



Cracks in the wall: Entrepreneurial action theory and the weakening presumption of intended rationality

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ABSTRACT

Entrepreneurship scholarship finds itself in something of a quandary concerning rationality. While an increasingly large body of empirical work has found evidence of less-deliberative and even impulsive drivers of business venturing, the dominant theories of entrepreneurial action remain anchored to the assumption that intended rationality is a defining attribute of entrepreneurship. The growing schism between entrepreneurial action theory (EAT) on the one hand, and empirics and practice on the other hand, represents a consequential and exciting opportunity for the field to revisit its core assumptions regarding rationality, particularly the presence, role, and function of rational intentionality. In this study, we undertake a review and exploratory investigation of the assertion that without reasoned intentionality there is no entrepreneurship. Our work generates three important insights that contribute to rethinking key facets of the most prominent and influential EATs: alternative, non-rational pathways to business venturing exist with a non-ignorable prevalence; a proclivity towards reasoned intentionality is not invariably prescriptive; and, less-reasoned, less-deliberative tendencies do not constitute an entrepreneurial death sentence. Rather, entrepreneurs (including highly successful ones) embody a shifting blend of rational and non-rational proclivities, motivations, decisions, and actions.

1. Introduction

In our view, the essence of this *Special Issue* is a call to explore the boundaries of rationality in the pursuit of entrepreneurship. The renewed focus is timely as entrepreneurship scholars increasingly find themselves at loggerheads concerning the role of intended rationality in entrepreneurial decision-making and action. On the one hand, a long-standing perspective – one that is well-ensconced in the dominant theories of entrepreneurial action (e.g. Alvarez and Barney, 2007; Foss and Klein, 2012; Kirzner, 1997; Klein, 2008; McMullen and Shepherd, 2006; Sarasvathy, 2001) – holds that reasoned intentionality and intendedly rational, deliberative

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judgements constitute a definitional cornerstone of entrepreneurship. “Entrepreneurial action,” wrote McMullen and Shepherd (2006: 134), “refers to behavior in response to a judgmental decision under uncertainty about a possible opportunity for profit.” In even more assertive fashion, Brown et al. (2018: 1) argued that all entrepreneurial action “ought to be understood within the framework of judgment and, thus, as rational human action.”

On the other hand, a growing body of empirical research (e.g. Lerner et al., 2019; Spivack et al., 2014; Wiklund et al., 2016, 2017; Wolfe et al., 2020; Pietersen and Botha, 2021; Yu et al., 2021) has identified the presence and impact of a-rational, less-deliberative, and even impulsive drivers of business venturing. While these alternatives to deliberative judgement – and the underlying neurological processes that give rise to them (Austin and Pisano, 2017) – do not negate rational judgement and action, a more useful and veridical conception of entrepreneurial action theory (EAT) requires acknowledgement that business venturing is subject to forces that are not solely grounded in rational intentionality (Lerner et al., 2018a).

What then is the role of rationality in entrepreneurship research? In essence, EAT is headed in one direction – a vector that is evidenced in part by recent conceptual work delineating the central role of rational intentionality in *Academy of Management Review* (Zellweger and Zenger, 2021) and *Journal of Business Venturing* (Packard and Bylund, 2021) – while recent empirical investigations in prominent entrepreneurship outlets reveal an increasing array of potent exceptions to the rationality assumption (e.g. Greidanus and Liao, 2021; Rajah et al., 2021; Wolfe et al., 2020; Yu et al., 2021). Thus, while the empirical work has yet to effectively engage EAT, EAT has failed to engage, incorporate, and reconceptualize its assumption of intended rationality in light of the empirical findings (Hunt and Lerner, 2018; van Lent et al., 2020).

The manner in which the entrepreneurship field navigates its way through this schism will exert an indelible influence upon EAT, and accordingly, upon the next generation of entrepreneurship research. The purpose of this study is to offer reconciling clarity concerning the unquestioned importance of reasoned intentionality and the increasingly questioned nature of its boundaries. In order to discern those boundaries and facilitate conceptual reconciliation, it is first necessary to demonstrate the existence of viable alternatives to the assumption of intended rationality, for which reason we pose the questions: *Do non-rational drivers of decisions and actions constitute a detrimental, beneficial, or unrelated determinant of business venturing outcomes? If so, are there implications for EAT?*

To ascertain utility or disutility of non-rational propensities towards action, we undertook an exploratory, abductive investigation of entrepreneurial action, using a representative sample of adults. In doing so, we include and observe psychiatric neurodiversity, with many subjects appearing to have one or more diagnosable psychiatric conditions. It is well-established that certain psychiatric syndromes are tied to deficits in executive control that guide the effective use of rational decision-making and reasoned foresight in the pursuit of goals, and that these deficits are particularly central to conditions such as ADHD and mania (Barkley, 1997; Nigg, 2000).² Generally speaking, the greater the ADHD symptoms or (hypo)manic tendencies, the further from reasoned judgement and rational goal pursuit individual behavior typically is (Barkley et al., 2008; Johnson et al., 2016b). Stated differently – while it would be incorrect and inappropriate to equate or label individuals with ADHD or (hypo)manic tendencies as irrational – the more symptomatic an individual is, the more typical it is to observe deviations from reasoned judgement and rational goal-directed behavior (e.g., Barkley, 1997; Barkley et al., 2008; Johnson et al., 2016b). Thus, the disinhibition and psychiatric neurodiversity captured through our inquiry offers a portal for examining whether the symptoms and proclivities known to undermine rational decision-making and goal pursuit diminish or enhance entrepreneurial outcomes.

Our review and investigation contribute to the conceptual and empirical underpinnings of entrepreneurial action by extending and enhancing recent research that seeks to identify and describe the nature and impact of entrepreneurial neurodiversity (e.g. Moore et al., 2021; Nicolaou et al., 2021; Stephan, 2018), thereby providing a more fruitful conceptualization of EAT; one in which intended rationality is not a definitional requirement. In facilitating this reconciliation of EAT and the empirical findings of a-rational, less-deliberative business venturing pathways, we extend and enhance the broad-spectrum approach put forth by Lerner et al. (2018a) in offering a more diverse, useful, and veridical conceptualization of entrepreneurial actions and outcomes. While neurodiversity – coined by Singer (1998, 1999) to capture and reframe the wide-ranging differences in human brain functions – is increasingly well-recognized across the social sciences, including the study of entrepreneurship (e.g. Moore et al., 2021; Nicolaou et al., 2021; Stephan, 2018; Wiklund et al., 2018a, 2020), its foundational impact on the field's conceptual underpinnings has to date been negligible. Our exploration contributes notable grounds upon which to reverse this lack of influence by clarifying why and how EAT can better account for presence, role, and impact of neurodiversity.

In the following sections we lay the groundwork for our exploratory investigation by presenting key definitions and reviewing the scholarly literature on the relationship between non-rationality, psychiatric neurodiversity, and entrepreneurial action.

2. Entrepreneurial action theory and the assumption of intended rationality

Without action, there is no entrepreneurship. For entrepreneurship to emerge, uncertainty-bearing individuals must transform the unknown into the known (Knight, 1921) through novel actions that engage the broader environment (Kirzner, 1997; McMullen and Shepherd, 2006; Sarasvathy, 2001; Schumpeter, 1934; Shepherd, 2015). Inspired largely by sociological theories of action (e.g. Archer,

² For this reason, we focus on psychiatric neurodiversity rather than on the full scope of neurodiversity, which is sprawling, complex, fast-changing, and a subject of some ongoing disputes regarding definitional boundaries (e.g. Nelson, 2021; Russell, 2020). Conversely, psychiatric neurodiversity has benefited from recent conceptual and empirical work that has highlighted its general relationship to entrepreneurship (e.g. Moore et al., 2021; Tucker et al., 2021), but not an explicit consideration of psychiatric neurodiversity in the context of rationality and entrepreneurial action, which is the focus of our study.

1995; Coleman, 1986, 1990; Giddens, 1979; Parsons, 1980; Parsons et al., 1951; Weber, 1947) – whose roots extend back to Enlightenment philosophers such as Locke, Smith, and Rousseau (Israel, 2006) – entrepreneurship scholars have, over the past two decades, developed various theories of entrepreneurial action to describe the dynamic interplay of actors and environments (Kim et al., 2016). Although there is considerable discussion among the dominant EATs concerning the origin and activation of opportunities (Davidsson, 2015), the role of agency (McMullen and Shepherd, 2006), the impact of macro-environmental structures (Landström and Harirchi, 2018), the role of resources (Baker and Nelson, 2005) and other dimensions associated with entrepreneurial action, extant EATs are unanimous concerning the central importance of one key aspect: the indispensability of rational intentionality. Faithful to their shared philosophical heritage, in what Coleman (1986, 1310) refers to as “reasoned” and “purposive” action, extant EATs – comprised of those based on discovery (e.g. Kirzner, 1997; Shane and Venkataraman, 2000), creation (e.g. Alvarez and Barney, 2007), imagination (Klein, 2008), effectuation (Sarasvathy, 2001), judgement-based belief development (Foss and Klein, 2012), and design (Berglund et al., 2020) – each find themselves anchored upon the assumption that business venturing actions and outcomes arise as the consequence of rational intentionality (Lerner et al., 2018a).

Moreover, recent conceptual work concerning EAT continues to reinforce this premise. Packard and Bylund (2021: 8), for example, situate rationality as a “foundational tenet” of EAT, while tying their conception to assumptions of reasoned intentionality and judgement-based decision-making (Foss and Klein, 2012). Their radically subjectivist view of rationality follows Brown et al. (2018) in continuing to argue that even impulsivity is a form of rationality. Zellweger and Zenger (2021, 40), echo this perspective in developing an entrepreneur-as-scientist model of business venturing “built on the premise that entrepreneurial action is underpinned by reasoned intentionality,” involving the deployment of intendedly rational heuristics by actors.

As appealing and seemingly logical as EAT’s purposeful, judgement-then-action paradigm is for organizational theory and explanatory models of entrepreneurial action, the concern with such assumptions is that the paradigm incompletely circumscribes the empirical diversity of entrepreneurial behavior in the face of an opportunity. Had entrepreneurship scholarship been born in organizational behavior rather than economics, it seems likely that any presumption that rational, reasoned judgement is the governing premise of entrepreneurial decision-making and action would have had a short life. But entrepreneurship’s roots lie deep within Enlightenment philosophy, which means that rather than simply being an important facet of venturing, rationality and boundedly rational decision calculus have had a dominating presence. As a result, entrepreneurship research has closely hewed to the notion that entrepreneurs undertake boundedly rational judgements (subject to bias) based on reasoned intentionality in the pursuit of utility-maximizing aims (Cushman, 2020; McMullen and Shepherd, 2006; Foss and Klein, 2012).³

2.1. Rationality in light of neurodiversity

Rationality has been defined in a multitude of ways, each of which has practical benefits as well as pitfalls. The American Psychological Association (APA, 2021) views rationality as the capacity to exhibit reason and the propensity to be “influenced by reasoning rather than by emotion,” and further defines rationality as “higher thought processes, based on, in accordance with, or justifiable by accepted principles of reasoning or logic.” As such, the APA orientation towards rationality suggests a broad spectrum, across which individuals will display varying capabilities and differing preferences for rational thought and action. Conceptualizing this variance as an inevitable consequence of a neurodiversity spectrum shifts the focus from pathologies and impairments to the natural diversity of preferences, skills, traits and experiences (Armstrong, 2011), and even fostering theorization that neurodiversity may be source of competitive advantage (Austin and Pisano, 2017).

Although rationality is often discussed as though it either exists or does not exist, the presence or absence of rationality is rarely, if ever, dichotomous. We accept that intendedly rational, deliberative, reasoned judgements indisputably constitute an important facet of entrepreneurial decision-making and action. However, logical, probabilistic calculations – those that are brilliantly conceived and those that are fundamentally biased or flawed (Kahneman, 2011) – are only a portion of the entrepreneurial action spectrum (Lerner et al., 2018a). Simon (1972: 161) seemed to apprehend this spectral variety when he wrote, “Rationality denotes a style of behavior that is appropriate to the achievement of given goals, within the limits imposed by given conditions and constraints.” Simon’s famous scissors metaphor of human decision-making – in which the “blades” of human cognition and environmental context both require consideration in describing human behavior – opens the door to consideration of interactions between individuals and environments that inherently foster the manifestation of non-deliberate heuristics and the virtual absence of reasoned forethought, especially in entrepreneurial contexts, which are commonly characterized by scarce resource environments (Mullainathan and Shafir, 2013).⁴

2.2. The materiality of non-rational entrepreneurial pathways

In the context of entrepreneurial action, diverse approaches to uncertain environments have been shown to have biological origins, including the premise that non-humans engage in entrepreneurial behaviors (Hunt et al., 2022). In pursuing this line of inquiry, Hunt

³ For example: market-directed theorists such as Klein (2008: 187) argue the exploitation of opportunities can be best thought of as “the exercise of judgement over the arrangement of heterogeneous capital assets,” and it would thus make sense that “entrepreneurship research should focus on the execution of business plans” (Lerner et al. 2018a: 62).

⁴ Thanks to anonymous reviewers throughout, including here for raising this point and tying in the importance of Simon’s metaphor as a gateway to comprehend and incorporate non-deliberative actions. Although the nature of our data set limited our ability to delve into these facets of the conditions and constraints Simon mentions, this line of inquiry constitutes an important future opportunity worth pursuing.

et al. (2022: 3) consider entrepreneurial behaviors as “*novel action to generate reproducible benefits*,” making room in EAT for alternative venturing pathways. This reorientation towards behavior and action and away from the primacy of intendedly rational decision-making is particularly important in light of research that has demonstrated the importance of genetics and physiology (Nicolaou et al., 2021; Nicolaou and Shane, 2014), affect (Baron, 2008; Baron et al., 2012; Delgado García et al., 2015), emotions (Cardon et al., 2012; Fodor and Pinteá, 2017), passion (Cardon et al., 2009), psychological and psychiatric syndromes (Hatak et al., 2020; Lerner et al., 2019; Wiklund et al., 2016; Wolfe et al., 2020; Yu et al., 2021; Freeman et al., 2019), contagion (Hunt, 2015), and even common parasites (Lerner et al., 2021).

Given the extent to which innovative technologies, organizational forms, and business models emanate from novel, out-of-the-box, breakthrough thinking (Hunt and Ortiz-Hunt, 2017) – the marginalization of less-rational or even irrational approaches is apt to hinder useful cognitive and behavioral diversity (Williams and Taylor, 2006) that can benefit individuals, ventures, sectors, and markets. Early-stage research has advanced the notion that being different can actually be an advantage in entrepreneurship (Wiklund et al., 2018a). Such work suggests that rationality and irrationality are best conceived as a broad continuum (Lerner et al., 2018a), with actual human thought and action lying somewhere in between. In a sign of potential cracks in EAT's wall of rationality, even Zellweger and Zenger (2021) point to Lerner et al. (2018a) in conceding that future studies of “reasoned versus impulse-driven entrepreneurial action” may necessitate a reconceptualization of EAT's rationality assumption.

This brings us to the first framing question of our exploratory investigation and that concerns the materiality of a-rational drivers. While recent research has found a positive connection between neurodiverse conditions and entrepreneurship (e.g. Lerner et al., 2019; Yu et al., 2021), few empirical studies have both employed representative population samples and considered various venturing outcomes, meaning that the relative prevalence of neurodiversity and its impact on entrepreneurship are still unclear. Accordingly, questions remain. Proponents of the reasoned judgement perspective can, for example, suggest that recent studies are not representative or that the studies with representative samples find neurodiverse pathways to venturing are inconsequential (Wood et al., 2020) if not negative (Rietveld and Patel, 2019; Rajah et al., 2021; Greidanus and Liao, 2021). Thus, as a point of departure:

Framing Question 1. : Is there a material presence of neurodiverse behavioral pathways in entrepreneurship? In particular, are individuals with psychiatric neurodiversity materially observable as entrepreneurs?

3. Weighing the merits of entrepreneurship's rationality assumption

In a manner that it highly reminiscent of biodiversity (Ridley, 2015), heterogeneity, not homogeneity, unlocks the potential emergence of novel behaviors and solutions (Hunt et al., 2022). Without variation – a lot of variation – there is an insufficient heterogeneity of behaviors to produce innovation. “If agents are all alike, then there is no room for trade,” asserted Arrow (1990: 28) in presenting his intrinsic dilemma. Arrow then goes on to argue that since agents exhibit heterogeneity in “unspecifiable ways,” the presumption of utility-maximizing rationality in decision-making and action is untenable.” (Arrow, 1990: 28). Keynes (1936) was even more pointed in his sentiments:

“[H]uman decisions affecting the future, whether personal or political or economic, cannot depend on strict mathematical expectation, since the basis for making such calculations does not exist; ... it is our innate urge to activity which makes the wheels go round...choosing between alternatives as best we are able, calculating where we can, but often falling back for our motive on whim or sentiment or chance” (1936: 162–163).

As an apparent antidote to this dilemma, Simon (1997) developed the concept of “bounded rationality,” noting that while humans may strive for the development and application of well-reasoned decisions, their ability to exercise rational, utility-maximizing judgement faces number of inherent limitations. Kahneman and Tversky (2013) demonstrated that humans undertaking decision-making involving uncertain outcomes are subject to a wide array of biases, misconceptions, and outright mistakes that deviate, sometimes quite markedly, from purely rational approaches to utility maximization. Subsequently, Prospect Theory was the subject of hundreds of experimental treatments, most of which have supported the predicted outcomes. Some scholars though, such as Gigerenzer (1996, 2008), argued that the cognitive errors Kahneman and Tversky observed were not mistakes, but rather evidence of sensible, energy-preserving short-cuts and heuristics designed for labor-saving approximations to rational deliberation that met the standards of what Simon (1957) referred to as “satisficing.” Regardless of whether one sides with Kahneman and Tversky or Gigerenzer, the issue for entrepreneurship scholars is largely mooted by the fact that both perspectives provide support for Simon's conception of bounded rationality.

Importantly, however, none of these perspectives has sought to challenge the core assumption of *intendedly* rational decision makers (Lerner et al., 2018a), which partially explains why the assumption has persisted in EAT. While prospect theory (Kahneman and Tversky, 1979) brought to light the existence of “cognitive errors”; while “bounded rationality” (Simon, 1997) demonstrated cognitive limits of actor agents; and, while “behavioral theories of organizations” (March and Simon, 1958) rejected the notion that humanness can be excluded from considering the structure and purpose of firms, none of these influential perspectives challenged the assertion that actions are at least *intendedly* rational. As a result, the role of disinhibition, impulsivity, and other less-deliberative, a-rational drivers of entrepreneurial action continue to be marginalized (Zellweger and Zenger, 2021) or flatly rejected (Brown et al., 2018). There are two principal reasons for this. First, unreasoned drivers of entrepreneurial action are observationally elusive, making

them notoriously difficult to study (van Lent et al., 2020). Second, the rational intentionality in EAT exerts tremendous influence; so much so, in fact, that even recent empirical studies seeking to illuminate the impact of unreasoned drivers find it difficult to escape resorting to a judgement-based view (e.g. Pietersen and Botha, 2021; Wiklund et al., 2017, 2018b).⁵ As a consequence, the impact of unreasoned drivers, such as impulsivity and disinhibition, remain on the outside of EAT, even as the exclusion grows more conspicuous. Wood et al. (2020), for example, acknowledge the probable role of impulsivity, but ultimately capitulate to EAT logics by leaving less-reasoned drivers outside their explanatory model, even while noting the need for future study. The implication of this is that even if non-rational drivers exist, they are simply too difficult to incorporate into EAT.

3.1. Are non-rational drivers an entrepreneurial death sentence?

Such an exclusion is consequential to the future study of entrepreneurship, particularly given the role novelty in generating reproducible benefits (Hunt et al., 2022), stemming from different ways of considering and implementing innovations of technologies, organizational forms, and business models. As Felin et al. (2014) argued, “entrepreneurial and economic activity is not computation, calculation or boundedly rational search.” Instead, they assert, entrepreneurship is best conceptualized as a “constant flow of emergent possibilities that cannot be meaningfully listed, let alone ‘rationally’ considered, searched, or compared.” The cause of this is figuratively and literally grounded in evolutionary forces. Only through the emergence of modifications can there be variation, from which some subset will be selected for survival and promulgation. “Radical and emergent heterogeneity” (Felin et al., 2014: 274; Fontana and Buss, 1994) is inexplicable in a completely rational context, even one posited to be only boundedly so. Arrow (1990: 25) similarly noted the “conceptual difficulties of rationality in a multi-person world,” given the clear tendency towards “dispersion” except under idealized conditions. Keynes (1936) underscored the essentiality of this through what he famously referred to as “animal spirits.”

“A large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive...can only be taken as a result of animal spirits — of a *spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities*. Enterprise only pretends to itself to be mainly actuated by the statements in its own prospectus ... If the animal spirits are dimmed and the spontaneous optimism falters, leaving us to depend on nothing but a mathematical expectation, enterprise will fade and die” (Keynes, 1936: 161–162, *emphasis added*).

As Felin et al. (2014) elaborated:

“Both in economics, particularly in entrepreneurial settings, as in nature, there is no effective procedure or algorithm that can list the opportunities available for organisms, and this non-algorithmicity means that the emergent possibilities cannot be pre-stated” (Felin et al., 2014: 270).

If emergent possibilities are best served by environs and processes exhibiting “non-algorithmicity,” then the extent to which rationality and non-rationality are advantageous or disadvantageous requires a meaningful comparison across those propensities. Since rationality is judged through an evaluation of actions taken in pursuit of an intended goal, the extent to which such actions are rational or not can only be determined in light of the action and the goal. Thus, any attempt to observe the absence of rationality is compromised by judging intentions and actions post hoc. Actions that turn out to serve an end-goal or an ultimately favorable outcome are likely to be considered as rational and endowed through narrativity with intentionality, even if the pursuit at the time of taking action was circuitous, clueless, unreasoned, or serendipitous (Lerner et al., 2018a; van Lent et al., 2020). Thus, our second and third framing questions concern the comparative nature of non-rational approaches to entrepreneurial action. In doing so, we aim to respond to the question of whether “decisions [and action] based on ‘impulse-driven, non-deliberative logics’ [are] less optimal (Lerner et al., 2018a)?” (JBV SI Call, 2020). First, in exploring the EAT assumption of rational intentionality, we ask whether a greater tendency towards less-reasoned decision-making and action are an impediment to entrepreneurial outcomes.

Framing Question 2. : Are non-rational proclivities antithetical to successful venturing outcomes?

3.2. Non-rational proclivities among “super-entrepreneurs”

Our third framing question takes a step further by proposing an exploration of the possibility that non-rational proclivities might restrict, or be advantageous in, reaching superlative entrepreneurial achievement. Even if non-rational proclivities are tolerated or positively associated with venturing outcomes in relatively “ordinary” and “mundane” entrepreneurship, what of high-growth/unicorn oriented venturing (cf. Aldrich and Ruef, 2018: 458)? Are non-rational proclivities generally disqualifying, observed in, or positively linked to the elite ranks of successful entrepreneurs? Insofar as entrepreneurial outcomes are best described as a power-law distribution (Crawford et al., 2015), in which a small number of extraordinarily successful firms create tremendous value, there is value in investigating the extent to which non-rational proclivities are evidenced among high-growth, unicorn-oriented business venturing.

Framing Question 3. : Are individuals higher in non-rational proclivities less, more, or equally apt to achieve exceptional entrepreneurial performance?

⁵ While such works clearly recognize and contribute to recent literature suggesting more impulsive bases for entrepreneurial action, they still for example see action being predicated on assessments and weightings of desirability versus feasibility.

4. What couldn't be considered intendedly rational? The portal of psychiatric neurodiversity and entrepreneurship

4.1. Proclivities towards unreasoned drivers of entrepreneurial action

As the foregoing discussion suggests, unreasoned drivers are difficult to observe and even more difficult to incorporate into existing theories of entrepreneurial action. However, this does not negate the importance of doing both. In this section, we delve into the context of clinical psychological symptoms and conditions to see ways in which it may serve as a useful, well-validated lens to capture unreasoned drivers of entrepreneurship by providing reliable instances of greater proclivity towards non-rational decision-making and action. Recent work suggests that certain correlates of psychiatric syndromes, such as creativity, innovativeness, energy, sociability and particular motivation, may be tied to propensities that are useful for entrepreneurs, thereby potentially fostering entrepreneurial success (e.g. Wiklund et al., 2018a). This approach is most commonly taken in considering hypomanic tendencies (Johnson et al., 2018) and ADHD (Yu et al., 2021), both of which are characterized by reward-seeking, high levels of energy, tendencies towards the pursuit of novelty and action, elevated creativity, and low inhibition. The following personal reflection, drawn from the clinical work of a co-author of this study offers poignant perspective on this:

"I am really an artist who paints with code," reports Shanita, a brilliant tech entrepreneur and software engineer who was expelled from high school and college. She was a misfit who couldn't graduate due to her ADHD-driven disruptive behavior, problems with time management, her aversion to task completion, and her defiant, oppositional attitude. "I innovate new products and features by walking in nature, daydreaming, taking a shower to let my mind wander, by getting lost and by using a whiteboard to brainstorm and free associate. I can't use a structured product development process guided by software and constrained by screens."

Scholars have also begun to lay out the case for a more integrative approach to the relationship with entrepreneurship, suggesting that rather than adopting a binary focus on the good or bad facets of psychiatric syndromes, it is more productive to consider specific phases and tasks of entrepreneurship that may be benefited or disadvantaged by specific psychiatric tendencies (e.g. Hatak et al., 2020; Lerner et al., 2018b). The seven-phase lifecycle approach to business venturing of Lerner et al. (2018b) suggests that the same high-energy, impulse-driven, zeal for novelty that can be an asset at the ideation and venture launch phases, can become a liability when a venture moves to a phase that requires attentiveness to details, replication, and diligent execution. Again, a real-life case illustrates this phenomenon:

Shanita refused to hire an operations manager when her team grew to 30 members and revenue surpassed \$1 million per month. "Operations people are just control freaks who get between the engineers and the users," she complained. However, she also complained about not having time to lead product development because she was overwhelmed by dealing with rapidly-mounting operations issues.

4.2. Insights from ADHD and hypomania

As a socially embedded concept (March and Simon, 1958), rationality is ultimately a determination of fit between individuals and various aspects of their work environment, including their fit with the job, workgroup, organization, and has been applied to considering the match between psychiatric syndromes – such as ADHD (Antshel, 2018; Lerner et al., 2018b) hypomanic tendencies (Akiskal et al., 2005; Freeman et al., 2019; Wolfe et al., 2020) – and the multifaceted demands of entrepreneurship. Although a myriad of other clinical conditions is manifested across material portions of human populations, these two provide particularly useful insights concerning rationality, neurodiversity and entrepreneurial outcomes.

ADHD is a common syndrome defined by problems with inattention, hyperactivity and impulsivity that are developmentally atypical and lead to difficulties with everyday tasks, such as school, work and household responsibilities (American Psychiatric Association, 2013; Visser et al., 2014); it may be counterbalanced by an ability to focus intently and thereby enter the "flow states" that facilitate engagement in chaotic and turbulent contexts that may overwhelm those who are neurotypical (Ozel-Kizil et al., 2016; Hupfeld et al., 2019).

Mania, the defining characteristic of bipolar disorder, is defined by periods of unusually positive mood or irritability accompanied by excessive levels of activity and goal-focused behavior, along with other symptoms such as decreased need for sleep, engagement in hedonic activities without attention to potential risks, increased talkativeness, unusually high confidence, racing thoughts, and distractibility (American Psychiatric Association, 2013). Hypomania refers to mild manic symptoms that do not produce major functional impairment. Various forms of bipolar disorder have been defined to reflect varying duration and intensity of manic symptoms and the intensity of mood fluctuations. Across forms of bipolar disorder, prevalence is estimated to be as high as 5–6% of the population (Merikangas et al., 2011).

4.3. Material divergences from reasoned intentionality

Such disorders, particularly during acute symptom periods, can cause material divergences from both rationality and reasoned

intentionality.⁶ During manic episodes, people can be unaware of the potentially disastrous consequences of their symptoms, which can include reckless spending, driving, and sexual activities. This experience has been described well by Kay Redfield Jamison:

"When I am high [manic] I couldn't worry about money if I tried. So I don't. The money will come from somewhere; I am entitled; God will provide. ... So I bought twelve snakebite kits, with a sense of urgency and importance. I bought precious stones, elegant and unnecessary furniture, three watches within an hour of one another (in the Rolex rather than Timex class: champagne tastes bubble to the surface, are the surface, in mania), and totally inappropriate siren-like clothes ... I imagine I must have spent far more than thirty thousand dollars during my two major manic episodes, and God only knows how much more during my frequent milder manias. But then back on lithium and rotating on the planet at the same pace as everyone else, you find your credit is decimated, your mortification complete." (Jamison, 1995, p. 75).

Psychiatric syndromes are consistently related to problems with cognitive control (cf. Lipszyc and Schachar, 2010; Wright et al., 2014), and diminished gray matter volume for the neural circuits engaged by cognitive control (McTeague et al., 2016). Deficits in cognitive control have been well documented in adult ADHD (Boonstra et al., 2005) and bipolar disorder (Bourne et al., 2013), and even among non-symptomatic relatives of those with bipolar disorder (Bora et al., 2009). Lower cognitive control is related to poorer social and occupational function in both bipolar disorder and ADHD (Barkley and Murphy, 2010; Depp et al., 2012). It is also tied to higher levels of disinhibition or impulsivity (Johnson et al., 2016b; Sharma et al., 2014). This is *not* to say that all individuals with bipolar disorder or ADHD lack control; rather, cognitive impairments appear tethered to the severity of syndromes. However, generally speaking, the greater the symptoms that are experienced, the more severe the effect on individual decision-making and behavior.

4.4. Potential benefits for psychiatric neurodiverse entrepreneurs

Despite the difficulties with cognitive and social outcomes with severe symptoms, scholars have also noted the neurodiversity benefits of these clinical conditions in case studies describing highly successful entrepreneurs with ADHD or mania (cf. Gartner, 2005; Orfalea and Marsh, 2007). Further, hypomanic tendencies, like ADHD symptoms, are tied to high energy, sensitivity to reward over risk, and creativity (Johnson et al., 2012a; Johnson et al., 2012b; Kyaga et al., 2013). Indeed, in one study, hypomanic tendencies were elevated among entrepreneurs (Akiskal et al., 2005). In a community-representative sample, persons who were taking lithium, the major treatment approach to bipolar disorder, were more likely to be entrepreneurs (Biasi et al., 2019). Nonetheless, another study found no significant link between interest in entrepreneurship and hypomanic tendencies (Johnson et al., 2015). In another recent study, Wolfe et al. (2020) did not find a significant relationship for hypomania in differentiating self-employed individuals from employees. However, among the self-employed individuals, Wolfe et al. (2020) found a positive association between hypomania and income. Furthermore, income was found to increase in proportion — such that the most hypomanic entrepreneurs were found to realize the highest incomes (Wolfe et al., 2020). This, in connection with other recent studies finding negative connections between ADHD symptoms or predictors and income (Rietveld and Patel, 2019; Rajah et al., 2021; Greidanus and Liao, 2021) indicate the open question about psychiatric neurodiversity's connection to entrepreneurial outcomes.

5. Exploratory design and methods

As an exploratory and illustrative investigation, guided by the three framing questions presented above, it is not our central aim to demonstrate causality through clinical experimentation. Instead, our design employs both quantitative and qualitative data drawn from three sources: a large-scale, general population survey of managers and entrepreneurs; a focused sample of highly successful entrepreneurs; and, an extract of clinical observations, drawn from hundreds of patient-hours compiled by a psychiatric therapist co-author. Our aim was to extract key findings from each that addresses our framing questions.

5.1. Study 1: primary, representative sample

In Study 1, participants were randomly selected from a probability-based, longitudinal Gallup panel of 60,000 U.S. adults, using random-digit-dial (RDD) and address-based sampling methods. To gather the Gallup sample, a dual frame approach was taken in which independent probability samples were taken from two overlapping frames, after which information from the two samples was combined to estimate items of interest. RDD sampling included conventional landline and cellphone numbers to maximize representativeness. For this study, 7732 invitations to participate in an online survey were sent to randomly selected panel members. An initial prompt was used to identify entrepreneurs, defined by self-endorsement of currently owning a business. This prompt was endorsed positively by 1475 persons; of these, 1049 completed the survey. A further 5447 individuals who had described themselves as employed by others were sent an invitation to take part in an online survey. Managers were identified based on positive responses to two self-report items: "are you currently employed by an employer?" (Yes/No), followed by "Are you a manager? A manager is someone whose primary role is to manage or supervise others" (Yes/No). 1578 of the 5447 endorsed currently being managers, and of these, 1060 completed the survey. Managers were chosen as the group of comparison to business owners, as they represent a working population

⁶ It is important to emphasize that the effects psychiatric symptoms can have on an individual's behavior must not be conflated with the individuals themselves. Furthermore, to stigmatize a person or group as being patently irrational, would be both immoral and unscientific. Relatedly, the conditions represent a cluster of symptoms and are not the same as being irrational.

with managerial decision-making discretion. Given the sufficiently large, randomly selected samples, we developed a matched-set design. This is methodologically preferable to statistically adjusting *ex post* for the matched variables, such as gender and education, which were employed in this study, per prior research (Miller and Chapman, 2001).

5.2. Study 2: Inc. 500 sample

Even if it can be determined from the representative sample that entrepreneurs are significantly higher in psychiatric symptoms and tendencies than the general population, it is important to consider whether such functionally obstructs individuals from high-levels of entrepreneurial achievement. As Crawford et al. (2015) demonstrated, entrepreneurial outcomes are best described as a power law distribution, wherein a relatively small number of extraordinarily successful firms account for the overwhelming preponderance of innovation, employment growth, and wealth generation. In order to investigate framing question three – regarding the extent to which individuals with psychiatric conditions are, or are not, found among highly successful entrepreneurs – an additional group of high-growth entrepreneurs were recruited through the Inc. 500 list of fastest growing private companies in America. To obtain this data, the publishers sent an email to firm founders, based on the 2017 rankings, requesting their participation. Thirty-eight utilizable surveys were completed, in-line with return rates for comparable survey protocols.

5.3. Qualitative, observational perspectives

The study team included two clinicians with decades of combined expertise in diagnosing and treating psychiatric conditions, including ADHD, (hypo)mania, bipolar disorder, and depression. One member's clinical practice specifically included a sizable number of entrepreneurs with one or more of the focal conditions. The longitudinal nature of these clinical relationships provided a valuable platform from which to supplement the quantitative panel data discussed above. Representative selections drawn from the multitude of case histories were anonymized and included in the study to provide vivid, representative lived-experiences of such entrepreneurs.

5.4. Measures

For our panel studies, participants completed online surveys (prior to COVID-19), including questionnaires, measures of entrepreneurial outcomes, and demographic items.

5.4.1. Psychiatric variables

We used the following well-validated instruments as symptom screeners for the correlates of clinical diagnosis and for traits related to those diagnoses. In addition to measures for ADHD and hypomania, others were also collected, allowing consideration of potential effects related to ADHD and hypomania over-and-above other psychiatric symptoms and recent mood-states.

5.4.1.1. Adult ADHD self-report scale (ASRS). The ASRS is a well-validated, 18-item scale developed in collaboration with the World Health Organization (Kessler et al., 2005, 2007). Items cover the frequency of symptoms of adult ADHD on a five-point scale, ranging from *never* to *very often*. ASRS scores predict diagnosis of ADHD and genetic polymorphisms related to ADHD, which have been validated through in-person, independent evaluations by licensed clinicians (Kessler et al., 2005, 2007; Reuter et al., 2006). The full 18-item ASRS measure is composed of two theoretical and factor-analytically derived subscales, relating to *Inattention* (9 items) and *Hyperactivity-Impulsivity* (5 items on restlessness, 4 items on poor constraint). In essence, the higher the score, the greater the ADHD symptoms. As such, we follow recent studies of ADHD in entrepreneurship suggesting the importance of delineating between *ADHD inattention* and *ADHD hyperactivity/impulsivity*. Consistent with its established use for assessing clinical symptoms, scoring at the item-level was dichotomized.⁷ Many entrepreneurship studies have *not* used the full 18-item ASRS but rather the abbreviated 6-item screener (providing a thinner measure).

5.4.1.2. Hypomanic Personality Scale (HPS). The HPS is a 48-item scale, covering lifetime experiences of hypomanic symptoms and related traits. Manic symptoms are the defining criteria for bipolar disorders and the scale has been validated as predictive of bipolar disorder through longitudinal studies (Kwapil et al., 2000). HPS scores have been shown to be strong correlates of genetic polymorphisms related to bipolar disorder (Johnson et al., 2016) and of fMRI profiles (Damme et al., 2017). Items range from 1 “Extremely untrue” to 4 “Extremely true.”

5.4.1.3. Psychiatric Diagnostic Screening Questionnaire (PDSQ). The PDSQ been shown to be highly sensitive to diagnoses based on structured clinical diagnostic interviews in large-scale studies (Zimmerman and Chelminski, 2006). Participants complete the depression subscale covering presence of 21 symptoms over the preceding 2 weeks. Although we gathered PDSQ alcohol and substance use items, rates were extremely low and were, therefore, not included in this study.

⁷ Following Kessler et al. (2005, 2007), each individual item's 5-point response is converted to a dichotomous score, indicating whether the frequency of each item/symptom is at a concerning level. The scores on each of the 18 items are subsequently summed, generating a possible range of total scores from 0 to 18 (0–9 on *Inattention*, and 0–9 on *Hyperactivity-Impulsivity*).

5.4.1.4. Mood and Anxiety Symptom Questionnaire (MASQ; Watson et al., 1995). General Distress Anxious Symptoms and Anxious Arousal subscales. The MASQ is a well-validated measure we used to assess anxiety. Items cover Anxious mood (11 items) and Arousal (17 items) in the past seven days. Items were rated on a scale of 1 “not at all” to 5 “extremely.” Scores were z-transformed⁸ and then averaged. To reduce the effects of extreme outliers on leptokurtosis, we recoded the 1.3% of outliers with z-scores >3 to a value of 3.

5.4.2. Entrepreneurial outcomes

By design, our study employed a wide range of financial and objective non-financial outcomes in order to assess the extent to which ADHD and HPS are or are not drivers of business venturing outcomes. Existing studies of have assessed the impact of either ADHD or hypomania on entry and income, but not together and not on this many entrepreneurial outcomes. This constitutes an important gap since the presence of ADHD and HPS are, for entrepreneurship scholars, important to the extent that either or both influence entrepreneurial outcomes. Consistent with the work on power law distributions (Crawford et al., 2015), our data similarly evinced outcome variables that were not normally distributed. To address the presence of extreme outliers, variables were winsorized (capped). In instances that distributions remained highly skewed, log transformations were performed (details below).

1. Intellectual Property: receipt of a copyright, trademark, or patent, coded as 1 (yes), 0 (no).
2. Lifetime number of businesses founded or acquired; log transformed.
3. Annual revenue, on an 8-point scale, scored as: 1 (<\$300k), 2 (\$300k–\$499k), 3 (\$500k–\$999k), 4 (\$1 million–\$1.9M), 5 (\$2M–\$4.9M), 6 (\$5M–\$9.9M), 7 (\$10M–\$49M), and 8 (\$50M or more).
4. Revenue change in the past 3 years, on a 7-point scale: 1 (dropped by 40% or more), 2 (decreased 20–40%), 3 (decreased 0–20%), 4 (no change), 5 (increased 0–20%), 6 (increased 20–40%), and 7 (increased 40% or more).
5. Jobs created in current venture, winsorized and then log transformed.
6. Lifetime number of their businesses failed, winsorized and then log transformed.

Exhibit A details the variable means and standard deviations, including before log transformation (Table E-1).^{9,10} Pairwise correlations are provided in Table E-2.

6. Findings

6.1. Materiality across a representative population

In addressing the first of our framing question, we assessed the differences in the random representative sample of entrepreneurs and managers, in terms of ADHD and HPS, using age as a covariate. Recall, given the adequately large samples, the two groups were already matched on education and gender. Age was included as a covariate as the two groups differed slightly but significantly (Mean = 56 versus 52). As shown in Table 1, the entrepreneurs were significantly higher in hypomanic tendencies (HPS) than the managers. The entrepreneurs and managers did not differ significantly in either ADHD symptom-scores or other psychiatric variables.

These findings suggest that psychiatric neurodiversity is observable among entrepreneurs and managers, and with the exception of HPS, to a statistically indistinguishable degree. Put differently, neurodiversity – operationalized through individuals with psychiatric conditions or symptoms involving a relative absence of planning, judgement, and reasoned decision-making – is present among managers and entrepreneurs. Despite the significant financial, logistical and inter-organizational complexities and stressors of business venturing, individuals with psychiatric symptoms are similarly represented among managers and entrepreneurs. As for (hypo)mania – which may involve the most challenging symptoms and substantive divergence from rational decision-making pathways – occurrence was significantly greater among entrepreneurs, indicating a measurable over-representation among those active in business venturing.

6.2. Entrepreneurial outcomes: assessing the necessity of reasoned judgement

Framing Question 2 sought to assess the extent to which a predilection towards rational intentionality and reasoned judgement is prescriptive; that is, the extent to which it is necessary to achieve favorable business venturing outcomes. First, we consider bivariate correlations as well as hierarchical multiple linear regression analyses for each of the six entrepreneurial outcomes captured in the data

⁸ MASQ subscales are based on overall scores formed by summing rather than averaging item scores. Accordingly, to provide an index that effectively balances the contributions of these two indices, it is important to z-transform the first.

⁹ The issue of outliers and non-normal distributions is endemic in psychiatric and psychopathology research. Accordingly, we have chosen the approach to non-normality carefully. Data from a given individual should be removed only if one has reason to believe that it is invalid. Data for each outlier was reviewed for inconsistencies across responses, speed in answering questions, or any other signals of invalid data, as has been recommended for cleaning questionnaire data (Meade and Craig, 2012). After having established a dataset that appeared to contain valid responses, the subsequent goal was to ensure that single cases do not distort the statistical parameters or lead to violations of statistical assumptions. To achieve this, we examined multiple approaches to normalizing the data (e.g., log vs. square root transformations), and chose one that best approximated normality. This was done since ineffective transformations (or dropping apparently valid data) would yield more biased estimates (e.g. Cain et al., 2017).

¹⁰ As elaborated later, we also used SPSS routines and bootstrapping, and examine robustness with different winsorization.

Table 1Comparison of randomly drawn entrepreneurs and managers, gender and education matched, with age as a covariate.^a

Psychiatric variable	Managers (n = 1060)		Entrepreneurs (n = 1049)		Group (df = 1)			Age (df = 1)	
	Mean	SE	Mean	SE	F	p	eta ²	F	p
HPS	17.203	0.159	18.518	0.161	33.256	0.000	0.016	64.241	0.000
ADHD hyp./impulsive	1.395	0.048	1.362	0.048	0.243	0.622	0.000	75.126	0.000
ADHD inattention	1.788	0.062	1.914	0.062	2.034	0.154	0.001	79.210	0.000
PDSQ depression	3.013	0.109	2.939	0.108	0.085	0.771	0.000	69.949	0.000
MASQ anxiety	0.003	0.026	−0.030	0.026	0.384	0.536	0.000	71.052	0.000

Notes: means are adjusted for age as a covariate; Bonferroni corrected alpha = 0.05/5 = 0.01. All ANCOVAs completed with 1000 bootstrap samples. Missing data varied per measure: Ns = 2081 for HPS; 2040 for ADHD Hyperactive-impulsive; 2056 for ADHD Inattention; 2037 for PDSQ Depression; 2087 for MASQ Anxiety.

^a Note: ANCOVA results were equivalent when depression and anxiety were also included as covariates.

collection. Reviewed in turn, these were: *intellectual property, number of businesses founded, annual revenue, revenue change in the past 3 years, job creation, and number of businesses failed*. In all regression models, gender, education, and age were controlled in block 1, and the psychiatric variables were entered in block 2. Considering the testing for six entrepreneurial outcomes, Bonferroni adjusted alpha equates to 0.008 (=0.05/6).

As backdrop, Exhibit A (Table E-3) shows zero-order correlations (reflecting the bivariate effect of given psychiatric symptoms on each of the six various entrepreneurial outcome variables), as well as the specific parameter estimates and *p*-values of the focal psychiatric variables (ADHD-Hyperactive/impulsive, ADHD-Inattention, HPS) in multivariate regressions which control for demographic and the other psychiatric variables.¹¹

In relation to the outcome of intellectual property, hypomanic tendencies, ADHD Hyperactive/impulsive, and ADHD Inattention were all tied to greater likelihood of generating intellectual property, in the bivariate correlations (zero-order *r*). This relationship between value-generation and clinically diagnosable conditions found support through qualitative observations, as well. Representative examples by entrepreneurs receiving treatment for one or more focal conditions include those of Jonathan and Ed:

After filing several medical device patent applications and landing his first big contract, Jonathan, an extraverted, energetic surgeon, had his first manic episode. Upon recovering in outpatient intensive care, he shared that “the body is intelligent but today’s prosthetics are dumb, which is why I want to bring artificial intelligence into inert post-operative medical devices.” His innovations improved post-operative outcomes so much that large customers initiated contracts and pilot programs.

Ed was a poor student and a moody young man; he became a quasi-successful rock star who liked to stay up all night and sleep all day. Hitting a ceiling, he grew despondent until he and his team invented and marketed a new type of karaoke machine that became a success. They sold the business, and Ed used his proceeds to start his next firm – marketing and promoting other rock bands. He disliked details and accounting so he grew the business while others managed the books. When there was no money in the bank despite strong sales, auditors discovered that staffers had embezzled from the business for several years, with little difficulty since Ed was entranced by the excitement of producing intellectual property and the show business swirl and didn’t pay attention to financials.

In the multivariate regression, controlling for the demographic variables and the concurrent psychiatric variables, the findings were somewhat more equivocal. In particular, HPS remained significantly predicative of intellectual property, while ADHD symptoms were not significant.

6.3. Impact on business starts, revenue growth and firm survival

Number of businesses started was tied to higher hypomanic tendencies in bivariate correlations, but not to other psychiatric variables. In multivariate regression controlling for demographic variables and the other psychiatric variables, the positive effect of hypomanic tendencies was confirmed. With respect to revenue, among the bivariate correlations, higher annual revenue was related to higher hypomanic tendencies and ADHD Hyperactive/impulsivity. In the multivariable model, only ADHD Hyperactive/impulsivity symptoms remained unequivocally significant (*p* = 0.002); with Bonferroni adjustment for the testing of six entrepreneurial outcomes, the otherwise significant effect of HPS did not meet the threshold (*p* = 0.037 > 0.008).¹²

¹¹ Note: to further assess the stability of the findings, and address any question of whether the other psychiatric variables as controls might bias results by only capturing the functional aspects of ADHD and Hypomania, all regressions were re-run without the inclusion of anxiety and depression. The effects of ADHD and HPS were equivalent. In terms of the significance of the overall variance explained by all the included psychiatric variables in the model – the results were also equivalent except in DV4 and DV6 as would be expected (i.e. where the overall deltaR² when including the additional psychiatric variables was driven, respectively, by Depression and Anxiety) (Table E-3).

¹² Note: for this outcome variable (*n* = 557) there was a fair amount of missing data. We thus looked for potential (non)response bias. Three *t*-tests tested whether non-respondents differed from the respondents. We found no evidence of potential (non)response bias, in ADHD Hyperactive/Impulsive, ADHD Inattention, or HPS (all *p*'s > 0.21). As such, there was no evidence of bias underlying the observed effects or otherwise threatening representativeness of the significant finding. In relation to the effect of HPS in the regression model, the reduced *N* reduced statistical power, such that detecting a positive effect of HPS (*p* ≤ 0.008) was less likely.

Regarding three-year revenue change, in the bivariate correlations, this outcome was positively linked to higher HPS, higher Hyperactive/impulsive symptoms, and lower PDSQ depression symptoms. These findings suggest that even when drawing from a large-scale, randomized population, a predilection towards reasoned judgement is not a requirement for successful business venturing outcomes. Building upon the prevalence issue raised in FQ1 above, our investigation of FQ2 suggests that the tendency for rational deliberation is not strictly prescriptive. In fact, a significant number of neurodiverse individuals perform at least as well as those without a clinical condition or symptoms. The experience of Pablo provides one vivid depiction of these neurodiverse alternatives:

Pablo was almost sent to trade school because his ADHD symptoms were mistaken for learning disabilities when he was young. He failed college once but his injured pride drove him to succeed the second time by working on just one task at a time. "I went into crisis mode to prove I could do it. After college, a big tech app I used drove me crazy because it was slow and clunky so I started a company to fix the problem and then I was totally in the flow zone for the next three years." He accepted the nine-figure acquisition offer from the major tech firm with the "clunky app." Bored and quickly frustrated at the large acquiring firm, he soon quit.

When considering multivariate effects of demographics and psychiatric variables together, and Bonferroni adjustment, once again there is some equivocality in the findings. With Bonferroni adjustment, change in revenue was significantly tied to lower depression (PDSQ) scores; despite their positive (and significant at $p < 0.05$) links to revenue change, the effects of HPS ($p = 0.035$) and ADHD-Hyperactivity/impulsivity ($p = 0.045$) were no longer considered significant ($p > 0.008$). As for job creation, the bivariate correlations were positively tied to both HPS and ADHD-Hyperactive/impulsivity symptoms. In the multivariate regression model controlling for demographics and psychiatric variables, with Bonferroni adjustment, only ADHD-Hyperactive/impulsivity symptoms remained significant ($p = 0.003$; HPS $p = 0.047 > 0.008$).

In terms of the number of business failures, bivariate correlations indicated an association with HPS, hyperactivity-impulsivity symptoms, and anxiety. Yet, in the multivariate model, controlling for demographic and psychiatric variables and the number of businesses started, indicated that neither HPS nor ADHD were related to the number of business failures. This suggests that number of ventures started is key in understanding the relationship with failures. As with all entrepreneurs, neurodiverse individuals fail more frequently than they succeed, but no more frequently than those without a clinical condition. Ryan's lived-experience illustrates:

Ryan started launching firms when he was in high school and never stopped. A top student and a top athlete, he still had time to build a small vending machine empire while in high school and to open a few pizza restaurants with his buddies in college. After the pizza business crashed due to co-founder conflicts he became deeply depressed but pulled himself out by getting into extreme sports.

Later he and two friends co-founded a unique sales and marketing company that took advantage of new internet and data analytic technologies. A warm and affable natural salesman, he survived alcohol-tinged crises and he blew up a promising love relationship during his tenure as Chief Growth Officer. "I was on a tear, man, but while I was in it I didn't realize how much I was tearing myself up at the same time" he proclaimed.

An examination of the quantitative results (Tables 2 and 3 below and Exhibit) reveals that being higher in psychiatric symptoms and tendencies does not appear to undermine various positive entrepreneurial outcomes. At the same time, psychiatric symptoms were

Table 2
Comparison of Super versus Typical Entrepreneurs, with education as a covariate.

Psychiatric variable	Super Entrepreneurs			Typical Entrepreneurs			Group (df = 1)			Education (df = 1)	
	Mean	N	SD	Mean	N	SD	F	p	eta ²	F	p
Hypomanic tendencies	22.98	38	6.406	18.33	1029	5.370	26.936	0.000	0.025	0.010	0.918
ADHD hyperactive-impulsive	2.76	38	2.519	1.30	1022	1.507	30.919	0.000	0.028	4.718	0.030
ADHD inattention	3.29	38	2.412	1.84	1022	1.992	18.514	0.000	0.017	1.085	0.298
MASQ anxiety	-0.102	38	0.798	-0.012	1036	0.859	0.383	0.536	0.000	0.064	0.800
PDSQ depression	2.84	38	2.973	2.83	1016	3.516	0.006	0.939	0.000	0.704	0.402

Table 3
Summary of key findings.

	HPS	ADHD-hyp./impulsivity	ADHD-inattention
<i>Psychiatric scores</i>			
Entrepreneurs > Managers	+	n.s.	n.s.
Super Entrep. > Typical Entrep.	+	+	+
Super Entrep. > Managers	+	+	+
<i>Entrepreneurial outcomes</i>			
Intellectual property	+	Bivariate r	Bivariate r
# of business	+	n.s.	n.s.
Revenue	Bivariate r	+	n.s.
3-year revenue change	Bivariate r	Bivariate r	n.s.
Job creation	Bivariate r	+	n.s.
Failed businesses	Bivariate r. n.s. adjusting for # of businesses started (i.e. proportion of failures)		n.s.

Notes: "+", positive statistically significant relationship in multivariate regression model. "bivariate r", significant correlation between two variables (but not in multivariate modeling with Bonferroni adjusted alpha of 0.008). "n.s.", not statistically significant.

not ubiquitously linked to outcomes. Looking for undermining or adverse effects, bivariate correlations can be found related to business failures. However, this effect did not hold when we controlled for the number of businesses started; thus, neither hypomanic tendencies nor hyperactivity-impulsivity symptoms predicted a higher proportion of business failures out of those started.¹³

Overall, this mixture of results under conditions of greater statistical control reveals that neither rational nor a-rational approaches and proclivities are strictly prescriptive. Rather, psychiatric neurodiversity produces a rich array of outcomes in response to a rich array of neural frames. As the foregoing findings reveal, HPS and ADHD are sometimes associated with better entrepreneurial outcomes, which suggests that entrepreneurs with proclivities towards alternative business venturing pathways often survive and prosper in respectable numbers.

6.4. Assessing the impact of unreasoned predilections among highly successful entrepreneurs

Still unanswered, however, is whether the linkages to venturing and venturing outcomes are largely relegated to relatively small and inconsequential firms (typical businesses) – or if hypomania and ADHD are evident among individuals leading the most influential and impactful entrepreneurial ventures.

Mental health symptoms have been recognized among several 20th and 21st Century tycoons. In 2021 Elon Musk made fun of his Autism Spectrum Disorder as a host on the comedy show Saturday Night Live, and in 2017 he acknowledged his bipolar tendencies on Twitter, stating “the reality is great highs, terrible lows and unrelenting stress. Don't think people want to hear about the last two.” “Are you bipolar?” asked a follower. “Yeah, maybe not medically tho. Dunno.” Howard Hughes spent much of his later life in a psychotic state. The great Swedish entrepreneur Alfred Nobel fluctuated in and out of deep depressive episodes followed by periods of energetic business development.

To address Framing Question 3, concerning the extent to which individuals who are higher in non-rational proclivities are able to become exceptional entrepreneurs, we employed the *Inc. 500* criteria, stipulating that top-tier firms needed to generate annual revenues of at least \$2,000,000. Using this cut point, we conducted a comparison between these as “Super” entrepreneurs versus the other (“Typical”) entrepreneurs.

In general, demographics and experience between the two groups is largely the same. As there was a slight, but statistically significant difference in education between the two groups, we included education as a covariate. The two groups did not differ significantly in other variables such as age. Analyses were conducted considering all of the psychiatric variables previously noted. As shown in Table 2, the super entrepreneurs were significantly higher in hypomanic tendencies, ADHD Hyperactivity/Impulsivity, and ADHD Inattention.

Investigating further with respect to the Framing Questions, examining the significant mean differences yields further insights. In particular, it provides evidence that compared to the randomly drawn sample managers, the super entrepreneurs exhibit much higher hypomanic tendencies as well as significantly higher ADHD Hyperactivity/Impulsivity and ADHD Inattention. These findings suggest that extant EAT's emphasis upon reasoned intentionality is not a precondition for superlative outcomes. Moreover, psychiatric symptoms and tendencies suggestive of alternate proclivities for processing and acting entrepreneurially are not disqualifying conditions. Indeed, they often are associated with superior results, as is apparent from the summary of findings provided in Table 3 below.

Though highly informative, our quantitative exploration only tells part of the story. To further highlight the distinctive decisions and actions of entrepreneurs with psychiatric conditions, we have compiled additional illustrative, real-life clinical-case vignettes, drawn from the work by a licensed psychiatrist and Clinical Professor of Psychiatry, providing qualitative texture on the essentiality of a broad-spectrum approach to entrepreneurial action that accounts for alternate pathways. These are presented in the following section and further elaborated in the Appendix.

7. Discussion

As the foregoing exploration suggests, neither the primacy nor the subordination of rationality is useful to entrepreneurship and entrepreneurship scholarship. Even Aristotle – ever the paragon of rational thought – noted that logical reasoning is only one of the seven causes driving human action¹⁴ (Hunt and Lerner, 2018). As Keynes (1936) and Arrow (1990) intimated, rationality is a tool, and like all tools it is only useful when applied in the contexts that generate value. While the complete absence of rationality will obliterate a business, the undue presence of rationality may starve it of creativity, energy, vibrance, depending upon the particular activity and phase of the business venturing lifecycle (Lerner et al., 2018b).

Thus, the purpose of our abductive, exploratory investigation is not to demonstrate, or even suggest, that rationality is neither present in nor useful to entrepreneurial decision-making and action. An extensive body of empirical work has demonstrated how entrepreneurs as well as their customers, suppliers, and investors often engage in structured, deliberative, reasoned intentionality, though with varying degrees of success. As with all facets of human existence, rationality is a notable dimension of business venturing and reasoning is often an applicable tool, but neither rationality nor reasoned intentionality circumscribe the entirety of any complex human endeavor, including entrepreneurial action (Hunt and Lerner, 2018; Lerner et al., 2018a).

¹³ For an alternative assessment the potential liability of psychiatric symptoms, we ran additional regressions on whether symptoms (negatively) predicted firm age. This and the associated results are elaborated in the Exhibit.

¹⁴ In Aristotle's words: “All human actions have one or more of these seven causes: chance, nature, compulsions, habit, reason, passion and desire.”

7.1. Implications for entrepreneurial action theory

To instigate our exploration, we proposed a set of framing questions regarding the prevalence and influence of alternative business venturing pathways, comprised of decisions and actions for which rationality plays a lesser role, or is altogether absent. The findings generated through our analysis have implications for debates regarding the form and function of rationality in entrepreneurship. Our findings also provide instructive insights concerning future research on the origins, initiation, operation, and survival of new business ventures, as they have been conceptualized through the lens of EAT.

Our line of inquiry focuses on whether intendedly rational judgement is in fact so central to the business venturing process that it functions as a definitional “gating mechanism,” the presence and prominence of which is a precondition to successful entrepreneurial outcomes (Packard and Bylund, 2021). Extant EAT continues to treat rational intentionality in precisely this fashion (Hunt and Lerner, 2018), which has led to the non-ignorable disconnect between EAT and empirical findings such those generated through our exploratory inquiry and other recent studies (e.g. Wolfe et al., 2020; Yu et al., 2021; Greidanus and Liao, 2021; Rajah et al., 2021).

Taking the issue a step further, we have posed a counterfactual circumstance, asking whether a proclivity towards less-rational decisions and actions are destined to fail. In an important sense, however, the relative success or failure of non-rational decisions and behaviors are secondary to the mere fact that they exist – as does neurodiversity itself – to a non-ignorable degree, meaning that the phenomenon and the subject matter is non-ignorable to entrepreneurship scholars. Thus, theories of entrepreneurial action must contemplate and incorporate a broad spectrum of dynamic forces, some of which are patently rational and many others of which are not (Hunt and Lerner, 2018; Lerner et al., 2018a). In this respect, the McMullen and Shepherd assertion – “Entrepreneurial action, refers to behavior in response to a judgmental decision under uncertainty about a possible opportunity for profit” (McMullen and Shepherd, 2006) – is, at a minimum, incomplete. Reconceptualizations of EAT need to incorporate the premise that neurodiversity results in alternate venturing pathways, some material number of which arise through the actions of individuals with non-rational predilections. Towards this end, our findings support the widening definition of entrepreneurial behavior developed by Hunt et al. (2022), which focuses on novel actions – from wherever they may emanate – to generate reproducible benefits, rather than on an exclusive preoccupation with rational intentionality and reasoned judgements, which tend to dramatically understate the messiness of the entrepreneurial action (van Lent et al., 2020).

Contrary to some recent perspectives, EAT can survive the inclusion of a-rational, non-deliberative, and impulsive proclivities, but many of the descriptive and predictive frameworks will have to be amended, particularly those EATs that are singularly wedded to the centrality of deliberation and reasoned foresight, such as those propounding judgement-based decision-making as a definitional gating condition to entrepreneurial action (e.g. Brown et al., 2018; Foss and Klein, 2012; Packard and Bylund, 2021).

The findings from our investigation offer a mixed set of results and a diverse array of implications for EAT. As Hunt and Lerner (2018) noted, entrepreneurial action has idiosyncratic expressions and outcomes, many of which favor neither those with nor those without mental health conditions. This is, however, precisely what one would expect if intended rationality is sometimes present and useful and other times unnecessary or counter-productive to the generation of value-enhancing variation. Lucy's experience provides a vivid exposition of how and why non-rational drivers play an amplified role for neurodiverse entrepreneurs.

Lucy was a scattered, hyperactive, and anxious low-level nurse who learned to sell healthcare services. Her account management talents helped her build a rapidly growing business. After five years she was in the top 10% of the Inc. 500 list of America's most rapidly growing companies, and acquisition offers began to pour in. The “best” offer was from a private equity firm that offered to buy 1/3 of her business at a very high valuation, allowing her to continue growing it with the option of selling more of it, or all of it, later. Plagued by catastrophic thinking and “what if” ruminations, she eliminated all of her risk by accepting the all-cash buyout offer from a large competitor at a much lower valuation.

As the *SI Call* aptly observes, to-date scholars of mental health and entrepreneurship have produced “little evidence concerning the utility of non-rational decision factors.” In a multiplicity of ways, our exploratory investigation presents evidence that proclivities towards non-rational decisions and actions exhibit instances of utility and disutility, as is the case with all entrepreneurial pathways constituting a broad-spectrum approach to entrepreneurial action that includes both rational and non-rational drivers (Lerner et al., 2018a). As our findings reveal, the existence of neurodiversity is an essential driver of variance in entrepreneurial actions and outcomes. In this sense, a reliance upon EAT conceptions that assume or even require rational intentionality, lack descriptive veridicality and predictive usefulness.

7.2. Implications for neurodiversity and the boundedness of rational intentionality

A steadily increasing body of empirical work has tied neurobiological differences to entrepreneurial processes and outcomes (e.g., Moore et al., 2021; Lerner et al., 2018c; Phan & Wright, 2018). Some of these studies, like ours, have specifically considered psychiatric symptoms and clinically diagnosable mental health disorders. The reasons for this focus stem from the existence of validated scales that

allow researchers to readily identify symptomatic individuals whose cognitive processing and behavioral manifestations at times materially differ from the general population. While all humans are subject to facets of neurodiversity, the distinctiveness of those with psychiatric conditions richly illuminates that diversity. The tragic, high-profile case of Kate Spade underscores the immediacy of the challenges confronting such individuals.

After Kate Spade's suicide at age 55, the late fashion entrepreneur's husband told the press "Kate suffered from depression and anxiety for many years...She was actively seeking help and working closely with her doctors to treat her disease, one that takes far too many lives...There were personal demons she was battling." (Busby, 2018).

There are deeply human, non-rational facets to stories like that of Kate Spade, which cannot be excluded from EAT simply because they do not exhibit reasoned judgement and purposive action. Heterogeneity is one of the key precepts identified by Davidsson (2016) as being essential to entrepreneurship research. Variation is an indispensable antecedent to innovation, which itself precedes entrepreneurial outcomes (Keynes, 1936).

To date, published studies have largely lacked the data necessary to complete such an assessment, including sufficiently granular, representative, comparison-based outcome data that can linked to individual-level psychological variables. Thus, fundamental questions have passed unanswered concerning whether or not there is a demonstrable association between the entrepreneurial outcomes and the non-rational clinical characteristics of mania/bipolar spectrum conditions and ADHD. Building on and integrating decades of clinical psychology and psychiatry literature, and extending recent work on non-intended rational bases for entrepreneurial action, we framed our inquiry around the question of whether and to what effect such psychiatric symptoms are connected to various venture outcomes. As our findings suggest and as the situation of Kelly reveals, the connection is more than simple happenstance:

As the daughter of an impoverished severely mentally ill single mother, Kelly rescued her family from one crisis after another from a very young age. Later she started a chaotic, crisis-ridden business that became a "Unicorn" under her driven, hyper-responsible, co-dependent, people-pleasing leadership. With psychiatric help she learned to manage her many psychiatric conditions including ADHD, depression, PTSD, panic disorder, and anxiety disorder.

Moreover, our findings reveal that the pathways of those with psychiatric symptoms often lead to successful entrepreneurial outcomes at or above the general population of entrepreneurs. Specifically, for the psychiatrically neurodiverse subjects in our studies, relative deficits in executive regulatory function and rational goal-directed behavior (Barkley, 1997; Nigg, 2000; Wright et al., 2014) are on-average not an impediment to successful venturing outcomes. Many neurodiverse entrepreneurs are not unaware of the judgmental burden that rests upon them as a consequence of the emphasis on rationality. As one individual, Nelson, conveyed, it can be a challenge to "fit in," to be understood, to be taken seriously. As a consequence, even successful entrepreneurs are shaped by social response to their "different-ness."

"The best way to piss me off is to call me an idiot," said Nelson, who was voted least likely to succeed by the faculty of a prestigious accelerator due to his tendency to interrupt people, skip training sessions, dismiss comments from program leaders, and annoy virtually everyone. "I like to get back at people who underestimate me by outperforming them in the marketplace." When his collaboration software company grew exponentially during the pandemic, highly-recognized venture capital firms offered to invest significant sums at a very high valuation, on excellent terms. He dismissed their offers, asking "Why should I accept money from these self-impressed morons and give them any credit for my success?"

As Nelson's testimonial suggests, entrepreneurship is a messy, unpredictable, and highly heterogeneous journey; one in which reasoned intentionality is not invariably prescriptive and cannot exclusively define either entrepreneurial actions or outcomes. Likewise, less-reasoned, less-deliberative tendencies are far from being a death sentence. Rather, each person's choices and behavior are guided by a shifting blend of rational and irrational motivators that shape their decisions, and actions – each one an idiosyncratic capture of Keynes' animal spirits.

7.3. Looking beyond intended rationality

The irresistible sway of post hoc narrativity – deepening and strengthening explanatory narratives with each successive retelling of a founding story – runs through entrepreneurship research (van Lent et al., 2020). Although extant scholarship takes note of business venturing's "messiness," "circuitousness," and maddening degree of failure, much research still marginalizes less-reasoned, non-deliberative, and even impulsive entrepreneurial action, and does so in a fashion that unnecessarily limits the study of entrepreneurship (Lerner et al., 2018a; van Lent et al., 2020). As Allison's experience suggests, such an omission mistakenly censors key dimensions of the entrepreneurial experience.

Alison's third, and current business involves manufacturing and distributing consumer goods. Through psychotherapy she learned that, due to her co-occurring bipolar disorder and ADHD, she is motivated by short-term rewards and that conversely, she gets demoralized when her efforts are thwarted. "The last two weeks were not great" she sighed. "The manufacturer messed up our batch, the retailer put our products in 20 stores instead of the 200 they promised, on-line sales were down, we didn't get the cash flow we needed to pay our vendors, the investors gave us pushback, and I got an emotional flat tire. At a certain point I just felt hopeless, went to a bar, got depressed, and basically quit working for a few days. Then I decided to wash my car. At least that's something I can control, and where I can get good results. My spirits picked up and I went back to work."

Allison's experience poignantly illustrates a non-rational mindset and pathway that should not be censored, regardless of whether her venture is ultimately a success or a failure. One could conceivably argue that entrepreneurship only occurs when individuals engage in rational judgement-based deliberation with some anticipatory sense of potential future gains. Reciprocally, the assertion would be that someone engaged in non-rational thinking or action is definitionally not engaged in entrepreneurship. This perspective is not without adherents. For example, Brown et al. (2018) maintain that all entrepreneurial action is definitionally circumscribed by rational judgement processes and reasoned intentionality. As our findings reveal, this view has a number of maladies: it turns entrepreneurship into a tautology, a semantic artifact of well-demarcated, but artificially limited conceptions; it is reductionistic without achieving greater explanatory power; and, it is not useful in addressing the vast array of motivational pathways that are not subsumed by either reasoned action or a priori intentionality.

As work on entrepreneurial passion, affect, emotion, stress, boredom, sensation-seeking and disinhibition have shown, decision-making does not occur in isolation from other attributes, dispositions, aspirations, and context-dependent situational factors. Dequech (1999: 420) argues that strong, Keynesian-style animal spirits undergird the individual call to action and often take the form of "spontaneous optimism," by which he means "optimism which does not logically follow from reason and evidence." Such a perspective is highly reminiscent of the irrationally inflated optimism that accompanies hypomania and dispositional positive affect – an optimism that does not logically flow from reasoned, deliberative, judgement-based logics.

7.4. Limitations and opportunities

As with all studies, some features of our research design are ideal for exploratory investigation, while other features inherently impose limitations and boundary conditions that present opportunities for follow-on research. Our decision to proceed abductively, commencing with an inductive, exploratory investigation of a randomly-selected, representative sample, yielded benefits, but also generated limitations. Proceeding abductively through framing questions, rather than deductively-derived hypotheses, gave us freedom to test a multiplicity of dependent variables and to make no a priori assumptions regarding the relative presence and performance of individuals with psychiatric symptoms. Since our investigation is exploratory, it is not our central aim to demonstrate a causal connection through experimentation; rather, we have intentionally sacrificed causal claims in order to allow the quantitative and qualitative data point us in whichever direction the boundaries of rationality would allow, and do so without fear of HARKing. Relatedly, given our exploration of six entrepreneurial outcomes, applying a Bonferroni adjusted alpha sets a very high bar for considering effects significant ($p \leq 0.008$). Going forward, however, the use of theory-motivated hypotheses will prove valuable to establishing stronger causal links.

Our design also involved the use of both cross-sectional data and completed surveys. While cross-sectional data can create some limitations, in relation to our inquiry the cross-sectional data does not threaten spurious relationships since the psychiatric variables are supported through clinically validated scales — and entirely separate from outcome variable items. The scales we employed have been tested through hundreds of studies in psychology, but there are always risks attendant to self-report surveys in an exploratory study. For example: while genetic and stable neurological differences that precede entrepreneurial action have been shown to underlie the validated psychiatric measures, it is possible that the stresses of business venturing and associated factors (e.g. lack of sleep) can contribute to the manifestation of certain symptoms (e.g. Gunia et al., 2021).¹⁵ Future studies, using hypothesized relationships that build upon our findings may find it useful to undertake a longitudinal design, which highlights with greater specificity temporal dynamics and the impact of reasoned versus non-reasoned action across phases of the business venturing lifecycle (Lerner et al., 2018b). Such studies would also go beyond data limitations of our quantitative inquiry.¹⁶

Finally, as we have explained, we employed psychiatric conditions and symptoms as a means to investigate the broad-spectrum entrepreneurial decisions and actions. This does *not* mean that individuals with psychiatric conditions are patently irrational and those without such conditions are invariably rational. On the contrary, we have taken great pains throughout this work to emphasize the vast array of idiosyncratic, situationally embedded combination of rational and irrational proclivities that reside across and within each person. As noted above, the use of validated scales for psychiatric symptoms and tendencies is driven by the capacity to compare individual proclivities along a spectrum. Future studies can extend and enhance our work through the use of methods, including experiments, that directly assess reasoned approaches.

¹⁵ Speaking further to the question of potential reverse causality: Symptoms, as measured using the ASRS scale, have revealed genetic underpinnings (Reuter et al., 2006). Additionally, the design and extensive validation of the psychiatric scales used further ensures the findings would not be a result of reverse causality (e.g. creating jobs (DV-5) does not cause psychiatric pathology).

¹⁶ For example, due to data limitations, we cannot speak to potential industry effects or interactions.

7.5. Conclusion

Entrepreneurial action is birthed by a wide assortment of circumstances and motivations; and, though notoriously elusive to discern and describe, the entrepreneurial actions of unreasonable men and women must also be captured, understood and assessed. “An efficient, vibrant marketplace for entrepreneurial innovation,” argued [Lerner et al. \(2018a: 67\)](#), “necessarily includes impulse-driven, non-deliberative actions, some proportion of which may evolve into entrepreneurial outcomes, formal organizations and competitive business models.” The Guest Editors of this *Special Issue* aptly asserted that “a seismic shift in extant approaches to research [concerning the role of rationality] is needed to move this research forward.” Our exploratory inquiry offers evidence of the alternative pathways taken by people, who by force of neurodiversity see the world and behave in the world in ways that are not adequately captured through the lens of extant EAT. This, then, is the boundary between productive and counter-productive conceptions of rational intentionality in the study of entrepreneurship.

Authors' credit statement

Co-authors of this work contributed the following: **Richard Hunt:** Conceptualization, Writing - Original Draft Preparation, Writing – Review and Editing. **Daniel Lerner:** Conceptualization, Writing - Original Draft Preparation, Project Administration, Writing – Review and Editing, Visualization. **Sheri Johnson:** Conceptualization, Investigation, Data Analysis, Writing - Original Draft Preparation, Writing – Review and Editing. **Sangeeta Badal:** Investigation, Quantitative Data Collection, Data Analysis, Writing – Review and Editing. **Michael Freeman:** Investigation, Qualitative Data Collection and Analysis, Writing – Review and Editing.

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Exhibit A

Table E-1
Descriptive statistics of key study variables.

	N	Min	Max	Mean	SD	Skew	Kurtosis	Alpha
Age	2140	20	95	53.9	11.051	−0.457	−0.035	
ADHD								
Inattention	2096	0	9	1.879	2.014	1.092	0.520	0.739
Hyperactive/impulsive	2095	0	9	1.399	1.571	1.418	2.105	0.642
HPS	2121	2.50	40.25	17.940	5.266	0.496	0.607	0.889
MASQ								
General distress: anxious symptoms	2125	11	53	17.881	6.121	1.447	2.416	0.871
Anxious arousal	2127	17	66	22.071	5.914	2.464	8.601	0.848
Anxiety (raw)	2127	−0.99	5.38	0.0003	0.922	1.939	5.249	0.823
Anxiety (winsorized)	2127	−0.99	3.00	−0.013	0.865	1.480	2.099	
PDSQ								
Depression	2077	0	19.95	2.980	3.530	1.647	2.543	0.868
Entrepreneurial variables								
Age of firm	572	0	83	13.201	11.159	1.265	2.758	
Copyright, trademark, or patent (IP)	1087	0	1	0.205	0.404	1.462	0.139	
# of businesses (raw)	1072	0	20	2.166	2.016	4.014	26.230	
# of businesses (log)	1072	0	1.32	0.447	0.202	0.766	1.500	
Annual firm revenue	557	1	8	1.989	1.558	1.504	1.339	
Revenue change in past 3 years	939	1	7	4.424	1.734	−0.346	−0.746	
Job creation	1070	0	400	9.031	36.523	8.659	0.076	
Job creation (log)	1070	0	2.60	0.560	0.537	1.414	1.949	
Number of failed businesses	1074	0	7	0.353	0.824	3.196	13.074	
Number of failed businesses (log)	1072	0	0.90	0.086	0.175	0.195	2.96	

Table E-2

Pairwise Pearson correlations.

	Gender	Education	Age	Business age	Has IP	# of bus. (log)	Firm revenue	Revenue change 3-year	Job creation (log)	# failed bus. (log)	ADHD_Inattention	ADHD_Hyp./Imp.	HPS	PDSQ depression
Education	0.063*													
Age	0.016	0.053												
Business age	−0.018	−0.138**	0.375**											
Has IP	−0.04	0.090**	−0.076*	−0.103*										
# of businesses (log)	−0.160**	0.001	0.132**	−0.116**	0.167**									
Annual firm revenue	−0.199**	0.05	−0.189**	−0.026	0.254**	0.197**								
Rev. change 3-year	−0.092**	0.079**	−0.062*	−0.113**	0.212**	0.108**	0.500**							
Job creation (log)	−0.170**	0.055	−0.013	−0.055	0.266**	0.252**	0.757**	0.684**						
# failed bus. (log)	−0.057	0.031	−0.05	−0.089*	0.133**	0.432**	0.093*	0.092**	0.107**					
ADHD_Inattention	−0.032	0.041	−0.221**	−0.206**	0.073*	0.033	0.091*	0.027	0.057	0.056				
ADHD_Hyp./Imp.	0.018	0.077*	−0.230**	−0.138**	0.146**	0.055	0.183**	0.095**	0.104**	0.104**	0.558**			
HPS	−0.102**	0.014	−0.207**	−0.120**	0.214**	0.182**	0.173**	0.111**	0.112**	0.146**	0.249**	0.423**		
PDSQ depression	0.018	−0.026	−0.209**	−0.066	0.088**	−0.033	0	−0.032	−0.042	0.04	0.498**	0.434**	0.242**	
MASQ anxiety	0.067*	−0.01	−0.224**	−0.081	0.051	−0.023	−0.021	−0.035	−0.036	0.090**	0.485**	0.486**	0.229**	0.642**

N varies according to missing data (552 to 1080); 12 of 14 Ns > 1053; mean N = 995.

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Table E-3

Hierarchical linear regressions (Bonferroni corrected alpha = 0.05/6 = 0.008).

DV 1: Intellectual property		r^2_{change}	p	Final standardized $Beta$	p	Zero-order r
Block	Model					
1		0.017	0.001			
	Gender			−0.032	0.292	−0.048
	Education			0.085**	0.006	0.088*
	Age			−0.036	0.263	−0.078
2		0.043	0.000			
	HPS hypomanic tendencies			0.179***	0.000	0.215**
	ADHD hyperactive-impulsive			0.066	0.104	0.143**
	ADHD inattention			−0.014	0.730	0.077*
	MASQ anxiety			−0.063	0.135	0.044
	PDSQ depression			0.055	0.180	0.084**
Overall model $F(8, 1025) = 8.257, p < 0.001, r^2_{\text{total}} = 0.061$						
DV 2: Number of businesses (log)		r^2_{change}	p	Final std. $Beta$	p	Zero-order r
1		0.050	0.000			
	Gender			−0.155***	0.000	−0.175**
	Education			0.001	0.971	0.009
	Age			0.178***	0.000	0.134**
2		0.043	0.000			
	HPS hypomanic tendencies			0.203***	0.000	0.183**
	ADHD hyperactive-impulsive			0.024	0.545	0.055
	ADHD inattention			0.038	0.332	0.030
	MASQ anxiety			−0.019	0.640	−0.029
	PDSQ depression			−0.057	0.164	−0.031
Overall model, $F(8, 1012) = 12.998, p < 0.001, r^2_{\text{total}} = 0.093$						
DV 3: Annual firm revenue		r^2_{change}	p	Final Std. $Beta$	p	Zero-order r
1		0.084	0.000			
	Gender			−0.187***	0.000	−0.190**
	Education			0.059	0.155	0.046
	Age			−0.189***	0.000	−0.199**
2		0.039	0.000			
	HPS Hypomanic tendencies			0.095*	0.037	0.171**
	ADHD Hyperactive-Impulsive			0.172**	0.002	0.186**
	ADHD Inattention			−0.030	0.584	0.080
	MASQ Anxiety			−0.088	0.121	−0.019
	PDSQ Depression			−0.039	0.488	0.001
Overall model, $F(8, 516) = 9.058, p < 0.001, r^2_{\text{total}} = 0.123$						
DV 4: Change in revenue over 3 years		r^2_{change}	p	Final Std. $Beta$	p	Zero-order r
1		0.056	0.000			
	Gender			−0.035	0.287	−0.049
	Education			0.096**	0.003	0.098**
	Age			−0.204***	0.000	−0.203**
2		0.039	0.000			
	HPS hypomanic tendencies			0.076*	0.035	0.120**
	ADHD hyperactive-impulsive			0.087*	0.045	0.111**
	ADHD inattention			0.075	0.070	0.077
	MASQ anxiety			−0.053	0.235	−0.040
	PDSQ depression			−0.188***	0.000	−0.088*
Overall model, $F(8, 889) = 11.748, p < 0.001, r^2_{\text{total}} = 0.096$						
DV 5: Job creation		r^2_{change}	p	Final Std. $Beta$	p	Zero-order r
1		0.029	0.000			
	Gender			−0.160***	0.000	−0.168**
	Education			0.041	0.184	0.047
	Age			−0.001	0.971	−0.018
2		0.024	0.000			
	HPS hypomanic tendencies			0.068*	0.047	0.110**
	ADHD hyperactive-impulsive			0.122**	0.003	0.103**
	ADHD inattention			0.026	0.506	0.048
	MASQ anxiety			−0.056	0.187	−0.035
	PDSQ depression			−0.086*	0.041	−0.044
Overall model, $F(8, 1010) = 7.469, p < 0.001, r^2_{\text{total}} = 0.056$						

Table E-3 (continued)

DV 5: Job creation		r^2_{change}	p	Final Std. Beta	p	Zero-order r
DV 6: Number of failed businesses		r^2_{change}	p	Final Std. Beta	p	Zero-order r
1		0.215	0.000			
	Gender			0.020	0.493	−0.056
	Education			0.026	0.357	0.028
	Age			−0.096***	0.001	−0.052
	Number of businesses started			0.461***	0.000	0.448**
2		0.008	0.063			
	HPS hypomanic tendencies			0.019	0.558	0.144**
	ADHD hyperactive-impulsive			0.047	0.212	0.112**
	ADHD inattention			−0.041	0.256	0.052
	MASQ anxiety			0.088*	0.024	0.087*
	PDSQ depression			−0.030	0.434	0.039
Overall model, $F(9, 1003) = 32.038, p < 0.001, r^2_{\text{total}} = 0.223$						

* significant at 0.05 (two-tailed); ** significant at 0.01 (two-tailed); *** significant at 0.001 (two-tailed).

Regarding outliers, normalcy, and robustness checks

In addition to the previously elaborated approach to outliers and normalcy, we further assessed the matter. In particular, we used SPSS routines for identifying multivariate outliers, and we examined graphs of univariate and multivariable distributions. We also computed use bootstrapping to resample the distributions across 1000 permutations, to examine the stability of the finding. Bootstrapping is considered an ideal technique for addressing non-normal distributions, as it allows for a more robust estimation of standard error, across variations in the sample that successively drop one individual and re-create the standard error. This generates a confidence interval and p value that are considered highly robust to deviations that could occur due to outlier scores.

Additionally, we examined robustness with different winsorizations. We reran the regressions involving the winsorized data of DV5 and DV6 (two variables with non-normalcy that guided our transformation decisions). In particular, we winsorized all cases above the 99th percentile and reran analyses. For DV5: the previously significant result of ADHD-Hyp./Impulsivity positively predicting Job Creation remained significant (Beta = 0.121, Bootstrapped $p = 0.002$). For DV6: HPS, ADHD-Hyp./Impulsivity, and ADHD-Inattention remain insignificant predictors of number of failed businesses (bootstrapped p 's > 0.37).

For an alternative assessment concerning the potential liability of psychiatric symptoms, we ran additional regressions on whether psychiatric symptoms (negatively) predicted firm age. Specifically, with the DV specified as firm age, regressions otherwise equivalent to those presented Table E-3 were run. The results supported the finding that HPS and ADHD-Impulsivity/Hyperactivity were not significantly predictive of firm age, while ADHD-Inattention was a significant negative predictor – with and without the inclusion of the anxiety and depression variables ($p = 0.001$ and $p = 0.003$ respectively). In terms of the overall variance explained, the R^2 of first-step controls was, respectively, 0.16 and 0.158, with the incremental variance explained by psychiatric variables 0.02 and 0.016. This suggests that within the population of entrepreneurs, ADHD-Inattention does, on average, constitute a small but statistically significant inhibitor of firm age. Concurrently, with significantly higher ADHD-Inattention in the Super Entrepreneurs compared to the Typical Entrepreneurs and Managers (Table 3), Inattention is definitively not a death sentence for business venturing.

As it relates to Firm age ($n = 572$), there was a fair amount of missing data. We thus looked for potential (non)response bias. Three t -tests tested whether non-respondents differed from the respondents. We found no evidence of potential (non)response bias, in ADHD Hyperactive/Impulsive, ADHD Inattention, or HPS (all p 's > 0.21). As such, there was no evidence of bias underlying the observed effects or otherwise threatening representativeness.

Appendix

Although our exploratory analyses of the representative sample and the specialized focus on highly successful entrepreneurs opens the door to the conceptualization of alternative, a-rational, non-deliberative business venturing pathways, aggregations cannot do justice to the actual ways in which neuro-diversity becomes manifested as entrepreneurial diversity, wherein evolutionary forces exert selective influence on both rational and irrational decisions and behaviors. Two additional vignettes, based on cases known to a psychiatrist, who is a coauthor of this study, demonstrate the essentiality a broad-spectrum approach to entrepreneurial action that accounts for alternate pathways.

Sophia loved the thrill of being a high-class prostitute while she was in college, sometimes forgetting to get paid because she was supercharged by the excitement of each adventure, particularly while she was in the midst of her full-blown manic episodes. In her thirties she launched her event production company and quickly attracted a high-powered clientele that included celebrities and political leaders. Auditory and visual hallucinations did not prevent her from working, and she would drop in and out of psychiatric treatment. As her business grew, she produced outdoor festivals, celebrity fashion shows, and high-end celebrity fundraisers for charities and political campaigns. She went for 36 h without sleep while producing an international film festival, wearing headphones to override the voices in her mind, believing she was on a mission to create world harmony through film, and then partying with the stars instead of running her

business at the end of the opening night. After the party she fell asleep on the lawn outside of a performance venue. Eventually the police picked her up and escorted her home.

Despite a delusional system of grandiosity within the pathological range, Sophia built a company that created dozens of jobs, even while she struggled manage the administrative and operations aspects of the business. In many respects, impulsivity and disinhibition can be an asset in generating creative approaches and fueling immediate action, but a liability in replicating quality business outcomes and maintaining financially viable operations.

An individual may excel in generating business, but not in managing it – a common phenomenon among entrepreneurs who prefer less-reasoned, less-deliberative decision-making logics. However, there are individuals with clinical conditions who embark upon less-reasoned entrepreneurial pathways and achieve comparative success by recognizing their limitations. The case of Linda dramatizes this point.

Linda was the associate lawyer under an older attorney who took workers compensation cases on a high-risk contingency basis. She was drawn to the challenge of having her fees at risk, tolerated panic attacks while enjoying conflict in the courtroom, outperformed her boss, resented him taking a cut of the fees she earned without sharing fairly in the risk she assumed, and confronted him with the option of selling the practice to her or else she would leave and start her own. He opted to sell and retire. She was a good enough lawyer but her strength lay in her aggressive, energetic engagement with referrals that repeatedly sent high-value cases, and her ability to attract more talented junior lawyers to work under her. Married to a husband who traveled for work, with three children and three dogs at home, Linda got up early every day to take care of the dogs, get the children to school, and then blast off into orbit. Her firm experienced 100% per year revenue growth every year for five years after she took it over. Soon the firm would require professional operators, marketers and managers yet she didn't want to relinquish control to professionals who would bureaucratize her firm to accommodate growth. Recognizing that she had reached the limit of what she found rewarding, she decided to sell the business. Several large competitors got into a bidding war to acquire her practice, which she sold for \$30MM more than she paid for it five years earlier.

With hypomania, panic attacks, and ADHD, Linda confronted an assortment of chronic symptoms, some impelling her to action and others making it wildly difficult for her to attend to basic details required to professionalize the business. Even so, consistent with Lerner et al. (2018b), entrepreneurs like Linda debunk the notion that rationality is an all-or-nothing proposition. Instead, business venturers are awash in an amalgamation of idiosyncratic forces; some are controllable, but many are not. Moreover, the desirability and impact of idiosyncratic modes vary depending upon which aspect of business venturing being considered.

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