positive effects of implementation intentions, research on antecedents of implementation intentions is scarce (van Gelderen et al., 2018). Churchill and Jessop (2010) found that goal intention strength is the main determinant of implementation intentions, and van Gelderen et al. (2018) postulate that further antecedents other than goal intention strength can only be moderators. In contrast, Gollwitzer (1990) conceptualized implementation intentions as subordinate to goal intentions and in their service. In addition, research has shown that implementation intentions are especially powerful in translating goals into action when goal intentions are strong (Sheeran et al., 2005). However, strong goal intentions do not necessarily lead to the formation of implementation intentions (Gollwitzer & Brandstätter, 1997; van Gelderen et al., 2018), suggesting the existence of other antecedents. Further, in the majority of studies (e.g., laboratory and field studies), implementation intentions are induced (Prestwich et al., 2015) with only few exceptions (e.g., Armitage, 2009; Brickell et al., 2006; Churchill & Jessop, 2010), challenging van Gelderen et al.'s (2018) claim that only goal intention strength can be a determinant. The real-world entrepreneurial context is a setting in which implementation intentions are unlikely to be induced, but much rather self-generated by the entrepreneur, supporting Gollwitzer's (1999) claim that implementation intentions emerge with a conscious act of will. Hence, as Gollwitzer (2012) conceptualized, goal intention strength may be relevant for the motivational state of an individual, yet not sufficient to take action. The volitional phase must further depend on self-regulatory strategies such as implementation intentions, indicating further antecedents of self-generated implementation intentions (van Gelderen et al., 2018).

Imagination, entrepreneurial imaginativeness and implementation intentions

Decades ago, economists such as George Shackle (1979) and Ludwig Lachmann (1986) postulated the importance of imagination in the process of entrepreneurial activity. Since then, several scholars (e.g., Cornelissen & Clarke, 2010; Suddaby et al., 2015) have adopted this view. Indeed, Seelig (2015, p. 56) states that "all great ventures begin with imagination". In this perspective, imagination can be considered a mental process in which old or new connections lead to new representations (Loasby, 2001). Regarding venture creation, the connections made concerning a potential entrepreneurial opportunity create imagined representations of the activities and resources needed to succeed (Keating & Mcloughlin, 2010). To do so, individuals ultimately require knowledge of the various task-related scenarios that venture creation entails (McMullen & Kier, 2017). In this vein, Kier and McMullen (2018) described the combination of the cognitive skill of imagination and the knowledge of core entrepreneurial tasks such as innovation, communication, and administration as entrepreneurial imaginativeness.

Entrepreneurial imaginativeness appears in the three measurable dimensions of creative imaginativeness, social imaginativeness, and practical imaginativeness (Kier & McMullen, 2018). Entrepreneurial imaginativeness is closely linked but different to the literature of empathy (Davis, 1980), theory of mind (Bagozzi et al., 2013), problem-solving (D'Zurilla & Goldfried, 1971), and creativity (Runco, 2004). Kier and McMullen (2018) derived entrepreneurial imaginativeness from the aforementioned literature – for which the concept of imagination serves as the common ground (Goldman, 2006) – but established a new construct which captures the specific cognitive skills of entrepreneurs (i.e., creative, social, and practical imaginativeness).

The first dimension, creative imaginativeness, is described as "the cognitive skill to envision something that cannot be or is not currently being observed for the purposes of novel, original, artistic, or innovative creation" (Kier & McMullen, 2018, p. 2271). Entrepreneurs who exhibit this dimension are likely to connect seemingly unrelated pieces of information to form new relationships (Eckhardt & Shane, 2003), promoting divergent thinking (Cropley, 2006; Gielnik et al., 2012), brainstorming (Osborn, 1963), and the overall amount of new ideas generated (D'Zurilla & Goldfried, 1971).

The second dimension, social imaginativeness, is described as "a cognitive skill with which one envisions something that cannot be or is not currently being observed for the purposes of taking the perspective of others, seeing and feeling the world from another's frame of reference, or reading the desires, intentions, beliefs, and emotions of others" (Kier & McMullen, 2018, p. 2272). Entrepreneurs who demonstrate this dimension to a high degree are likely to anticipate and sense customer needs and determine who potential stakeholders might be in the future. In doing so, they exhibit forms of communication and understanding that facilitate exchange as important constituents of entrepreneurial action (Miller et al., 2012). This ability can be attributed to empathy, perspective-taking and the theory of mind, for which social imaginativeness offers a common and connecting ground (McMullen, 2010, 2015).

The third dimension, practical imaginativeness, is described as "a cognitive skill to envision something that cannot be or is not currently being observed for the purposes of planning, organizing, analyzing, or managing information, resources, or projects" (Kier & McMullen, 2018, p. 2273). Entrepreneurs who demonstrate this dimension to a high degree are likely to be better able to identify potential pitfalls and, in the same vein, to come up with adequate solutions to solve the situation (Adamski & Westrum, 2003). Thus, practical imaginativeness triggers "future-oriented cognitive representations of what will be" (Haynie et al., 2009, p. 338) and is associated with logic and reason, facilitating casual and logical inference (Kier & McMullen, 2018).

In this study we propose that Kier and McMullen's (2018) conceptualized combination of knowledge and imagination, termed entrepreneurial imaginativeness, may support implementation intentions. According to Gollwitzer (1999), in order to form implementation intentions, an entrepreneur defines action plans in the format "if cue X occurs, then I will perform behavior Y". Thereby, corresponding to the Rubicon model and mindset theory of action phases, the entrepreneur transfers from a motivational to a volitional mindset that aims at translating goals into action and regulating the corresponding goal-directed processes (Brandstätter et al., 2003). This regulation entails addressing questions regarding the execution of the project (Heckhausen & Gollwitzer, 1987). For creating and building a venture, this suggests the formulation of specific cues but also the corresponding goal-directed responses to these cues to optimally reflect the multitude and relevance of activities required to start and build the venture (Carter et al., 1996). Imagination thus provides guidance to the entrepreneur before they experience these cues and situations to which they need to respond (Rescher, 1976), and thus changes the individuals' knowledge by enabling them to image different connections (Keating & Mcloughlin, 2010). Thereby, images of the future are created that can be applied to plan and perform future tasks (Taylor et al., 1998). This provides the necessary components of implementation intentions (i.e., "if" and "then" components) specifying the when, where, and how (Fayolle & Liñán, 2014) to respond to an imagined cue.

New venture creation is a relatively complex endeavor requiring a multitude of tasks and skills (Carter et al., 1996). Therefore, in order to manage the variety of tasks, different forms of imaginativeness are required. In the following, we outline how all three dimensions of entrepreneurial imaginativeness may allow the entrepreneur to create the entrepreneurial possibility space (Felin & Zenger, 2009) and define a broad variety of cues and behavioral responses.

Creative imaginativeness and implementation intentions

Creative imaginativeness may contribute to the overall quantity of implementation intentions. Creative imaginativeness is considered to promote brainstorming, the ability to think about many specific cues and corresponding cue responses without direct judgement or selection (Osborn, 1963). This may allow the entrepreneur to holistically oversee the variety of different and most relevant entrepreneurial cues that may require attention to act on in the venture creation process. Further, creative imaginativeness may promote finding alternative behavioral

responses to a specific cue, in order to maximize the likelihood that the best possible behavioral response to the cue will be among the alternatives (Kier & McMullen, 2018). Moreover, creative imaginativeness may be particularly beneficial for action plans concerning the configuration of new and innovative combinations of resources (Kind, 2016). Creative imaginativeness further enables divergent thinking, the ability to generate new and original ideas (Cropley, 2006; Gielnik et al., 2012). Divergent thinking will be particularly helpful in the context of starting a new venture, as a consistent challenge faced by entrepreneurs is a situation of scarce resources (Miles et al., 2006). Imagining innovative and new combinations of existing resources can form the basis for the formation of the "if" and "then" components of a corresponding implementation intention. Implementation intentions resulting from creative imaginativeness will most likely concern novel or innovative action and outcomes, such as product or service innovations (Kier & McMullen, 2018). Thus, creative imaginativeness may help the entrepreneur to consider a wider range of options and thus better tailor implementation intentions to the specific needs of the venture.

However, we reason that the relationship between creative imaginativeness and implementation intentions may be non-linear, based on the two following reasons. First, creative imaginativeness is also connected with the notion of "letting one's imagination run loose" (D'Zurilla & Goldfried, 1971, p. 115). Thereby, an entrepreneur may lose sight of the entirety of cues and corresponding responses triggered by their creative imaginativeness. This may lead to difficulties in identifying and balancing implementation intentions (Carter et al., 1996). Consequently, at a certain point, the entrepreneur may cease to derive further benefit from creative imaginativeness, and instead too much creative imaginativeness may counteract the formation of implementation intentions. Second, as reflected by corresponding implementation intentions in this study, the venture creation process entails a broad variety of relevant tasks, ranging for instance from strategic tasks with a focus on innovative elements (e.g., introducing a product to the market) to purely organizational tasks such as creating invoices and collecting receivables (Trevelyan, 2011). For implementation intentions to successfully transform into entrepreneurial activity, the defined action plans need to cover the variety and relevance of required entrepreneurial tasks. Creative imaginativeness is unlikely to capture the full range of cues and corresponding responses required to also reflect for instance purely organizational tasks. Thus, at a certain degree of expression, creative imaginativeness may come to counteract the formation of relevant implementation intentions that ultimately contribute to action. This reasoning may also be supported by findings from Kier and McMullen (2020). They investigate entrepreneurial imaginativeness at team level and refute the idea that high levels of imaginativeness are always better, finding instead that "a little creative imaginativeness goes a long way" (Kier & McMullen, 2020, p. 13). Concluding from the two outlined arguments, higher levels of creative imaginativeness do not ultimately lead to an increased ability to define relevant implementation intentions, leading to a curvilinear relationship. This leads us to propose the following hypothesis:

Hypothesis 1 (H1): Creative imaginativeness displays a curvilinear relationship with implementation intentions.

Social imaginativeness and implementation intentions

Social imaginativeness facilitates the social skills of understanding and communicating (Miller et al., 2012) to sense relevant cues and responses required for new venture creation. Thus, we argue that social imaginativeness predominantly promotes the formation of implementation intentions concerning entrepreneurial action, in particular those involving relevant stakeholders but also the overall number of implementation intentions formed. First, regarding the type of implementation intentions, social imaginativeness empowers the entrepreneur's ability to imagine mental states of other people (Goldman, 2006). This kind of perspective allows the entrepreneur to see and feel the environment from a different point of view (Kier & McMullen, 2018). The empathic root of social imaginativeness then puts the information in broader context and triggers stimuli (Brown, 2008) to define specific cues and possible responses as components of implementation intentions. Especially regarding typical entrepreneurial tasks, such as developing a product or service or negotiating with potential investors and banks, social imaginativeness may help one to imagine the mental states of other stakeholders, and thus to respond in optimal ways via developed implementation intentions. Social imaginativeness may also promote communication by helping the entrepreneur to apply illuminating analogies and metaphors that speak to their stakeholders clearly and vividly (Cornelissen & Clarke, 2010).

Second, regarding the overall number formed, social imaginativeness may further increase the relevant stimuli on which relevant implementation intentions can be developed. Social imaginativeness is also likely to favor a higher level of concern for other individuals by taking perspective (Davis, 1980), allowing entrepreneurs to relate with these individuals better and reconcile their mental state. This could lead to the identification of hitherto unacknowledged needs and wants of potential customers as well as additional stakeholders (McMullen, 2010) and thus allow for consideration of these otherwise unidentified cues (Sciangula & Morry, 2009). Consequently, the more social imaginativeness an entrepreneur has, the more relevant cues and responses can be imagined, and the more implementation intentions can thus be formed. Unlike creative imaginativeness, with the characteristic of "letting one's imagination run loose" (D'Zurilla & Goldfried, 1971, p. 115), for social imaginativeness we do not expect a curvilinear relationship with implementation intentions, as social imaginativeness can be particularly trained and intensified by deliberately seeking the perspective of other stakeholders and potential customers (Goldman, 2006). Consequently, for social imaginativeness, we expect to find a positive linear relationship with implementation intentions. This leads us to propose the following hypothesis:

Hypothesis 2 (H2): Social imaginativeness is positively related with implementation intentions.

Practical imaginativeness and implementation intentions

Practical imaginativeness supports the definition of relevant cues for venture creation as well as the connection with feasible entrepreneurial responses to form implementation intentions. Kier and McMullen (2018) conceptualized the efficacy of practical imaginativeness as highly contingent on the involvement of the entrepreneur in an overarching context. Thus, for new venture creation, which can be considered to be simultaneously both an overarching context and a goal (Brandstätter et al., 2003), practical imaginativeness may be stronger and thus facilitate implementation intentions in the service of this goal. In particular, practical imaginativeness is considered to promote logic and causal inference, whereby entrepreneurs cognitively construct representations of future situations (Haynie et al., 2009). These representations, as possible entrepreneurial cues and corresponding responses, may then be evaluated with logic and reason to assess their applicability, feasibility, and usefulness – three evaluation criteria associated with practical imaginativeness (Cropley, 2006). Thereby, existing knowledge and information is preferably connected to new knowledge and information (McMullen & Dimov, 2013) accounting for the degree of uncertainty that entrepreneurs are able to reduce in the venture creation process (Autio et al., 2013). Thus, based on this line of reasoning, practical imaginativeness is likely to promote implementation intentions regarding cues and responses requiring analyzing, planning, or managing of information, resources, or projects in new venture creation (Kier & McMullen, 2018).

However, we argue that the relationship between practical imaginativeness and implementation intentions may be curvilinear, rather than linear, for the following two reasons. First, as outlined, practical imaginativeness connects existing information and knowledge with new information and knowledge and accounts for the uncertainty and risk of this combination. Thus, and unlike creative and social imaginativeness, the entrepreneur is likely to apply some form of judgement (McMullen, 2015) when forming implementation intentions based on practical imaginativeness. In this regard, existing resource endowments and required future resource configurations are anticipated (Haynie et al., 2009). Hence, more practical imaginativeness entails more connections of existing knowledge and information. These connections render judgement as to whether action steps towards venture creation, thus forming implementation intentions, make sense. Ultimately, this increased judgement, limiting further ideation towards implemental steps, may hinder the formation of further implementation intentions. Second, practical imaginativeness has been observed to promote performance in solving micro problems and is particularly attributed to the engineering type entrepreneur (Stinchfield et al., 2013). This leads to a greater ability to solve complex tasks, to engage in cognitive processing (Adamski & Westrum, 2003), and to anticipate more cues and more potential responses to these cues (Kier & McMullen, 2018). However, and given the fact that entrepreneurs must be mindful to when, where, how, and to what (Bieleke et al., 2021) they devote their attention (Baron, 2007; Gifford, 1992), the judgmental character of practical imaginativeness, increasing with higher levels of practical imaginativeness, may even decrease

the formation of implementation intentions. This decrease may particularly occur when practical imaginativeness predominantly contributes to envisioning micro problems without a connection to an overarching goal such as, for instance, venture creation. This leads us to propose the following hypothesis:

Hypothesis 3 (H3): Practical imaginativeness displays a curvilinear relationship with implementation intentions.

All hypotheses are summarized in Fig. 2:

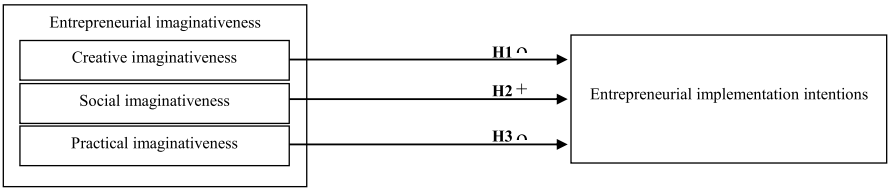
Methodology

Study setting

The aim of this study is to understand the role entrepreneurial imaginativeness plays in implementation intentions. Thereby, this study targets the context of new venture creation. According to Dimov (2011), questions concerning this context can best be answered in retrospect. We follow this conceptualization and apply a retrospective study design.

Sampling and data collection

Our sample is based on primary data, collected from a sample of 2,802 key informants, uniquely well-suited for the purpose of this study's investigation. These individuals are in the process of receiving or having received the "Gründerstipendium NRW" (GSNRW), a EUR 1,000 monthly grant, established in 2018, paid to individuals to set up a venture. This grant is financed by the Ministry of Economic Affairs, Industry, Climate Action and Energy of the German state of North Rhine-Westphalia, from which we obtained permission to use this sample and apply our distribution approach. Data was collected between June 2022 and the beginning of September 2022. Our survey was designed and operationalized using Qualtrics (e.g., Courtright et al., 2016), an online market research and survey software tool, and sent to respondents via an email invitation link by the managing entity of the GSNRW, the "Projektträger Jülich" (PTJ). To increase



Note: This figure provides the proposed research model with the hypothesized relationships.

Fig. 2 Research model

response rate, one reminder was sent at four weeks after the initial distribution of the survey via the PTJ (Dillman, 1991). From the 2,802 surveys sent, we obtained a total of 194 responses, for a response rate of ~ 7%. Seven of these responses were from individuals involved in the distribution process, however, not recipients of the grant, and they were thus excluded. Further, we dropped 17 observations for which respondents took less than ten minutes to complete the survey or provided inconsistent answers to the test question (the same question asked twice, once at the beginning and once at the end of the survey). Finally, we dropped one observation that was missing values for more than four items for our dependent variable of implementation intentions. We proceeded similarly for two of the observations which showed more than three unanswered items for our independent variable of entrepreneurial imaginativeness, in the corresponding subindices of creative imaginativeness, social imaginativeness, and practical imaginativeness. Six additional observations were dropped due to missing values in control variables. This resulted in a final sample size of 161 responses for our analysis. Sample characteristics are summarized in Table 1.

Table 1 Sample characteristics

(N = 161)			
All numbers are listed in % *(rounding may lead to totals > < 100%)*			
Broad age categories	*%*	***Commitment in work hours per week***	*%*
19 – 25 years	25	20 h or less	19
26 – 30 years	32	21 – 40 h	28
31 – 35 years	25	41 – 60 h	37
> 35 years	17	More than 60 h	16
Gender		***Sector: Information technology***	
Male	78	Not IT	62
Female	22	IT	38
Educational attainment of individual		***Entrepreneurial self-efficacy***	
Less than Bachelor	19	1 – 3	4
Bachelor	30	> 3 – 5	14
Master of higher	51	> 5 – 7	82
Entr. Experience 3: Ever started a business before		***Secondary work jo***bs	
No	66	0	51
Yes	34	1	39
		2	10
Entrepreneurial goal intentions		3	1
1 – 3	6		
> 3 – 5	22	***Entrepreneurial motivation***	
> 5 – 7	72	1 – 3	4
		> 3 – 5	9
		> 5 – 7	86

Measurement

For our study we rely on published and well-established multi-item scales. We apply seven-point Likert scales ranging from *1 = Strongly disagree* to *7 = Strongly agree* for all constructs. Survey respondents were asked to evaluate the questionnaire items with reference to the period of their venture creation. For calculation purposes, responses to survey items per construct were averaged. Constructs and respective items are listed in Table 2.

Implementation intentions Our dependent variable is a methodologically operationalized construct. It comprises two components. The first is a list of typical entrepreneurial activities for venture creation as detailed by the Global Entrepreneurship Monitor (GEM) and the Panel Study of Entrepreneurial Dynamics (PSED) (Kautonen et al., 2013a, b; Shirokova et al., 2016). The second is taken from the work of Ziegelmann et al. (2007), which completes the construct by translating the logic of implementation intentions (in the form of when, where, and how to act) to the entrepreneurial activity list. This formed construct seeks to capture the degree of the respondent's implementation intentions for conducting entrepreneurial activities for venture creation.

In this study setting we acknowledge that the formation of implementation intentions may reflect a time-bound process. Therefore, our questionnaire asked respondents to reflect on a period a certain amount of time preceding their creation of their venture. In this regard, given the retrospective nature of this study, the indication of the entrepreneur regarding this construct thus reflects their degree of implementation intentions experienced considering this period.

Entrepreneurial Imaginativeness In order to capture the independent variable of this study, we apply the well-published 18-item measure of Kier and McMullen (2018). This construct is grounded on three dimensions: creative imaginativeness, social imaginativeness, practical imaginativeness.

Control variables The nature of our research required extensive control for individual-level factors. We asked for the year of birth of respondents to cover age (Cressy & Storey, 1995) and for the highest degree obtained or currently pursued to cover education (Davidsson & Honig, 2003). The entrepreneurial experience of respondents was captured with the question whether the entrepreneur has started a business before (van Gelderen et al., 2015). We further control for the gender of respondents (van Gelderen et al., 2018). Given the respondents' setting of receiving a grant for venture creation, important controls were provided by the commitment of the responding entrepreneur, the number of secondary work jobs, and the entrepreneurial motivation. Commitment was measured in hours per week dedicated towards venture creation or the venture in general; for secondary work jobs we ask for the number of these; and regarding entrepreneurial motivation, we asked respondents to rate their motivation to be an entrepreneur on a seven-point Likert scale. Moreover, we controlled for entrepreneurial self-efficacy using a scale by Zellweger et al. (2011), as the presence

Table 2 Constructs, reliability and validity

		Cronbach's Alpha	AVE	CR
	Entrepreneurial imaginativeness	**0.825**	**0.779**	**0.859**
	(Source: Kier & McMullen, 2018)			
	Creative imaginativeness			
	Please indicate the degree to which you agree or disagree with each of the following statements:			
1	I consider myself to be inventive.			
2	I consider myself to be innovative.			
3	I demonstrate originality in my work.			
4	I like to create original work.			
5	People say I am artistic.			
6	Being creative is a large part of who I am.			
	Social imaginativeness	**0.894**	**0.676**	**0.622**
	Please indicate the degree to which you agree or disagree with each of the following statements:			
7	It is easy for me to see things from the other person's point of view.			
8	I always make an effort to see the world through other people's eyes.			
9	It is easy for me to understand why people feel the way they do.			
10	I have a good sense for what other people are feeling.			
11	I can read people's emotions just from their facial expressions.			
12	I am good at reading people.			
	Practical imaginativeness	**0.77**	**0.521**	**0.411**
	Please indicate the degree to which you agree or disagree with each of the following statements:			
13	I tend to be good at project management.			
14	I can picture what the bottleneck of a system will be.			
15	Before I face a new situation, I picture the issues I may encounter and plan accordingly.			
16	I see connections between seemingly unrelated pieces of information.			
17	Forming mental images helps me solve problems.			
18	I extrapolate existing methods to solve new problems.			
	Entrepreneurial implementation intentions	0.804	0.715	0.861
	(Source: based on Kautonen et al., 2013a; Shirokova et al., 2016; Ziegelmann et al., 2007)			
	I have planned precisely, when, where and how…			
1	…I will engage in my first step to discuss the product or business idea with potential customers.			
2	…I will engage in my first step to collect information about markets or competition.			
3	…I will engage in my first step to write a business plan.			
4	…I will engage in my first step to start product/ service development.			
5	…I will engage in my first step to start marketing or promotion efforts.			
6	…I will engage in my first step to purchase material, equipment, or machinery for the business.			
7	…I will engage in my first step to attempt to obtain external funding.			
8	…I will engage in my first step to apply for a patent, copyright, or trademark.			

Table 2 (continued)

		Cronbach's Alpha	AVE	CR
9	…I will engage in my first step to register the company.			
10	…I will engage in my first step to sell the product or service.			

of this variable is argued to increase the pursuance of entrepreneurial action (Boyd & Vozikis, 1994). Further, we included entrepreneurial goal intention strength (Liñán & Chen, 2009), as, according to the Rubicon model of action phases, entrepreneurial goal intentions most likely precede entrepreneurial implementation intentions. For entrepreneurial goal intentions we find a mean of 5.66 across our sample, showing that respondents' implementation intentions are likely backed by relatively strong goal intentions. Finally, we include risk propensity (Zhao et al., 2005) and capture the respondents' risk propensity via a well-established, published scale of Zhao et al. (2005). Previous research has shown that entrepreneurs construct risk in their mind (Palich & Bagby, 1995), and entrepreneurial imaginativeness strongly involves the human mind (Kier & McMullen, 2018). We adjust the five-point Likert scale to a seven-point Likert scale and transform reverse-coded items into positive connotation (Podsakoff et al., 2003).

Results

Model specification

We tested both the validity and reliability of our model and applied constructs. We ran an exploratory factor analysis (EFA) by utilizing maximum likelihood factor analysis and promax rotation (Hair et al., 2009). Since implementation intentions are a methodologically operationalized construct, we checked for factor loadings and potential cross-loadings. For all our measurement constructs we found loadings on one factor exclusively, without any cross-loadings. We applied confirmatory factor analysis (CFA) to check the validity of our model. Measured against commonly accepted thresholds (Hair et al., 2009), we found an overall good model fit with values of comparative fit index (CFI) = 0.932, Tucker–Lewis index (TLI) = 0.923, standardized root mean square residual (SRMR) = 0.074, and root mean square error of approximation (RMSEA) = 0.049. We further ensured convergent and discriminant validity of our model setup (see Table 2). The average variance extracted (AVE) for our dependent variable implementation intentions is 0.71, and for creative, social, and practical imaginativeness the values are 0.78, 0.68 and 0.52, respectively. Further, we find that all square roots of AVEs are greater than reported correlations among applied measurement constructs (Fornell & Larcker, 1981; Hair et al., 2009). We evaluated Cronbach's coefficient alpha (α) and composite reliability (CR) to ensure reliability of measurement scales. All Cronbach's coefficient

alphas are greater than 0.80, with the exception of practical imaginativeness at 0.77. We report a composite reliability value of 0.86 for implementation intentions and of 0.86, 0.62 and 0.41 respectively for creative, social, and practical imaginativeness. We acknowledge the low composite reliability for practical imaginativeness. However, given the definition, usage and reliability of this scale in published studies, we assume no issue with composite reliability. Table 3 summarizes descriptive statistics, correlations, and square roots of average variances extracted.

To conclude, we checked bivariate correlations and variance inflation factors (VIF). For all main variables in the model variance inflation factors are below 2 and never exceed 2.30 for control variables. The mean variance inflation factor is at 1.77 for the complete model, and listed values are thus beneath suggested thresholds (i.e., 10) (Fotheringham & Oshan, 2016; Hair et al., 2009). Following Kalnins's (2018) suggestion, we checked bivariate correlations to ensure they do not significantly exceed 0.3. Thus, it seems that there is no evidence for multicollinearity.

Hypotheses testing

We used STATA 17 software and applied hierarchical regression analysis to test our hypotheses (Dawson, 2014). Based on the Breusch-Pagan/ Cook-Weisberg test for heteroskedasticity we report ordinary least squares (OLS) standard errors, as the null hypothesis issupported, suggesting constant variance. We accounted for linear and non-linear relationships and thus built a multiple regression model with five steps (Dawson, 2014) (see Table 4).

Model 1 includes controls only. Three control variables are significantly related to implementation intentions: risk propensity ($\beta = 0.172$, $p = 0.092$), entrepreneurial goal intention ($\beta = 0.155$, $p = 0.043$), and entrepreneurial self-efficacy ($\beta = 0.232$, $p = 0.027$). To test the linear effects of creative, social, and practical imaginativeness we refer to Model 2. All dimensions of entrepreneurial imaginativeness were tested including controls. We find statistically significant support for practical imaginativeness ($\beta = 0.217$, $p = 0.034$), whereas the results for creative imaginativeness ($\beta = 0.131$, $p = 0.196$) and social imaginativeness ($\beta = 0.036$, $p = 0.699$) do not indicate statistical significance. We therefore reject H2.

Our first hypothesis (H1) postulates a curvilinear relationship between creative imaginativeness and implementation. Referring to Model 3, we included the linear effect of creative imaginativeness, the squared term of creative imaginativeness, and controls. The results show a positive, but statistically insignificant association of creative imaginativeness on implementation intentions ($\beta = 0.139$, $p = 0.177$). The squared term of creative imaginativeness is statistically significant ($\beta = -0.104$, $p = 0.078$) supporting a curvilinear relationship, thus, confirming H1. The findings appear to indicate the curvilinear relationship resembling an inverted U-shape, which also found support in an augmented component-plus-residual plot (see Fig. 3).

Accordingly, we followed Haans et al. (2016) and Lind and Mehlum (2010) and conducted further tests to validate whether the identified curvilinearity is in fact a U-shape with statistical significance. First, we analyzed the upper and lower bound of the curve's slope for the respective steepness and its significance (Lind

Table 3 Correlation table and descriptive statistics

	1	2	3	4	5	6	7	8	9	10	11	12
Main												
1. Entrepreneurial implementation intentions	0.84											
2. Creative imaginativeness	0.28***	n.a.										
3. Social imaginativeness	0.21**	0.28***	n.a.									
4. Practical imaginativeness	0.30***	0.36***	0.31***	n.a.								
5. Creative imaginativeness (squared)	0.25**	0.99***	0.28***	0.34***	n.a.							
6. Social imaginativeness (squared)	0.22**	0.28***	0.99***	0.32***	0.28***	n.a.						
7. Practical imaginativeness (squared)	0.28***	0.34***	0.29***	0.99***	0.33***	0.31***	n.a.					
Controls												
8. Risk propensity	0.20*	0.28***	0.11	0.14+	0.26***	0.11	0.15+	n.a.				
9. Age of the individual	0.00	0.02	-0.12	-0.15+	0.03	-0.10	-0.16*	-0.15+	n.a.			
10. Gender: Female (vs. male)	0.10	0.17*	0.22**	-0.11	0.19*	0.24**	-0.09	-0.08	-0.02	n.a.		
11. Education: Less than Bachelor's	0.09	0.04	0.08	0.09	0.04	0.08	0.10	0.01	-0.17*	0.01	n.a.	
12. Education: Bachelor's	-0.04	0.01	-0.01	-0.07	0.00	-0.02	-0.06	0.15+	-0.13	0.08	-0.32***	n.a.
13. Education: Master's or higher	-0.04	-0.04	-0.05	-0.01	-0.04	-0.05	-0.02	-0.15+	0.25**	-0.09	-0.50***	-0.66***
14. Ever started a business before?	-0.06	-0.05	-0.05	-0.03	-0.03	-0.05	-0.02	0.10	0.14+	-0.18*	0.09	0.03
15. # of secondary work jobs	0.05	-0.02	0.01	-0.07	-0.02	0.01	-0.06	0.09	-0.10	0.11	-0.13	0.36***
16. Commitment in work hours per week	0.05	0.09	0.03	0.05	0.10	0.04	0.06	0.09	0.12	-0.13	0.01	-0.15+
17. Entrepreneurial goal intentions	0.25**	0.32***	0.29***	0.34***	0.30***	0.31***	0.32***	0.26***	0.02	-0.03	0.12	0.03
18. Entrepreneurial motivation	0.15+	0.40***	0.17*	0.28***	0.37***	0.18*	0.27***	0.38***	-0.01	-0.04	0.07	0.03
19. Entrepreneurial self-efficacy	0.25**	0.38***	0.22**	0.43***	0.35***	0.24**	0.42***	0.34***	-0.01	-0.09	0.00	-0.07
Statistics												
mean	4.87	5.45	5.58	5.65	30.85	32.39	32.65	5.06	30.75	0.21	0.19	0.29
sd	1.11	1.02	1.11	0.82	10.65	11.28	8.76	0.95	8.11	0.41	0.39	0.46
min.	1	2	1.16	2.83	4	1.36	8.02	2.33	19	0	0	0
max.	7	7	7	7	49	49	49	6.83	64	1	1	1

Table 3 (continued)

	13	14	15	16	17	18	19
13. Education: Master's or higher (vs. no degree)	n.a.						
14. Ever started a business?	-0.09	n.a.					
15. Secondary work jobs	-0.22**	0.03	n.a.				
16. Commitment in work hours per week	0.13+	0.08	-0.41***	n.a.			
17. Entrepreneurial goal intentions	-0.12	0.09	0.02	0.03	n.a.		
18. Entrepreneurial motivation	-0.08	-0.04	-0.13+	0.21**	0.46***	n.a.	
19. Entrepreneurial self-efficacy	0.07	0.04	-0.11	0.16*	0.43***	0.67***	n.a.
Statistics							
mean	0.51	0.33	0.60	2.5	5.66	6.32	5.98
sd	0.50	0.47	0.69	0.98	1.30	1.22	1.15
min.	0	0	0	1	1	1	1
max.	1	1	3	4	7	7	7

Pearson correlation shown; Square root of AVEs reported on main diagonal of correlation matrix

N = 161 + p < 0.1; *p < 0.05; **p < 0.01; ***p < 0.001

Table 4 Regression results (Dependent variable: Entrepreneurial implementation intentions)

		(1)	(2)	(3)	(4)	(5)
Main effects						
Creative imaginativeness (std.)			0.131	0.139		0.0710
			(0.196)	(0.177)		(0.498)
Social imaginativeness (std.)	**H2**		0.0365			0.0274
			(0.699)			(0.819)
Practical imaginativeness (std.)			0.217		0.160	0.148
			(0.034)		(0.128)	(0.179)
Squared effects						
Creative imaginativeness (squared, std.)	**H1**			-0.104		-0.0785
				(0.078)		(0.200)
Social imaginativeness (squared, std.)						0.0045
						(0.943)
Practical imaginativeness (squared, std.)	**H3**				-0.119	-0.0908
					(0.030)	(0.118)
Controls						
Risk propensity		0.172	0.160	0.130	0.193	0.162
		(0.092)	(0.115)	(0.201)	(0.051)	(0.109)
Age of the individual		0.0081	0.0122	0.0074	0.0123	0.0117
		(0.468)	(0.277)	(0.501)	(0.264)	(0.296)
Gender: Female (vs. male)		0.290	0.245	0.232	0.395	0.332
		(0.171)	(0.271)	(0.281)	(0.057)	(0.145)
Education: Bachelor's (vs. no degree)		-0.392	-0.345	-0.414	-0.355	-0.375
		(0.140)	(0.185)	(0.115)	(0.167)	(0.148)
Education: Master's or higher (vs. no degree)		-0.305	-0.275	-0.309	-0.308	-0.308
		(0.209)	(0.248)	(0.196)	(0.190)	(0.193)
Entrepreneurial Experience: Ever started a business		-0.257	-0.210	-0.182	-0.193	-0.151
		(0.176)	(0.260)	(0.336)	(0.297)	(0.422)
Secondary work jobs		0.174	0.183	0.191	0.198	0.206
		(0.232)	(0.199)	(0.182)	(0.159)	(0.147)
Commitment: 21–40 h		-0.0834	-0.169	-0.140	-0.115	-0.140
		(0.747)	(0.510)	(0.587)	(0.647)	(0.583)
Commitment: 41–60 h		0.248	0.210	0.282	0.259	0.282
		(0.338)	(0.409)	(0.275)	(0.302)	(0.270)
Commitment: > 60 h		0.110	0.0649	0.112	0.200	0.182
		(0.727)	(0.834)	(0.720)	(0.518)	(0.561)
Entrepreneurial goal intentions		0.155	0.0957	0.129	0.0827	0.0741
		(0.043)	(0.222)	(0.091)	(0.281)	(0.351)
Entrepreneurial motivation		-0.134	-0.127	-0.164	-0.113	-0.134
		(0.195)	(0.213)	(0.108)	(0.258)	(0.187)
Entrepreneurial self-efficacy		0.232	0.126	0.180	0.131	0.109
		(0.027)	(0.247)	(0.086)	(0.218)	(0.313)
Constant		2.437	3.308	3.415	3.121	3.657
		(0.001)	(0.000)	(0.000)	(0.000)	(0.000)

Table 4 (continued)

	(1)	(2)	(3)	(4)	(5)
Observations	161	161	161	161	161
R^2	0.157	0.207	0.196	0.222	0.237
Adjusted R^2	0.082	0.119	0.112	0.142	0.135

N = 161

p-values in parentheses

& Mehlum, 2010). We found a positive and significant slope at the lower bound (β = 0.838, p = 0.028) and a negative but insignificant slope at the upper bound (β = -0.10, p = 0.603). Following Haans et al. (2016) we were able to verify that the untransformed (i.e., unstandardized) turning point of the curve (6.14) is located within the 95% Fieller interval (4.73; 7.55). However, the upper bound of the confidence interval is outside of the value range (i.e., 7) of the unstandardized variable. Further, we tested alternative specifications and did not find support for cubic or exponential relationships (Haans et al., 2016). We did however find statistically significant results when testing for a logarithmic relationship (β = 1.066, p = 0.022), which is further indicated by the insignificant upper bound of the slope. Also, when excluding outliers, the effect of squared creative imaginativeness is no longer significant (β = 0.026, p = 0.840). Thus, we conclude that the identified curvilinear relationship does resemble an inverted U-shape. However, the inverted U-shape could not be confirmed statistically (see Fig. 4).

H3 postulates a curvilinear relationship between practical imaginativeness and implementation intentions. We refer to Model 4 and included the linear

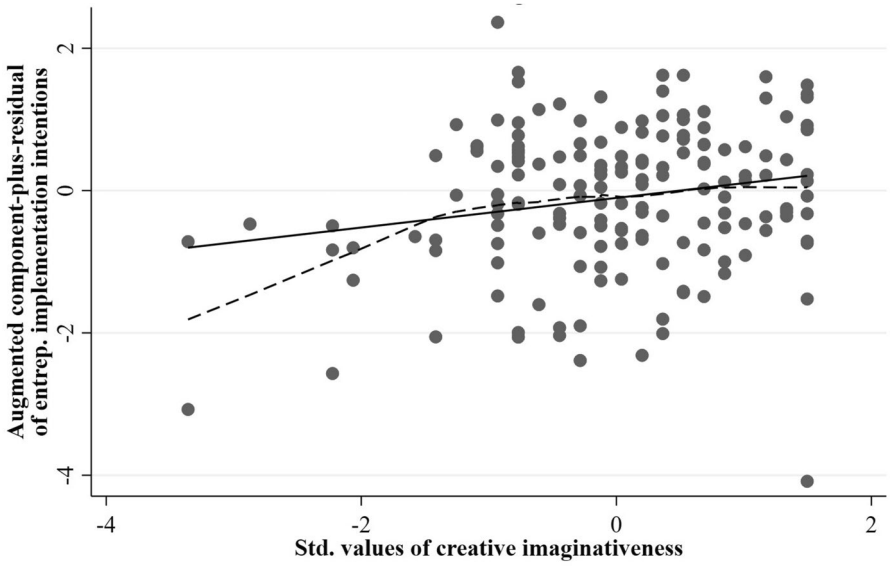


Fig. 3 Augmented component-plus-residual plot for creative imaginativeness

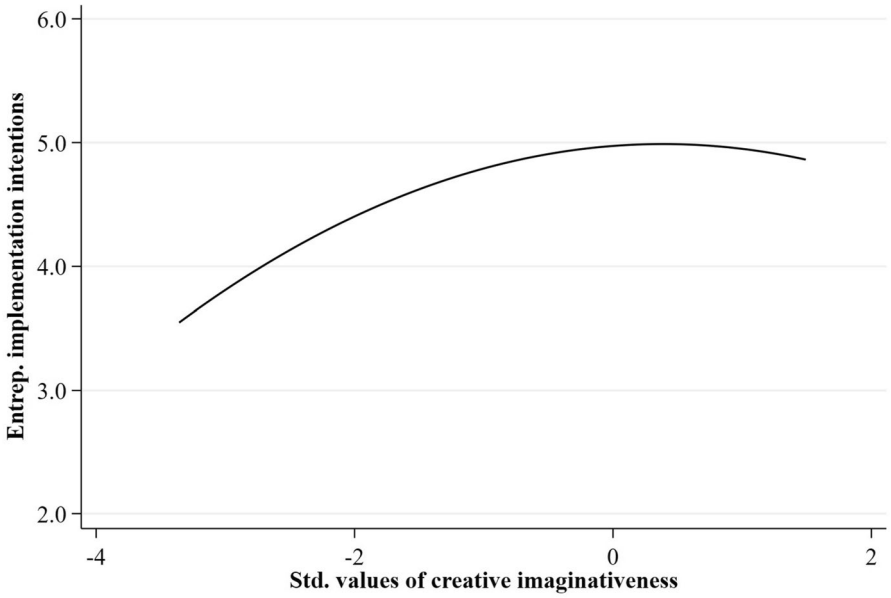


Fig. 4 Linear prediction of entrepreneurial implementation intentions dependent on creative imaginativeness

effect of practical imaginativeness, the squared term of practical imaginativeness, and controls. We find a positive but insignificant main linear relationship ($\beta = 0.160$, $p = 0.128$) and a negative and statistically significant effect of the squared term ($\beta = -0.119$, $p = 0.030$), which suggest a curvilinear relationship, confirming H3. We find indication that the curvilinear relationship resembles an inverted U-shape which was further suggested by an augmented component-plus-residual plot (see Fig. 5).

In order to further validate whether the identified curvilinearity is in fact a U-shape with statistical validity, we conducted additional tests (Haans et al., 2016; Lind & Mehlum, 2010). We evaluated the steepness and significance of the slope of the curve at the upper and lower bound (Lind & Mehlum, 2010). At the lower bound, the slope was positive and significant ($\beta = 0.959$, $p = 0.005$). At the upper bound, the slope was negative but insignificant ($\beta = -0.111$, $p = 0.565$). The untransformed (i.e., unstandardized) turning point (6.21) is located within the 95% Fieller interval (5.18; 7.24), but the upper bound of the Fieller interval is located outside of the value range (i.e., 7). Excluding outliers following the suggestion Haans et al. (2016), the effect of squared practical imaginativeness was no longer significant ($\beta = -0.127$, $p = 0.222$), which further suggests that a statistically significant inverted U-shaped relationship does not exist. We did not find support for a cubic or an exponential relationship, but we did find support for a logarithmic relationship ($\beta = 1.762$, $p = 0.003$). Consequently, these additional tests show that the indication of an inverted U-shape could not be proven with statistical significance Fig. 6.

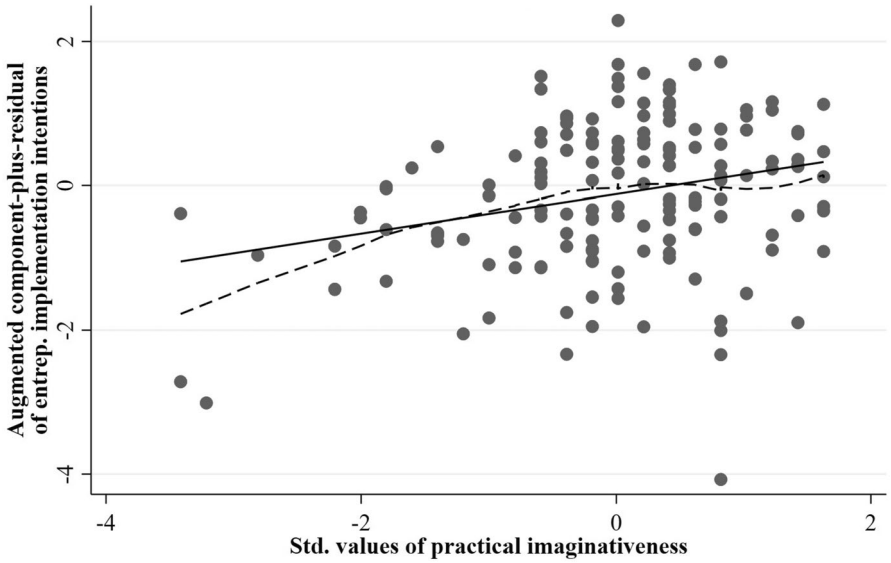


Fig. 5 Augmented component-plus-residual plot for practical imaginativeness

Bias testing

Given our primary data collection, we adopted several measures to limit informant bias. By means of distribution, the questionnaire was exclusively sent out to

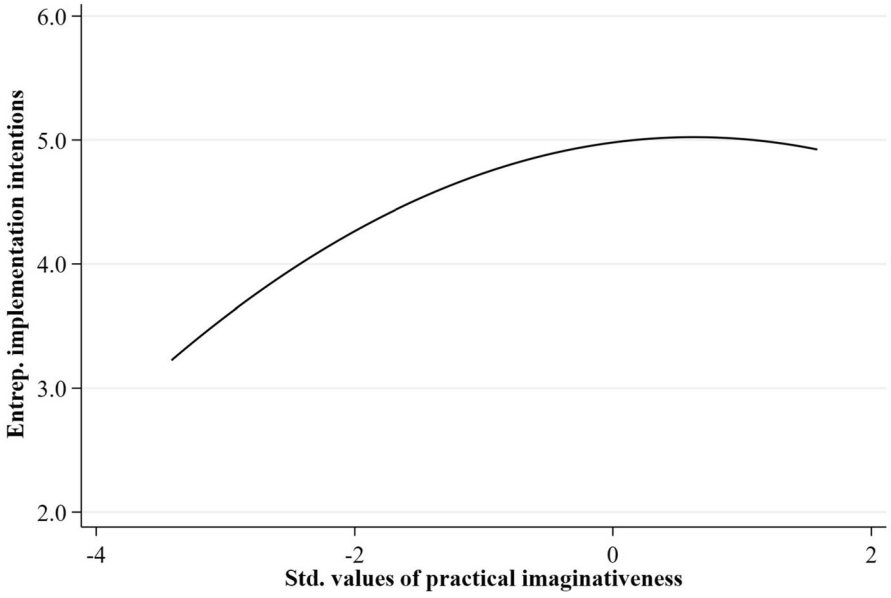


Fig. 6 Linear prediction of entrepreneurial implementation intentions dependent on practical imaginativeness

recipients of the GSNRW. This exclusive distribution was guaranteed by the managing entity of the grant (the PTJ as well as the corresponding founding networks who act as coaches for recipients of the GSNRW during the grant period. Moreover, via the survey, it was checked whether respondents had in fact received the required funding recommendation. In this way, we identified and excluded seven responses that appeared to have been provided by interested people involved in the distribution process.

We further tested for non-response bias. To evaluate non-response bias, we tested our data and split our respondent sample into three groups according to the times at which their responses were received (Berg, 2005). Since late respondents are likely to be similar to non-respondents (Armstrong & Overton, 1977), we applied a t-test to compare the first with the third group, namely early respondents with late respondents. We generated statistically significant findings regarding five variables, producing no noticeable findings for the t-test coefficients of the remaining variables. Compared to early survey respondents, late survey respondents are on average seven years older, 17% less likely to know someone who started a business, and to score 0.62 in skills for reading people's emotions and 0.70 lower in skills for reading people in general. Finally, a detected difference in the industry sector between the two respondent groups is likely to be random.

The design of our research and use of primary data collection pose the risk of common method bias (CMB), particularly insofar as data on dependent and independent variables were collected from the same survey respondents (Podsakoff et al., 2003). We therefore followed Podsakoff et al. (2012) and applied procedural techniques and statistical tests to reduce the risk of CMB. First, we tested our questionnaire with over 20 academics and seven practitioners. We ensured validity of the survey by modifying unclear structures and items (Podsakoff et al., 2003). Further, in the survey, we separated the questions on independent and on dependent variables to prevent respondents from making inferences as to our research purpose. Second, when they began the questionnaire, all respondents were informed that their responses would be kept strictly confidential and used exclusively for scientific purposes, and it was made clear that there were no right or wrong answers. We further assessed the risk of CMB by using the Comprehensive CFA Marker Technique, which is known as an ex-post statistical technique. Thereby, a marker variable was included in the survey and added to the CFA (Williams et al., 2010). We do not find any evidence for common method variance (Method-C vs. baseline: $\Delta\chi^2 = 1.39$, $df = 1$, $p = 0.24$) and there is thus no indication that common method variance may have affected the relationships in our model (Method-R vs. Method-C: $\Delta\chi^2 = 0.02$, $df = 6$, $p = 1.00$) (see Table 5 for full results).

Lastly, we addressed potential endogeneity issues and applied the instrumental variable approach (Bascle, 2008). We applied the two-stage least-squares approach (Baum, 2006), operationalized in STATA 17 by the command ivreg2. The instrumental variables for this test were thinking and working style and work rumination. We did not find any indication of endogeneity issues ($\chi^2(df = 3) = 1.879$, p-value = 0.598).

Table 5 Model fit indices and model comparisons for CFA model with marker variable

Model	χ^2 (df)	CFI	RMSEA (90% CI)	LR of $\Delta\chi^2$	Model comparison
CFA with marker	875.13 (454)	0.7971	0.076 (0.068 – 0.083)		
Baseline	877.73 (465)	0.8012	0.074 (0.066 – 0.081)		
Method-C	876.34 (464)	0.8013	0.074 (0.066 – 0.082)	1.391, $df=1$, p = 0.238	vs. Baseline
Method-U	857.39 (437)	0.7975	0.077 (0.069 – 0.085)	18.947, $df=27$, p = 0.871	vs. Method-C
Method-R	876.35 (470)	0.8042	0.073 (0.065 – 0.081)	0.014, $df=6$, p = 1.000	vs. Method-C

CFA confirmatory factor analysis, *CFI* comparative fit index, *RMSEA* root mean square error of approximation, *LR* likelihood ratio test, *U* unconstrained, *C* common, *R* restricted

Robustness tests

We evaluated the robustness and limitations of our model in three principal respects. First, given a relatively small sample size, we identify the risk that control variables might overfit the outliers and thus influence our findings (Harrell, 2015). Hence, following Han et al.´s (2020) suggestion, we re-ran the regression using only our explanatory variables, which showed a positive linear effect of creative imaginativeness (β = 0.183, p = 0.043) and practical imaginativeness (β = 0.241, p = 0.009) as explanatory variables on implementation intentions, showing no indication for the risk of overfitting. Second, in Model 1 we included only our control variables to ensure that we were not missing any variables that might significantly affect our main variables. Third, we re-ran regressions with different specifications based on the regressions in Model 3 for creative imaginativeness and Model 4 for practical imaginativeness.

The specifications were as follows. The first specification concerned the exclusion of all observations for which the standard deviation from the mean was greater than 1 for the construct, checking for social desirability. Thereby, we validate our model and results against the possibility of respondents aiming for social approval or self-presentation concerns (i.e., everybody wants to be imaginative) (Krumpal, 2011). We identified 130 (-31 from original sample size) remaining responses and saw improvement for the effects of both squared creative imaginativeness (β = -0.103, p = 0.080 vs. β = -0.151, p = 0.046) and squared practical imaginativeness (β = -0.110, p = 0.049 vs. β = -0.183, p = 0.007).

The second specification addressed potential outliers affecting the model. Thereby, we evaluated whether the results are sensitive to outliers or influential data points. By following Rousseeuw and Leroy (1987) we applied robust regression analysis to avoid observation deletion and biased confidence intervals while at the same time limiting the weight of the outliers affecting the regression analysis. We found that both, the effect of creative imaginativeness on implementation intentions ((β = 0.131, p = 0.196 vs. β = 0.178, p = 0.076) and practical imaginativeness

on implementation intentions (β = 0.217, p = 0.034 vs. β = 0.029, p = 0.023) improve. Further, both, the effect of squared creative imaginativeness (β = -0.104, p = 0.078 vs. β = -0.065, p = 0.268) and squared practical imaginativeness (β = -0.119, p = 0.030 vs. β = -0.104, p = 0.058) are weakened. Accordingly, we conclude that outliers in the sample are likely to be responsible for the initial indication of the identified curvilinear relationships of creative and practical imaginativeness on implementation intentions being an inverted U-shape.

Discussion

Implications for research & theory

Before we outline the implications and limitations of our study, we discuss our findings, which were partly unexpected. Between implementation intentions and both creative imaginativeness (H1) and practical imaginativeness (H3), we hypothesized a curvilinear relationship. We also hypothesized a positive linear relationship between implementation intentions and social imaginativeness (H2). While H1 and H3 were confirmed, for H2 no statistically significant relationship was found. For H2, our theoretical reasoning was grounded in prior research that credited social imaginativeness with enhanced perspective-taking and thus allowing the entrepreneur to see and feel the environment from a different point of view (Kier & McMullen, 2018). On this basis, we argued that perspective-taking may inform the development of implementation intentions that seek to address the needs and wants of relevant stakeholders.

Despite the results not supporting our hypothesis, we continue to believe that this line of reasoning is plausible. One factor potentially bearing on this reasoning calls for detailed discussion. Social imaginativeness is in particular conceptualized to enhance the identification of problems in need of a solution (Kier & McMullen, 2018). The construct of implementation intentions in this study reflects action plans for ten typical entrepreneurial tasks for venture creation. Individual entrepreneurs, however, may have different expressions of the three forms of entrepreneurial imaginativeness. An outstanding example of social imaginativeness, for example, may be Steve Jobs (Isaacson, 2011), who clearly focused on understanding the needs and wants of his stakeholders and especially customers. Reflecting this reasoning with respect to the respondents to this study, the tasks indicated by the action plans of implementation intentions in this study may be insufficiently representative of the types of activities characteristic of entrepreneurs with stronger expressions in social imaginativeness. Consequently, the efficacy of social imaginativeness may be less relevant for tasks such as "I have planned precisely when, where, and how to write a business plan".

Aligning with our study's overarching motivation to contribute to research related to closing the intention–action gap in entrepreneurship (Adam & Fayolle, 2015), we provide three principal contributions. We do so by building on foundations laid by scholars from the field of social psychology and adapting Heckhausen and Gollwitzer's (1987) Rubicon model of action phases to the context of entrepreneurship. The first contribution

is derived from the empirical finding that implementation intentions can be formed in the entrepreneurial context of new venture creation. Originally, implementation intentions were conceptualized as single cue–response links that promote the process of goal-striving in laboratory-based (e.g., Adriaanse et al., 2011; Brandstätter et al., 2001; Webb & Sheeran, 2008) and field studies (e.g., Sheeran et al., 2005). In contrast, we show that implementation intentions may well arise in contexts of more complex behavior and associated complex goals, such as entrepreneurship, and thus respond to relevant research calls (Adam & Fayolle, 2016; Sheeran, 2002). This adds to extant literature and the conceptualization of implementation intentions, and connects to recently published work investigating the multiplicity of "if–then" plans (Tam et al., 2010; Wiedemann et al., 2012). Further, by directly assessing implementation intentions in the entrepreneurial context of venture creation (van Gelderen et al., 2018), we are able to derive application specifics from this context back to the original conceptualization source of implementation intentions in socio-psychological literature (Gollwitzer, 1990). As such, our findings suggest that the distinct and linear phases of the Rubicon model and mindset theory of action phases may be more dynamic and that an implemental mindset can be taken on actively by the entrepreneur.

For the second major contribution, we line this study up to the limited research investigating naturally evolving and non-induced implementation intentions (e.g., Armitage, 2009; Brickell et al., 2006; Churchill & Jessop, 2010). We thereby show that even in the entrepreneurial context, implementation intentions can be self-generated and that there exist further antecedents besides goal intention strength (e.g., Brickell et al., 2006; Churchill & Jessop, 2010). This finding is likely to be relevant also in other settings and disciplines in which implementation intentions may serve as self-regulatory strategy (e.g., to promote goal-striving in the absence of experimental laboratory or field studies).

Our third major contribution results from responding to Kier and McMullen's (2018) call for further research on consequents of entrepreneurial imaginativeness and its role for entrepreneurial action. Following van Gelderen et al. (2018), we apply the Rubicon model of action phases from socio-psychological disciplines in order to theoretically derive the relationship between entrepreneurial imaginativeness and implementation intentions. Our empirical results support the establishment of entrepreneurial imaginativeness as antecedent of implementation intentions, which suggests that the model and underlying psychological principles attributed to the processes of goal-setting and goal-striving (Gollwitzer, 1990, 1999, 2012) may also be valid in the entrepreneurial context. Thus, after having formed a goal intention, entrepreneurial imaginativeness (i.e., creative imaginativeness and practical imaginativeness) transitions the entrepreneur to the pre-actional phase.

Practical contribution

From a practical perspective our study sheds light on how individuals may create a self-regulatory strategy to convert their intention of becoming an entrepreneur into entrepreneurial action and venture creation. Since forming implementation

intentions, as a self-regulatory strategy, has been shown to promote goal-striving (Bieleke et al., 2021), the results and implications of this study may help not only entrepreneurs but also architects of entrepreneurship programs and policy makers. Entrepreneurs will benefit from not only the validation that the self-regulatory strategy of implementation intentions may also be effective in entrepreneurial context of new venture creation, but also with the recipe for promoting this strategy, in the form of creative imaginativeness and practical imaginativeness. Further, for program architects of entrepreneurship programs and policy makers, insights from this study may contribute to a thorough understanding of, and consequent design for, how best to support and finance entrepreneurial programs for successful venture creation. Thereby, elements strengthening entrepreneurial imaginativeness as well as fostering the formulation of corresponding "if–then" plans are likely to support aspiring entrepreneurs in their endeavor. Training and developing these elements may work well via a frequent exchange with likeminded entrepreneurs as well as distinct and focused elements in the curriculums of entrepreneurship programs.

Limitations and avenues for further research

We identify some limitations in this study, as with all empirical work, that present promising directions for future research. First, the cross-sectional nature of our data means we can only identify associations, not causalities. Future research could therefore investigate the relationship between entrepreneurial imaginativeness and the formation of implementation intentions by using a longitudinal research design, which would make it possible to infer causalities. Second, based on our sample of grant holders of the GSNRW, we identify the condition for all beneficiaries of the grant to officially register a venture in order to receive the full term (i.e., 12 months) of funding. However, as the responses were asked to consider a longer timeframe, there may have been limitations in the key informants' ability to recall information. However, an event like venture creation is infrequent and highly relevant (Sudman & Bradburn, 1973), and thus the recall ability in this regard could be expected to be independent of the elapsed time (Schoenduwe et al., 2015). Third, to measure implementation intentions, we listed ten distinctive and typical tasks for venture creation for which implementation intentions could be formed (Kautonen et al., 2013a, b; Shirokova et al., 2016). These tasks may not be equally important to all respondents, or may not fully cover the individuals' most important tasks. Future research is needed to validate what the most relevant tasks are for an entrepreneur in venture creation. Fourth and finally, our study investigates the effects of different forms of entrepreneurial imaginativeness on implementation intentions. Knowing that entrepreneurs are likely to have spikes in one or more forms of creative imaginativeness, social imaginativeness, and practical imaginativeness (Kier & McMullen, 2018), this study lacks a differentiated view on respective combinations. Future studies could therefore focus on different levels and combinations of creative imaginativeness, social imaginativeness,

and practical imaginativeness and investigate how these relate to implementation intentions for various tasks involved in venture creation.

Future research could also apply the Rubicon model and mindset theory of action phases to this entrepreneurial context and validate further antecedents that favor entrepreneurial implementation intentions. Mindfulness, termed "a receptive attention to and awareness of present events and experience" (Brown et al., 2007, p. 212) may be such an antecedent, as it has been shown to have positive benefits on the individual-level as well as for work performance (e.g., Hyland et al., 2015; Ostafin et al., 2015).

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