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Working Paper

Entrepreneurship & Attention Deficit/Hyperactivity Disorder: A Large-Scale Study Involving the Clinical Condition of ADHD

IZA Discussion Papers, No. 11105

Provided in Cooperation with:

IZA – Institute of Labor Economics

Suggested Citation: Lerner, Dan; Verheul, Ingrid; Thurik, Roy (2017) : Entrepreneurship & Attention Deficit/Hyperactivity Disorder: A Large-Scale Study Involving the Clinical Condition of ADHD, IZA Discussion Papers, No. 11105, Institute of Labor Economics (IZA), Bonn

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ABSTRACT

Entrepreneurship & Attention Deficit/ Hyperactivity Disorder: A Large-Scale Study Involving the Clinical Condition of ADHD

A growing conversation has emerged linking ostensibly *dark* or *pathological* individual-level characteristics to entrepreneurship. Attention Deficit/Hyperactivity Disorder (ADHD) emerged as a proof-of-concept phenomenon. Recent studies in entrepreneurship journals have made great strides – articulating the theoretical relevance of ADHD-type behavior in entrepreneurship, and suggesting a positive link consistent with narratives in the popular press. While the recent research has made important inroads, quantitative studies have yet to empirically examine ADHD in line with its theoretical roots and definition – as a full-blown clinical disorder. The present paper contributes by providing a theoretically-empirically aligned test of the connection between clinical ADHD and entrepreneurial intention as well as action.

JEL Classification: L26, I12

Keywords: attention deficit/hyperactivity disorder, ADHD, nascent venturing, entrepreneurial intentions, entrepreneurial action

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Entrepreneurship & Attention Deficit/Hyperactivity Disorder: A Large-Scale Study involving the Clinical Condition of ADHD

1. INTRODUCTION

By the end of the 20th century, the entrepreneurship literature had built a body of knowledge on logical, generally positive, factors associated with business venturing such as human capital, financial capital, cognitive biases, traditional traits differentiating entrepreneurs (Shane, 2003). Building on that tradition, in the present 21st century, scholars have made great strides in advancing entrepreneurship theory – covering many other factors associated with venturing such as regulatory-focus (Tumasjan & Braun, 2012; Hmieleski & Baron, 2008), affect and passion (Baron et al., 2012; Cardon et al., 2012; Gielnik et al., 2017). Recently, a relatively new and growing conversation has emerged – that involving conventionally *dark* or *pathologized* constructs that may be positively associated with entrepreneurship. Among the most prominent, and previously suggested in the popular press (Archer, 2014; The Economist, 2012), is *Attention Deficit/Hyperactivity Disorder (ADHD)*. Characterized by behavioral disinhibition, ADHD is indicated by impulsivity, hyperactivity, and problems with attentional regulation (APA, 2013).

The theoretical and practical relevance of the above to entrepreneurship has recently been discussed (Verheul et al., 2015; 2016; Thurik et al., 2016; Wiklund et al., 2016a; 2016b; 2017; Miller & Le Brenton-Miller, 2016; Lerner, 2016; Antshel, 2017; Canits et al., 2018). In particular, a number of studies drawing on the ADHD literature have emerged, suggesting a positive association between ADHD related behavior and entrepreneurship, including an increased likelihood of entrepreneurial intentions (Verheul et al., 2015; Canits et al., 2018), venturing (Verheul et al., 2016) and orientation (Thurik et al., 2016). These and related studies provide an important point of departure for the present investigation. In essence they deal with

behavioral tendencies that *at the high-end of the spectrum might be* indicative of ADHD or other (possibly comorbid) disorders. With limited exception (discussed later), recent empirical research, while grounded in the clinical literature of *Attention Deficit/Hyperactivity Disorder*, has yet to empirically examine actual ADHD – a diagnosed clinical disorder. In other words, while predicated on prior research on the clinical condition of ADHD, the emerging link with entrepreneurship has yet to examine whether actual ADHD is significantly linked to a higher propensity for entrepreneurial intention and action. We contribute to recent theory about a positive ADHD--entrepreneurship link by providing a simple theoretically—empirically aligned test of the connection between actual ADHD and entrepreneurship.

The present work offers a number of contributions. It generally foments the emergent scholarly interest in the link between mental conditions and entrepreneurship (Hatak et al., 2016; 2017; Wiklund et al., 2017) – by focusing on a common condition that affects hundreds of millions of adults world-wide (de Graaf et al., 2008), and that may be over-represented in entrepreneurial environments. Specifically, we go beyond recent research relating ADHD-related behavior to entrepreneurship (Lerner, 2016; Verheul et al., 2015; 2016; Thurik et al., 2016; Wiklund et al., 2016b; Canits et al., 2018). Based on the reported large-scale study involving actual ADHD, we directly test whether ADHD is linked to an increased propensity for both entrepreneurial intention and action. In conjunction with related entrepreneurship research, this offers a novel basis for entrepreneurship theory, future research, and practice.

2. ATTENTION DEFICIT/HYPERACTIVITY DISORDER (ADHD)

2.1 Attention Deficit/Hyperactivity Disorder – The Condition

Attention Deficit/Hyperactivity Disorder is a common clinical condition, defined by impulsive, hyperactive, and inattentive behavior (APA, 2013), affecting individuals of all ages

worldwide. With a full discussion of clinical diagnostic criteria beyond the scope of this paper, for ADHD to exist, the impulsive, hyperactive, and inattentive behavior must be pervasive, enduring, and – to an age inappropriate frequency and magnitude – materially impairing normal functioning (APA, 2013). Adult ADHD is well established in scientific literature (Barkley et al., 2008; Kessler et al., 2005; 2007) and is known to affect organizations and vocational behavior (Bozionelos and Bozionelos, 2013; de Graaf et al., 2008; Halbesleben et al., 2013; Kessler et al., 2009).

Like other disorders, ADHD is diagnosed by a licensed clinician (e.g. a clinical psychologist or psychiatrist), based on a battery of psychological tests and other data. It also requires *differential diagnosis*, meaning that the clinician must judge that the behavior and impairment consistent with ADHD is not attributable to another cause (e.g. mania, substance abuse, or say distractibility and impulsivity caused by a lack of sleep or being in the midst of a difficult divorce). Suffice to say, *there is no single test, let alone any simple psychometric measure, able to determine if an individual has ADHD.*

ADHD is, *by definition*, a clinical construct and disorder that has its roots in the extensive clinical literature, which over the past 30 years has established the validity condition (APA, 2013; Goldman et al., 1998) and the vast majority of its effects. Consistent with traditional clinical psychology and psychiatry, in the clinical literature ADHD is considered inherently pathological.

2.2 ADHD in Organizational Scholarship

In terms of the emerging management and entrepreneurship literature involving ADHD, recent studies have relaxed the need to empirically consider actual ADHD (i.e., individuals with the condition) and instead have taken a disposition-type approach (with two exceptions

subsequently elaborated). There are good and pragmatic reasons for this. The non-clinical consideration of a clinical construct has allowed empirically tractable investigations and uncovered significant, non-obvious findings – namely the positive association between ADHD-type behavior and entrepreneurship.

There are two noteworthy exceptions. First, the recent study of Wiklund, Patzelt, and Dimov (2016) illustrates and provides insight into how 14 Swedish entrepreneurs with ADHD ‘behave’. Their work demonstrates the entrepreneurial relevance of having ADHD. In line with its qualitative design and contribution, the study cannot speak to – but rather further motivates – the need to understand whether there is a significant positive connection between ADHD and entrepreneurship (whether ADHD significantly increases the likelihood of venturing). The second partial exception comes from Verheul et al. (2016) study linking individuals’ *continuous* scores on an ADHD screener (the ASRS v1.1) to their self-employment status in two datasets. Specifically, Verheul et al. (2016) performed a sensitivity analysis where individuals were screened as positive or negative for ADHD based on their ASRS score. Linking the *dichotomous* (positive vs. negative) screening variable to self-employment, the authors find that the positive association between ADHD (type behavior) and self-employment holds.

For organizational research involving ADHD to advance, however, there is an issue. While empirically *not* studying actual ADHD, the extant entrepreneurship research imported ADHD from the clinical literature, including a short screening tool¹ for identifying individuals for possible clinical referral/evaluation. We appreciate that this can be entirely appropriate, depending on the research question, the state of (incipient) knowledge, and research constraints.

¹ Unlike self-report psychometric scales commonly used in management research to measure latent non-clinical constructs, the ASRS (Kessler et al., 2005; 2007) was designed and validated to simply screen individuals for subsequent in-person evaluation by practicing clinicians.

The present concern and hitherto limitation is the absence of a large-scale basis to consider whether the reported connection with entrepreneurship is true if considering actual *Attention Deficit/Hyperactivity Disorder*. Thus, the unresolved issue with the extant theory and research, suggesting a positive ADHD—entrepreneurship link, is that it has been built on, and is fundamentally grounded in, the clinical literature (applying a clinical construct and using a screening tool) – without yet comparing individuals with and without the condition of ADHD.

Toward building a sound literature, we need to understand if the recently suggested positive connection between ADHD and entrepreneurship is veridical in the sense that this relationship holds when using the strict definition of ADHD – i.e., operationalizing it dichotomously as the diagnosed condition it fundamentally is. Based on the empirical and theoretical origins of ADHD, finding a positive link between the diagnosed condition and entrepreneurship would substantially bolster the emerging conversation. Specifically, this would validate recent entrepreneurship theory and findings that, although they involve clinical literature, yet have not empirically treated and linked *Attention Deficit/Hyperactivity Disorder* to entrepreneurship. Thus, extending recent research that has examined a behavioral disposition that *at one end of the spectrum might be* indicative of ADHD (Lerner, 2016; Thurik et al., 2016; Verheul et al., 2015; 2016; Wiklund et al., 2016b), true to the grounding literature and ADHD construct, we focus on the actual condition of ADHD.

2.3 ADHD and Entrepreneurial Intention

Notwithstanding a greater ultimate interest in entrepreneurial action (versus intention), an important starting point for the scholarly consideration of a connection between ADHD and entrepreneurship is provided by Verheul et al. (2015). It is the first large-scale scientific inquiry

focusing on the topic. Sampling of over 13,000 university students, Verheul et al. (2015) link a continuous indicator of ADHD-like behavior to entrepreneurial career intentions.²

We begin by first asking *if* the apparent ADHD – entrepreneurial intentions link indeed exists when considering the actual clinical condition. It is hitherto unclear whether, within a normal professional-oriented adult population, those who actually have ADHD show significantly higher entrepreneurial intentions than those without this condition. Potentially validating and extending prior research, we will empirically explore whether: (1) *Individuals with actual ADHD have higher entrepreneurial intentions than those without.*

2.4 ADHD and Venturing/Entrepreneurial Action

Individual entrepreneurial action is central to entrepreneurship; without such “there would simply be no entrepreneurship and no new ventures” (Baron, 2007: 167). Considering ADHD as a clinical condition affecting individual behavior, we acknowledge that it could have opposing effects on one’s propensity to undertake entrepreneurial action. Although entrepreneurship is generally perceived to involve risky, complex and innovative activities (something typically attractive to individuals with ADHD), the reality of starting a business may be far less exciting or motivating. In particular, starting a firm involves many tasks that are formal, protracted, administrative, and require attention to mundane detail. Individuals with ADHD tend to struggle with such activities, and also perceive them as less attractive (Barkley, 1997). Thus, when it comes to starting a venture and associated activities requiring sustained attention to details, individuals with ADHD may be apt to procrastinate such action or be otherwise distracted by more stimulating activities (including *thinking* about other opportunities/venture ideas). Following this line of reasoning, the classical pathological perspective on ADHD would suggest

² Using a sample of 766 university workers Canits et al. (2018) find no association between academic entrepreneurial preference and hyperactivity, and a negative one with attention deficit.

that individuals with ADHD may be significantly *less likely* to venture, compared to individuals without ADHD.

Alternatively, considering that entrepreneurship requires an action orientation (Frese, 2009; Sarasvathy, 2001) and given that unfettered even impulsive action is central to ADHD (APA, 2013), the opposite might be true. In individuals with ADHD “act first, think later” behavior prevails, meaning action itself is often prepotent (i.e. will be expressed in the absence of top-down restraint) (Barkley, 1997). This suggests that, at least for experimenting with entrepreneurship, those with ADHD may very well act without much or any forethought or consideration of potential consequences. In this respect, ADHD’s disinhibition (Barkley, 1997; Lerner, 2016) promotes action. Consistent with this, Wiklund et al. (2016a) document considerable entrepreneurial activity in their study of 14 ADHD-entrepreneurs. Likewise, in their sensitivity analysis, Verheul et al. (2016) find a positive link between a dichotomized score on the ASRS v1.1 screener and self-employment. Though the latter can be considered stricter than using continuous ASRS scores, ADHD diagnostic status was entirely unknown. Additionally, a positive dichotomous score does not mean an individual has ADHD, rather that further evaluation by a clinician might be appropriate. Hence, neither the recent extant studies nor the extensive popular press provide conclusive empirical evidence of the central question whether ADHD significantly increases (or decreases) the probably of venturing/entrepreneurial action.

Appreciating the ambivalent nature of ADHD, we note that early-stage venturing primarily involves initiating entrepreneurial action. Consequently, we offer but at the same time question the notion that individuals with ADHD – *a clinical disorder* – are more likely than others to venture. We will empirically examine whether: (2) *Individuals with ADHD are more likely to venture/engage in entrepreneurial action, than those without.*

3. METHOD

To examine whether the positive *ADHD – entrepreneurship* connection suggested by recent studies is in fact true when taking into account the actual disorder, a large-scale study was undertaken. The purpose was to provide a basic straightforward examination of the connection between the condition of ADHD (independent variable) and entrepreneurial intention (dependent variable 1) as well as nascent venturing (dependent variable 2).

As such, we were *not* interested in full-time entrepreneurs or employees – but rather focus on a population that is heterogeneous in terms of venturing activity (distinguishing between nascent actors and non-actors) as well as career intentions (distinguishing between individuals with and without intentions). Accordingly, and following Verheul et al. (2015), we sampled about 9,800 university students who participated in GUESSS Netherlands 2014. Comparing the Dutch sample with the global GUESSS sample, reported in Sieger et al. (2014), our sample was representative in terms of age, gender, management students, and the prevalence of self-employed parents³.

In relation to the research question, this sample is *not* intended to proxy some other population such as entrepreneurs, and offers a number of advantages. Given the nature of the sample and age of the respondents, the inquiry offers the advantage of capturing individuals prior to the possibility of being forced into entrepreneurship, and prior to selection and sampling biases that would be present in older workers. On a related note, it is important to acknowledge that individuals with ADHD are less likely to attend university and may be pushed into entrepreneurship via struggles with conventional employment. Thus, if significant results

³ The Global University Entrepreneurial Spirit Students' Survey (GUESSS) is a data set collected by an international research consortium aimed at examining career aspirations of students in higher education. For more information, we refer to: www.guesssurvey.org

positively linking ADHD to entrepreneurship are found, the results may *understate* what would be the effect in the general population. Hence, with the research question about whether in fact actual ADHD significantly increases entrepreneurial propensity (and not about providing a specific parameter estimate of a well-established effect generalizable to the overall population), the sample likely offers a conservative test of the fundamental relationship in question.

The data collection included the following variables: 1) *Attention Deficit/Hyperactivity Disorder* – yes/no to whether the individual had the diagnosed condition of ADHD; 2) *Entrepreneurial Intentions* – based on Linan and Chen (2009) and for robustness and replication, also operationalized dichotomously with post-secondary career intention (Verheul et al., 2015); 3) *Venturing/Entrepreneurial Action* – operationalized as whether the individual was in the process of starting or already running a venture; 4) *Control variables* – gender, age, self-employed parents, academic performance, management as field of study. These controls were included based on their consistency with prior entrepreneurship research. Considering the sample, the latter two adjust for the potential effects of academic performance or area of study.

In terms of ADHD, 4.2% reported having the diagnosed condition⁴. This is comparable to the adult ADHD community prevalence rate of 5% in the Netherlands (de Graaf, et al., 2008) and more broadly to the 3.4% across 10 countries according to World Health Organization studies (de Graaf, et al., 2008). That said, the following issues may arise when collecting the data. First, there is the possibility of *under-reporting*: some individuals with ADHD might falsely report that they do *not* have the condition, for example because they fear stigmatization. Such false-negatives would reduce an already very minority base-rate and add noise to the

⁴ ADHD is associated with genetics and stable neurological differences (physical brain-structure and neurotransmitters). Individuals previously diagnosed that may no longer meet diagnostic criteria, whether per taking medication or for other reasons, are often considered *in-remission*. In relation to the current research, bifurcation between ADHD diagnosed individuals currently meeting diagnostic criteria and those who could be clinically considered in-remission, it is neither realistic (as it would require individual clinical evaluations by psychiatrists or clinical psychologists) nor is it essential for our basic research question.

empirical testing – increasing the likelihood null-effects (and Type-II error), and decreasing the likelihood of significant results. Second, in terms of possible *over-reporting*, there was no reason for undiagnosed individuals to falsely report an ADHD diagnosis in the data collection. Also, the rate of 4.2% does not suggest an over-reporting problem. Third, *undiagnosed* individuals who would qualify for a diagnosis do not lead to spurious positive results but rather would make any true positive effect more difficult to detect. Finally, it is possible that some of the diagnosed individuals take ADHD medication (or may be considered “in remission” by a clinical psychologist/psychiatrist); however the implications of such are beyond the scope of our central research question. Furthermore, as not bifurcating diagnosed individuals *taking ADHD medication* from those *not taking medication* would not result in spurious results – and with the recent studies cited also not controlling for possible use of medication – we do not complicate our study by including medication. In summary, considering the above, any significant findings would likely be conservative in nature.

4. RESULTS

The following are the results of the large-scale empirical inquiry conducted. Table 1 presents the descriptive statistics and correlations.

<< *Insert Table 1 here* >>

Tables 2 and 3 present the results of the standard regression analyses. We find that a reported ADHD diagnosis positively predicts entrepreneurial intentions. This was the case whether operationalized as a continuous variable, following Linan and Chen (2009), or as a dichotomous variable, following Verheul et al. (2015). In terms of the readily interpretable latter measure, individuals with ADHD were approximately 1.7 times (60-80%) *more likely* to have entrepreneurial intentions (Models 1c and 1d in Table 2). This extends the findings of Verheul et

al. (2015), assuaging the clinical-but-non-clinical disjuncture of prior research, and validating the veridicality of the previously suggested positive link with intentions.

<< *Insert Table 2 here* >>

More importantly, an ADHD diagnosis positively predicts entrepreneurial action. In particular, having actual ADHD increases the odds of venturing by almost 100%. The results indicate that university enrolled adults with ADHD are *almost two times more likely* to initiate entrepreneurial action than those without ADHD (Models 2a and 2b in Table 3). In other words, among individuals who still have to make a vocational choice and have no need to venture, those with the *disorder* of ADHD were not *less* or *similarly* likely to venture than those without the disorder – but rather were significantly *more* likely to venture. Considering that individuals with ADHD are less likely to attend post-secondary education and more likely to struggle with conventional employment, these results may understate the true effect size relative to the overall population. Considering the design and nature of the sample, these results do not speak to venturing outcomes. Simply, the results provide a straightforward test and clear support for a positive link between ADHD and entrepreneurship, attributable to individual choice versus a vocation of last resort.

<< *Insert Table 3 here* >>

These results extend prior research and establish a potential upside or non-pathological effect of a clinical disorder. *Given the research question, the highly significant positive effect of ADHD and the associated odds-ratios – indicative of a large effect – are the focus.* This low total variance explained rightfully indicates that there are myriad factors influencing whether an individual is interested and will engage in venturing.

Moreover, given the representative but minority frequency of individuals with ADHD diagnoses in the sample, the overwhelming majority of the sample is non-ADHD and, accordingly, low R^2 s are not just normal but mathematically ought to be observed.⁵ If around 4% of a sample has some *dichotomous condition*, and many individuals without the disorder also venture, looking at R^2 is analogous to say looking how much of the total probability of engaging in Corporate Acquisition activity is explained by a *relatively* uncommon predictor such as CEO ADHD. However, the objective and research question *is not* about explaining the broad preponderance of the dependent variable, but instead *is* about understanding whether a theoretically meaningful, yet relatively low-base rate, predictor indeed has a significant and material effect on the probability of nascent venturing. As such, the highly significant readily interpretable odds-ratios, indicative of a large effect are informative and meaningful. The results indicate that not only is the effect of ADHD statistically significant, but that it very materially increases the odds of venturing (increases the likelihood by almost 100%, 79% after controls) – which is at least as much as other well-established predictors such as having entrepreneur parents (Model 2b).

5. DISCUSSION

The present paper extends recent entrepreneurship research, using a stricter conceptualization and measurement of ADHD – that is, actual ADHD, a clinically diagnosed condition. The results find that, in spite of ADHD's downsides and individuals having sufficient *disorder* as to be clinically diagnosed, it positively rather than negatively affects the likelihood of

⁵ Low R^2 s are to be expected based on very limited variance in ADHD as a dichotomous predictor, especially when attempting to predict a relatively infrequent dichotomous variable. Any relatively minority (i.e. low base-rate) feature, whether a clinical condition or otherwise, will not explain the vast preponderance of variance in a human activity such as entrepreneurship – considering such (as a dependent variable) is also engaged in by some of the overwhelming majority – that is, those without the low-frequency dichotomous feature.

venturing. Building on prior research, this elucidates that a *dark* and *pathologized* condition can serve as a wellspring for entrepreneurial action.

This complements the qualitative findings of Wiklund et al. (2016a) and Verheul et al.'s (2016) quantitative findings based on dichotomized ASRS v1.1 scoring. Based on our large-scale quantitative testing that did not preselect on either ADHD status or observable entrepreneurs, and prior to choosing entrepreneurship as last resort, we find evidence that individuals with diagnosed ADHD are significantly more likely to take entrepreneurial action than individuals without such a diagnosis. It suggests the potential adaptiveness of the unequivocally pathological – going beyond a behavioral trait such as impulsivity to a full-blown *clinical disorder/diagnosis*. Our findings empirically advance emergent theory, characterized well by Wiklund et al. (2017) with the telling title “Mental disorders in the entrepreneurship context: When being different can be an advantage.”

Concurrently, it is important to underscore that entrepreneurial action and performance are far from synonymous. The linkage found between ADHD and nascent venturing should absolutely not be conflated or interpreted to suggest a positive link with business venture performance. The reported study cannot speak to the effect of ADHD on venture performance. Rather, it suggests the need and opportunity for future research in this direction. Certainly, in the face of the idea that managerial tasks increase when ventures grow and performance becomes an issue, and that the links between managerial tasks and ADHD are not obvious. Thus, the link between ADHD and performance merits future investigation.

Additionally, it is also important to note some limitations. The simple, straightforward design and sample used were appropriate for the critical research question of whether in fact actual ADHD and the likelihood of entrepreneurial action are connected. The resultant

coefficient estimates, while likely conservative in nature for aforementioned reasons, should however *not* be presumed to be broadly generalizable to other populations (Antshel, 2017; Canits et al, 2018). Generalizability to other populations may be a question of *how large* the effect is. Finally, at an even deeper level, it is important to recall that generalizability is not per se a property of any empirical study, but rather is a question of whether a theoretical relationship generalizes across empirical contexts (Zelditch, 1969). As our findings quite strongly ground prior research and establish the central theorized relationship, they indicate the fruitfulness of future research involving other populations, other designs, and more complex theory.

The present work foments and contributes to various scholarly conversations, particularly those involving mental health or ADHD and entrepreneurship (Hatak et al., 2016; 2017; Lerner, 2016; Thurik et al., 2016; Verheul et al., 2015; 2016; Wiklund et al., 2016a; 2016b; Canits et al., 2018). It also serves as a basis for future research. For example, the finding that individuals with ADHD are almost two times as likely to venture, indicates the importance of further studies on ADHD and venturing outcomes. This is particularly so once considering the otherwise squandered human capital, the costs of business failure, and/or the many adverse outcomes associated with unchanneled adult ADHD (such as absenteeism, unemployment, substance abuse, incarceration).

Bolstered by the findings of our large-scale quantitative inquiry, ADHD has implications for organizational research, practice and policy. Research implications include highlighting the need for further study of contextual factors determining under which conditions ADHD is a strength or a weakness, and is adaptive or counter-productive in venturing. In regards practice and policy, understanding that mental health, and ADHD in particular, has dark and bright sides for entrepreneurship, has various implications. For example, it suggests the opportunity for

research to help educators, clinicians, and even organizations focus on strengths (such as a willingness to act, an imperturbable focus on activities of interest) and compensate for weaknesses (such as distractibility and poor attention to detail in mundane activities). More generally, it suggests the continued opportunity for considering other predictors potentially seen as *aberrant* in respect to entrepreneurship (Hatak et al., 2016; Hmieleski & Lerner, 2016; Wiklund et al., 2017).

Overall, the present work contributes to theory by grounding recent research positively linking ADHD and entrepreneurship – with a large-scale quantitative examination that squarely tests the effect of (actual) ADHD. In concert with other studies, the work establishes an emergent entrepreneurship literature on ADHD. In doing so, it attests to broader emerging theory that generally suggests the relevance of *clinical* or otherwise *dark* constructs in entrepreneurship.

REFERENCES

- American Psychiatric Association (APA) (2013). *Diagnostic and statistical manual of mental disorders (DSM-5)*. American Psychiatric Publishing.
- Antshel, K.M. (2017). Attention Deficit / Hyperactivity Disorder (ADHD) and Entrepreneurship. *Academy of Management Perspectives*, doi: 10.5465/amp.2016.0144
- Archer, D. (2014). ADHD: The Entrepreneur's Superpower. *Forbes Magazine Online*. <http://www.forbes.com/sites/dalearcher/2014/05/14/adhd-the-entrepreneurs-superpower>. Retrieved 11/22/2016.
- Barkley, R.A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of AD/HD. *Psychological Bulletin*, 121(1), 65-94.
- Barkley, R.A., Murphy, K.R., Fischer, M. (2008). *ADHD in Adults: What the Science Says*. Guilford, New York.
- Baron, R. A. (2007). Behavioral and cognitive factors in entrepreneurship: Entrepreneurs as the active element in new venture creation. *Strategic Entrepreneurship Journal*, 1(1-2), 167-182.
- Baron, R.A., Hmieleski, K.M., & Henry, R.A. (2012). Entrepreneurs' dispositional positive affect: The potential benefits – and potential costs – of being “up”. *Journal of Business Venturing*, 27, 310-324.
- Bozionelos, N. & Bozionelos, G. (2013). Attention deficit/hyperactivity disorder at work: does it impact job performance? *Academy of Management Perspectives*, Vol. 27 (3), <http://dx.doi.org/10.5465/amp.2013.0107>.
- Cable, D.M., & Edwards, J.R. (2004). Complementary and supplementary fit: A theoretical and empirical integration. *Journal of Applied Psychology* 89(5), 822-834.
- Canits, I., Bernoster, I., Mukerjee, I., Bonnet, J., Rizzo, U., & Rosique, M. (2018). ADHD (Attention-deficit/hyperactivity) symptoms and academic entrepreneurial preference: is there an association? *Small Business Economics*, this issue.
- Cardon, M., Foo, M-D., Shepherd, D. & Wiklund, J. (2012). Exploring the heart: Entrepreneurial emotion is a hot topic. *Entrepreneurship Theory and Practice*, 36 (1), 1-10.
- Frese, M. (2009). Towards a Psychology of Entrepreneurship: An Action Theory Perspective, *Foundations and Trends in Entrepreneurship*, 5, 6, 437-496. <http://dx.doi.org/10.1561/03000000028>
- Gielnik, M. M., Uy, M. A., Funken, R., & Bischoff, K. M. (2017). Boosting and sustaining passion: A long-term perspective on the effects of entrepreneurship training. *Journal of Business Venturing*, 32(3), 334-353.

- Halbesleben, J.R.B., Wheeler, A.R., & Shanine, K.K. (2013). The moderating role of Attention-Deficit/Hyperactivity Disorder in the work engagement-performance process. *Journal of Occupational Health Psychology* 18(2), 132-143.
- Hallowell, E. & Ratey, J. (2011) *Driven to Distraction (Revised)*. Anchor Books, New York.
- Hatak I., Wiklund J., Phan P., & Dimov D. (2016). *Underdogs, Misfits and Weirdos: Entrepreneurship and Mental Health*. Academy of Management Perspectives Showcase Session, Academy of Management Conference, Anaheim, USA.
- Hatak I., Wiklund J., Phan P., & Stephan U. (2017). *ADHD & Entrepreneurship*. Academy of Management PDW, Academy of Management Conference, Atlanta, USA.
- Hmieleski, K.M. & Lerner, D.A. (2016). The Dark Triad and Nascent Entrepreneurship: An Examination of Unproductive versus Productive Entrepreneurial Motives. *Journal of Small Business Management*, doi: 10.1111/jsbm.12296.
- Hmieleski, K.M. & Baron, R.A. (2008). Regulatory focus and new venture performance: A study of entrepreneurial opportunity exploitation under conditions of risk versus uncertainty. *Strategic Management Journal*, 2, 285-299.
- Kessler, R. C., Lane, M., Stang, P. E., & Van Brunt, D. L. (2009). The prevalence and workplace costs of adult attention deficit hyperactivity disorder in a large manufacturing firm. *Psychological Medicine*, 39, 137-147.
- Kessler, R.C., Adler, J. Gruber, M.J. Sarawate, C.A. et al. (2007). Validity of the World Health Organization Adult ADHD Self-Report Scale (ASRS) screener in a representative sample of health plan members. *International Journal of Methods in Psychiatric Research*, 16 (2) 52-65
- Kessler, R.C., Adler, L., Ames, M., Demler, O., Faraone, S., Hiripi, E., Howes, M.J., Jin, R., Secnik, K., Spencer, T., Ustun, T.B., Walters, E.E. (2005). The World Health Organization Adult ADHD Self-Report Scale (ASRS). *Psychological Medicine*, 35(2), 245-256.
- Kristof-Brown, A.L., Zimmerman, R.D., & Johnson, E.C. (2005). Consequences of individuals' fit at work: A meta-analysis of person-job, person-organization, person-group, and person-supervisor fit. *Personnel Psychology* 58, 281-342.
- Lerner, D.A. (2016). Behavioral disinhibition and nascent venturing: Relevance and initial effects on potential resource providers. *Journal of Business Venturing* 31 (2), 234-252.
- Linan F. & Chen Y-W. (2009). Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship: Theory and Practice* 33(3), 593-617.
- Miller D. & Le Brenton-Miller, I. (2016). Underdog entrepreneurs: A model of challenge-based entrepreneurship. *Entrepreneurship Theory & Practice*. DOI: 10.1111/etap.12253
- Nadeau, K.G. (2005). Career Choices and Workplace Challenges for Individuals with AD/HD. *Journal of Clinical Psychology: In Session*, 61, 549-563.
- Nigg, J. T. (2000). On Inhibition/Disinhibition in Developmental Psychopathology: Views From Cognitive and Personality Psychology and a Working Inhibition Taxonomy. *Psychological Bulletin*, 126(2), 220-246.
- Painter, C., Prevatt, F., & Welles, T. (2008). Career beliefs and job satisfaction in adults with symptoms of attention-deficit/hyperactivity disorder. *Journal of Employment Counseling* 45, 178-188.
- Sarasvathy, S.D. (2001). Causation and effectuation: Toward a theoretical shift from economic inevitability to entrepreneurial contingency. *Academy of Management Review* 26 (2), 243-263.
- Sieger, P., Fueglistaller, U., Zellweger, T. (2014). *Student Entrepreneurship Across the Globe: A Look at Intentions and Activities*. KMU-HSG, St.Gallen
- Shane, S. 2003. *A General Theory of Entrepreneurship: The Individual-Opportunity Nexus*. Aldershot, UK: Edward Elgar.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research, *Academy of Management Review*, 25 (1), 217-226.
- The Economist. (2012). In praise of misfits: Why business needs people with Asperger's syndrome, attention-deficit disorder and dyslexia, June 2nd, 2012.
- Thurik, A.R., Khedhaouria, A., Torrès O., & Verheul, I. (2016). ADHD symptoms and entrepreneurial orientation of small firm owners. *Applied Psychology*, 65 (3), 568-586.
- Tumasjan, A. & R. Braun. (2012). In the eye of the beholder: How regulatory focus and self-efficacy interact in influencing opportunity recognition. *Journal of Business Venturing*, 27, 622-636.
- Verheul, I., Rietdijk, W., Block, J., Franken, I., Larsson, H., & Thurik, R. (2016). The association between attention-deficit/hyperactivity (ADHD) symptoms and self-employment. *European Journal of Epidemiology*, 31(8), 793-801. <http://doi.org/10.1007/s10654-016-0159-1>.
- Verheul, I., Block, J., Burmeister-Lamp, K., Thurik, R., Tiemeier, H. & Turturea, R. (2015). ADHD-like behavior and entrepreneurial intentions. *Small Business Economics* 45(1), 85-101.

- Wiklund, J., Hatak, I., Patzelt, H., & Shepherd, D. (2017). *Mental Disorders in the Entrepreneurship Context: When being different can be an advantage*. Unpublished working-paper.
- Wiklund, J., Patzelt, H., & Dimov, D. (2016a). Entrepreneurship and psychological disorders: How ADHD can be productively harnessed. *Journal of Business Venturing Insights*, 6, 14–20.
- Wiklund, J., Yu, W., Tucker, R., & Marino, L. (2016b). *ADHD, Impulsivity, and Entrepreneurship*. Paper presented at Academy of Management Conference, Anaheim, USA.
- Zelditch, M. (1969). Can you really study an army in the laboratory? in *A Sociological Reader on Complex Organization*. Holt, Rinehart, and Winston, New York, 528–539.

Table 1: Descriptive Statistics and Correlations

| | Mean | SD | Min. | Max. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------------------|------|------|------|------|------|------|-------|------|------|-----|-----|-----|
| 1. A.D.H.D. | .04 | .20 | 0 | 1 | | | | | | | | |
| 2. Parent entrepreneur | .31 | .46 | 0 | 1 | .02 | | | | | | | |
| 3. Academic performance | 4.92 | .93 | 1 | 7 | -.04 | .02 | | | | | | |
| 4. Mgmt. Major (yes) | .21 | .41 | 0 | 1 | -.01 | .06 | .02 | | | | | |
| 5. Age | 22.4 | 3.39 | 17 | 40 | .04 | -.06 | .03 | -.05 | | | | |
| 6. Gender (male=1) | .38 | .49 | 0 | 1 | .04 | -.01 | -.004 | .09 | .08 | | | |
| 7. Ent. Intention (yes) | .05 | .21 | 0 | 1 | .03 | .03 | .001 | .03 | .05 | .09 | | |
| 8. Ent. Intentions (contin.) | 3.28 | 1.76 | 1 | 7 | .03 | .14 | .01 | .18 | -.03 | .16 | .25 | |
| 9. Ent. Action (yes) | .13 | .33 | 0 | 1 | .06 | .08 | .03 | .06 | .06 | .17 | .43 | .38 |

N=9749; All correlations $\geq |.02|$ are at least significant at 5%. All correlations $\geq |.03|$ are significant at 1%.

Table 2: OLS and Logistic Regression Results Predicting Entrepreneurial Intentions

| <i>Dependent Variable</i> | <i>Entrepreneurial Intentions</i> | | | |
|---|--|---------------------|--|---------------------------|
| | <i>Continuous DV (Linan & Chen 2009)</i> | | <i>Dichotomous DV (Verheul et al., 2015)</i> | |
| Model | 1a: Simple Main-effect | 1b: with Controls | 1c: Simple Main-effect | 1d: with Controls |
| <u>Predictor Variables</u> | B Estimates (standard errors) | | Odds Ratios: Exp(B) (95% confidence interval) | |
| Constant | 3.268*** (0.019) | 3.109*** (0.152) | 0.048*** | 0.009*** |
| Age | | -0.015* (0.005) | | 1.053*** (1.028-1.078) |
| Parent Entrepreneur | | 0.495*** (0.039) | | 1.429*** (1.177-1.736) |
| Academic performance | | 0.001 (0.019) | | 0.998 (0.904-1.101) |
| Management Major (0,1) | | 0.688*** (0.044) | | 1.322** (1.068-1.636) |
| Gender (male=1) | | 0.536*** (0.037) | | 2.151*** (1.778-2.602) |
| ADHD Diagnosis (0,1) | 0.231* (0.095) | 0.200* (0.092) | 1.802** (1.247-2.605) | 1.625* (1.119-2.360) |
| <u>Model</u> | | | | |
| R ² // Nagelkerke R ² | 0.001 | 0.071 | 0.003 | 0.036 |
| Chi-square | | | 8.511** | 113.849*** |
| -2 Log likelihood | | | 3770.50 | 3631.53 |
| N | 9,211 | 9,124 | 9,869 | 9,770 |

Significant at: †=0.10, *=0.05, **=0.01, ***=0.001, 2-tailed.

Note: Differences in reported Ns are per missing data from some subjects (SPSS pairwise exclusion).

Table 3: Logistic Regression Results Predicting Venturing

| <i>Dependent Variable</i> | <i>Entrepreneurial Action (yes=1)</i> | |
|-----------------------------------|--|---|
| | 2a: Simple Main-effect | 2b: with Controls |
| Model | | |
| | Odds Ratios: Exp(B) (95% confidence interval) | |
| <u>Predictor Variables</u> | | |
| Constant | 0.141*** | 0.017*** |
| Age | | 1.039*** (1.022-1.057) |
| Parent Entrepreneur | | 1.665*** (1.469-1.888) |
| Academic performance | | 1.111** (1.041-1.187) |
| Management Major (0,1) | | 1.355*** (1.179-1.558) |
| Gender (male=1) | | 2.709*** (2.394-3.066) |
| ADHD Diagnosis (0,1) | 1.926*** (1.510-2.457) | 1.792*** (1.393-2.305) |
| <u>Model</u> | | |
| Nagelkerke R ² | 0.005 | 0.077 |
| Chi-square | 24.795*** | 412.292*** |
| -2 Log likelihood | 7513.90 | 7037.85 |
| N | 9,869 | 9,770 |

Significant at: †=0.10, *=0.05, **=0.01, ***=0.001, 2-tailed.

Note: Differences in reported Ns are per missing data from some subjects (SPSS pairwise exclusion).