

A Meta-Analysis of Correlations between Trait Mindfulness and Impulsivity: Implications for Counseling

Junfei Lu¹  • Keith Huffman¹

Published online: 11 August 2017
© Springer Science+Business Media, LLC 2017

Abstract This study applied meta-analysis to investigate mean correlations between self-report measures of awareness and attention (AA) of trait mindfulness, and five major sub-traits of impulsivity that underlie various behavioral problems (e.g., binge drinking) and/or mental health issues. In total, we identified 13 articles and retrieved relevant information when provided. The results revealed that AA had various degrees of mean correlations (from small to large) with different impulsive sub-traits. Implications for counseling practice and future research are discussed.

Keywords Mindfulness · Impulsivity · Meta-analysis · Counseling · Mental health

Introduction

Impulsivity can be defined as a “predisposition toward rapid, unplanned reactions to internal or external stimuli with diminished regard to the negative consequences of these reactions to the impulsive individual or to others” (Fineberg et al. 2014, p. 70). It has been related to quite a few problematic behaviors, such as risky driving (Bachoo et al. 2013), physical violence (Chen et al. 2014), binge drinking (Townshend et al. 2014), delinquency (Vogel and Barton 2013), substance use, and risky sexual behaviors (Agarwal et al. 2013). Moreover, impulsivity is a major diagnostic criteria underlying a number of mental disorders; for instance, borderline personality disorder (Kotov et al. 2010), alcohol abuse (Christopher et al. 2013), eating disorders (Waxman 2009), substance abuse (Robinson et al. 2014), depression and anxiety (Corruble et al. 2003). In such cases, an individual’s impulsive urge seems to become refractory and difficult to control.

✉ Junfei Lu
junfei1982@gmail.com

¹ Department of Educational Studies in Psychology, Research Methodology and Counseling, The University of Alabama, Box 870231, Tuscaloosa, AL 35487, USA

Multidimensional Nature of Impulsivity

Impulsivity is a multidimensional construct. Eysenck and Eysenck (1985) conceptualized it as consisting of impulsiveness (i.e., narrow impulsive) and venturesomeness. The former highlights typical impulsive behaviors that feature acting without thinking, while the latter associates with risk taking and sensation seeking behaviors. The well-known *Eysenck's Impulsivity Inventory* was developed for the purpose of measuring these two aspects of impulsivity, in addition to considering it in relation to empathy (Eysenck et al. 1985). In comparison, Patton et al. (1995) concluded that impulsivity is composed of three sub-traits: motor impulsiveness (Im), non-planning (Inp), and attentional impulsiveness (Ia). Im describes how a person acts or reacts without deliberate thinking; Inp relates to an individual who lacks a sense of future and does not want to plan ahead; and, finally, Ia features a person who has problems with paying attention or keeping a stable thought process. The *Barrat Impulsiveness Scale* version 11 (BIS-11; Patton et al. 1995) was developed in accordance with these sub-traits (i.e., Im, Inp, and Ia).

A more comprehensive perspective toward impulsivity comes from Whiteside and Lynam's (2001) study. They explored the factor structure of impulsivity within the framework of the Five Factor Model of personality (FFM; McCrae and Costa 1990). Specifically, they applied exploratory factor analysis on a number of impulsivity measures (e.g., the *Eysenck's Impulsivity Inventory* and the BIS-11) and impulsivity-related facets in the *Revised NEO Personality Inventory* (NEO-PI-R; Costa and McCrae 1992), which was developed based on the FFM. The results of their analysis revealed four dimensions of impulsivity – urgency, (lack of) premeditation, (lack of) perseverance, and sensation seeking. Urgency commonly associates with negative emotions and reflects one's urge to escape those distresses. Lack of premeditation features one's acting upon an urge without taking the consequence into consideration. Lack of perseverance discloses one's inability to maintain attention on difficult or boring tasks. Finally, sensation seeking encompasses those people who are attracted to engaging in exciting or risky activities. These four dimensions compose the *UPPS Impulsive Behavior scale* (Whiteside and Lynam 2001). Cyders et al. (2007) suggested an additional dimension "Positive Urgency," which describes one's impulsive behaviors due to positive moods. Together these five facets make up the *UPPS-P Impulsive Behavior Scale* (Lynam et al. 2006).

Mindfulness and Impulsivity

Currently, Lynam et al.'s (2006) five-factor model of impulsivity is likely the most inclusive, and researchers have applied this model to investigate various impulsive-related behaviors or mental health issues. Meanwhile, there have been a growing number of studies in recent years to explore the relationship between impulsivity and mindfulness (cf., Christopher et al. 2013; Papias et al. 2012). This increasing interest in mindfulness reflects ongoing efforts of researchers to explore potential approaches to regulate one's impulsive urges. The concept of mindfulness has been promulgated globally and its practices have received great attention from researchers and mental health practitioners all over the world in an effort to use mindfulness to deal with various mental illnesses and generalized well-being (Baer 2003; Carmody and Baer 2009; Hofmann et al. 2010; Toneatto and Nguyen 2007).

Mindfulness can be described as a state, a trait, and a practice. As a state, mindfulness is a moment-by-moment "regulation of attention while cultivating an open orientation to experience" (Bishop et al. 2004, p. 234). Scholars such as Brown et al. (2007) and Holas

and Jankowski (2013) also name this as “bare attention”; i.e., simply being aware of the present moment without singular attachment to objects (e.g., thoughts and feelings). Mindfulness can also be perceived as a human trait, mainly reflecting individual differences in the ability to deploy attention to the here and now (Brown and Ryan 2003). Finally, mindfulness also refers to a series of practices designed to help practitioners cultivate bare attention in order to promote their mindfulness traits. These practices include, but are not limited to, mindful eating, mindful breathing, body scan, yoga, and advanced mindful meditation (Stahl and Goldstein 2010).

Regardless of whether one treats mindfulness as a trait, state, or a practice, awareness and attention is the core process. Although some scholars (e.g., Baer et al. 2004; Kabat-Zinn 2003) also highlight the importance of non-judgment when defining mindfulness, others perceive non-judgment as an effect of being mindful rather than being a part of mindfulness itself. For example, Brown et al. (2007) define mindfulness as “a receptive attention to and awareness of present events and experience” (p. 212).

In this present study, we mainly focused on attention and awareness with regard to mindfulness. This decision was based on the views that (1) there is a consensus in the literature that the main mechanism of mindfulness underlies awareness and attention (Brown et al. 2007; Kabat-Zinn 2003); and (2) there are a number of entry-level mindfulness practices that simply teach individuals skills of paying attention and being aware, which lay the foundation for more advanced practices (Stahl and Goldstein 2010).

An impulsive person is frequently characterized by having an instant urge to act (Fineberg et al. 2014). Furthermore, this person might not even be aware of such an urge but acts anyway (Peters et al. 2011). Mindfulness, through its bare attention and awareness, could help individuals experience “sensations, emotions, and thoughts in a way that is clearer and more distinct” (Holas and Jankowski 2013, p. 236). Thus, it is reasonable to envision that a mindful person could detect his/her impulsive urge when it emerges, thereby being more likely to regulate it.

Following this logic, we assume a moderate to large correlation between mindfulness and impulsivity. In the literature, for example, there is ample evidence to support the salutary effects of mindfulness practices in treating borderline personality disorder (Wupperman et al. 2008), depression (Brown and Ryan 2003), and alcohol abuse (Katie et al. 2005), in which impulsivity usually is presented as a key trait. However, it is rare for those studies to directly attend to impulsivity when mindfulness practices are used as an intervention. Thus, we still know little about the extent to which impulsivity and mindfulness relate.

Importance of the Study

The current study aims to apply meta-analysis to synthesize study outcomes regarding the correlations between mindfulness and impulsivity. Since there are few studies that focus on how mindfulness state or mindfulness practices are relevant to impulsivity, our attention is primarily on trait mindfulness and impulsivity. In addition, we perceive mindfulness as being a unique way of paying attention and being aware.

This study is critical for counseling in several aspects. First, although mindfulness practices have been supported as being effective when dealing with a number of problematic behaviors and mental disorders wherein impulsivity plays a significant role (cf., Bachoo et al. 2013; Chen et al. 2014; Kotov et al. 2010; Robinson et al. 2014; Townshend et al. 2014; Waxman 2009), little has been done to clarify the relationship between impulsivity and mindfulness. A

synthesis of correlations between impulsivity and mindfulness could provide a more convincing argument for the necessity to consider these two concepts jointly. Second, should there be a strong correlation, this study would lay the foundation for future scholars and therapists to extensively investigate the effectiveness of mindfulness practices on regulating clients' urges. Lastly, this study on mindfulness and impulsivity may pave the road for future research to test the mechanism/s through which mindfulness practices take effect in order to handle impulse-related behaviors (e.g., drinking problems).

Method

Literature Search

Two authors comprised the research team; the first author is a faculty member and the second a master's-level student. We employed two search engines – PsycINFO and Google Scholar. The keywords applied were “mindfulness,” “mindful,” “mindfulness traits,” “impulsivity,” “impulse control,” “impulsiveness,” and “impulsive.” We combined these keywords alternatively with Boolean operators (e.g., “AND”, and “OR”) to (a) maximize findings when using PsycINFO; or (b) narrow down findings to a manageable amount when using Google Scholar. We searched from the year of 1970 to 2016. The decision on 1970 comes from the fact that Kabat-Zinn (2003) first introduced the mindfulness concept and practice to the U.S. around that time.

The search engine of PsycINFO yielded a total of 72 resources, and the search engine of Google Scholar identified 1800. We then reviewed all of those resources according to the following inclusion criteria: (1) it was a research article/thesis/dissertation; (2) it was written in English; (3) it measured mindfulness as a trait (i.e., mindfulness was assessed through a self-report scale); (4) the measure of mindfulness awareness and attention could be singled out from a scale; (5) it measured impulsivity as a trait (i.e., impulsivity was assessed through a self-report scale); and (6) it contained (or could be converted to) Pearson bivariate correlation regarding mindfulness and impulsivity measures. By these guidelines, we identified 13 resources. Among them, 12 were published research papers, and one was a thesis.

Data Coding

In order to systematically retrieve information from those resources, we developed a codebook to help identify and organize key data. Variables included in this codebook were: (a) the name(s) of author(s) and the year of publication or completion; (b) the source of the study (i.e., journal article or thesis); (c) the roles of participants (e.g., students); (d) number of females; (e) number of non-Caucasians; (f) mean age and age range (if available); (g) sample size; (h) mindfulness measurements; (i) impulsivity measurements; and (j) Pearson bivariate correlations between mindfulness and impulsivity. Particularly, we classified available correlations into five groups: (1) awareness/attention (AA) with premeditation (PM); (2) AA with perseverance (PS); (3) AA with negative urgency (NU); (4) AA with positive urgency (PU); and (5) AA with sensation seeking (SS). The impulsive sub-traits were retrieved from the *UPPS-P Impulsive Behavior Scale*, with this decision being based on the fact that the original developers of the *UPPS Impulsive Behavior Scale*, Whiteside and Lynam (2001), offered clear reference as to how other impulsive measures loaded on these sub-traits.

We spent time discussing the meanings of the coded variables to ensure that we interpreted each variable similarly, and then collaboratively worked on one randomly selected resource to retrieve key information according to the codebook. Following this action and subsequent discussion, we independently coded the remaining articles. Finally, we compared results and discussed any inconsistencies until consensus was reached.

Data Analysis

The entire analysis was based on the software Comprehensive Meta-Analysis© (CMA) version 3.3–070. Meta-analysis is a quantitative form of systematic review to synthesize effects of interventions, or relationships between variables, in order to provide a more balanced or general understanding of a treatment or phenomenon of interest (Cook et al. 1997).

A key statistic of interest in meta-analysis is effect size (*ES*). It can take forms of standardized mean difference, odds ratio, and correlation (Borenstein et al. 2009). In this study, we used Pearson bivariate correlation as an indicator of *ES*. There are two models of *ES* calculations – (1) fixed-effect, and (2) random-effects. In the fixed-effect model, all *ES*s from studies are assumed to come from a shared population in which there is only one common (true) *ES*. As Borenstein et al. (2009) noted, in this model “all factors that could influence the effect size are the same in all the studies” (p. 63). In comparison, a random-effects model assumes that true *ES* varies across different studies, given the unique features of each study. In this research, our primary application was the random-effects model due to there being a number of variations across studies (e.g., characteristics of samples, and different measures of impulsivity).

Effect Size (*ES*) Calculation

We attended to Pearson bivariate correlations (*r*) when considering the *ES*, between trait mindfulness and impulsivity. When retrieving *r*s, we only focused on the correlation between the awareness/attention (AA) dimension of trait mindfulness and the sub-traits of impulsivity. When the total correlation between AA and a sub-trait of impulsivity was available, we retrieved this correlation. When a sub-trait of impulsivity was composed of a number of measures (e.g., all subdomains in the BIS-11 target premeditation), we calculated the mean *r* between impulsivity measures and AA. When a study reported the correlations between a sub-trait of impulsivity and two or more measures of AA, we calculated the mean *r* across the different measures.

In some studies the researchers reported the correlations between impulsivity and AA across two samples. However, they did not clarify whether or not these samples were independent. In such cases, we only focused on the sample with the larger sample size, which was thought might yield a more accurate estimate. Finally, all retrieved *r*s were justified according to corresponding measurement reliabilities. When scale reliability was provided in a study, we applied it accordingly. If not, we referred to its original reliability score when the scale was developed.

For the analysis, all *r*s were firstly transformed to corresponding Fisher's *z* (z_i ; i.e., ES_z) scores to estimate related statistics (e.g., mean *ES*, *Q*). To account for the unequal variances among studies, each ES_z was weighted by the inverse of its respective sample variance, which is based on sample size, to attain the mean ES_z and relevant 95% confidence interval (*CI*). Other than mean ES_z and its 95% *CI*, we also reported *Q* statistic, I^2 and τ . *Q* statistic indicates

whether the heterogeneity of variances among samples can be attributed to random error. I^2 reflects the proportion of variance that can be accounted for by true differences in ES_z s, and τ can be perceived as the standard deviation of such true ES_z s (Borenstein et al. 2009). Finally, mean ES_z and corresponding 95% *CI* were converted back to ES_r , the meanings of which were then interpreted and discussed.

Publication Bias

Finally, if the mean ES_r was statistically significant, we then examined two statistics to identify potential publication bias. Publication bias assumes that a study with significant results is more likely to be published than if otherwise (Borenstein et al. 2009). It would not be uncommon for identified studies to be biased in that only those with significant findings would be available from the search process. To estimate the magnitude of such potential bias, one approach is to predict how many missing studies with small/zero degree of ES_r one needs to obtain in order to drag the significant mean ES_r back to being non-significant. Two statistics used were Rosenthal's *Fail-safe N*, and Orwin's *Fail-safe N*. The former reports the number of missing studies one needs in order to attain a mean ES of zero, while the latter allows one to set a non-zero mean ES , which is non-significant in a practical sense. In this study, we set this value at .05, which reflects a mean ES that lies in between a correlation of zero and a small figure ($r = .10$; Cohen 1988).

Results

Participants Characteristics

Among the 13 studies, there were in total 2821 participants. Eleven studies included both genders (percentages of females ranged from 45% to 81%), one study had no females, and one had 100% female participants. Six studies were from the United States, two from India, one from Greece, one from the United Kingdom, and three from Australia. Regarding race/ethnicity, five studies had both Caucasian and non-Caucasian participants (percentages of Caucasians ranged from 49% to 86%); six studies had no report on race/ethnicity; and two studies had no Caucasians.

As for participant roles, eight studies recruited samples from undergraduate students and were aged from 18 to 30. One study recruited only individuals from the military with a mean age of 25. One study involved students, faculty, and staff members in a university, with a mean age of 24 within a range from 18 to 65. One study was composed of college student participants, as well as people from a local community, with a mean age of 26 in a range of 19 to 49. Two studies had both healthy individuals as well as those with behavioral or substance dependence issues, with a mean age of 27 and 29, respectively. For details, see Table 1.

Measurement Scales

Impulsivity Measure

In general, there were five types of scales used to measure impulsivity in the current review. These were the UPPS-P (Lynam et al. 2006), BIS-11 (Patton et al. 1995), the narrow impulsive

Table 1 Sample characteristics, measurement scales, and correlations (r) between awareness and attention sub-trait of mindfulness and five sub-traits of impulsivity

Author	Sample	Female%	White%	Age (Range)	Sample size	Mindfulness measure	Impulsivity measure	AA/ PS (r)	AA/ NU (r)	AA/ PM (r)	AA/ PU (r)	AA/ SS (r)
Brown and Ryan (2003)	Undergraduates	66	73	20 (18–23)	313	MAAS	NEO personality inventory-impulsivity	-0.38 (-.29)				
Christopher et al. (2013)	Undergraduates	67	77	24	125	MAAS	Eysenck impulsiveness scale	-0.55 (-.45)				
Fetterman et al. (2010)	Undergraduates	56	N/A	N/A	91	MAAS	Eysenck impulsiveness scale	-0.60 (-.45)				
Lattimore et al. (2011)	Students and people within a community	100	N/A (United Kingdom)	26 (19–49)	190	FFMQ	BIS-11	-0.66 (-.56)				
Lyvers et al. (2014a)	Substance dependent clients and people within a community	51	N/A (Australia)	29 (18–63)	207	MAAS	BIS-11	-0.61 (-.52)				
Lyvers et al. (2014b)	Undergraduates	57	N/A (Australia)	21 (18–30)	153	MAAS	BIS-11	-0.36 (-.30)				
Manziotis (2014)	Military recruits	0	N/A (Greece)	25	160	MAAS	BIS-11	-0.53 (-.44)				
Murphy and MacKillop (2012)	Undergraduates	81	86	20 (18–23)	116	FFMQ	UPPS-P	-0.39 (-.33)	-0.51 (-.45)	-0.18 (-.16)	-0.36 (-.32)	-0.21 (-.18)
Peters et al. (2011)	Undergraduates, faculty, and staff	59	49	24 (18–65)	347	MAAS (FFMQ)	BIS-11	-0.60* (-.50)*				
Rajesh (2013)	Undergraduates	45	0 (India)	20 (18–27)	321	MAAS	UPPS-P	-0.2 (-.17)	-0.57 (-.50)	-0.15 (-.13)	-0.54 (-.47)	-0.14 (-.12)
Rajesh et al. (2013)	Undergraduates	61	0 (India)	19 (18–26)	370	MAAS	BIS-11	-0.61 (-.50)				
Williams and Grisham (2012)	People with compulsive buying problems and health individuals	85	N/A (Australia)	27	86	MAAS	UPPS-P	-0.38 (-.33)	-0.42 (-.38)	-0.3 (-.27)	-0.37 (-.34)	-0.09 (-.08)
Wupperman et al. (2008)	Undergraduates	73	63	N/A	342	MAAS	Emotional means-end Problem-solving test	-0.35 (-.27)				

MAAS stands for Mindful Attention Awareness Scale; FFMQ stands for Five Facet Mindfulness Questionnaire; BIS-11 stands for Barrat Impulsiveness Scale version 11; UPPS-P stands for UPPS-P Impulsive Behavior Scale. AA stands for awareness and attention; PS stands for perseverance, NU stands for negative urgency; PM stands for premeditation; PU stands for positive urgency; and SS stands for sensation seeking

Correlations within () are original ones, while without () are reliability-justified ones

*Correlation was calculated based on the mean correlation between the impulsivity measure and both MAAS and FFMQ

subscale in the *Eysenck Impulsiveness Scale* (Eysenck et al. 1985), the *NEO Personality Inventory-Impulsivity* (Costa and McCrae 1992), and the *Emotional Means-End Problem-Solving Test* (MEPS-Emo; Linehan et al. 1987). In Whiteside and Lynam's (2001) study, the narrow impulsive subscale in the *Eysenck Impulsiveness Scale* mainly loaded on the sub-trait of premeditation, and the *NEO Personality Inventory-Impulsivity* mainly loaded on negative urgency. All sub-scales in the BIS-11 loaded on the sub-trait of premeditation when the BIS-11 was factor analyzed with all subscales in the *NEO Personality Measure* and several other impulsivity measures. This result is consistent with Patton et al.'s (1995) belief when they developed the BIS-11 that impulsivity should be best defined as an affect-free concept. Finally, the MEPS-Emo mainly attends to one's impulsive behaviors due to negative emotions, thus conceptually fitting well with the sub-trait of negative urgency.

Mindfulness Measure

There were two mindfulness measures used across studies in this review – the *Mindful Attention Awareness Scale* (MAAS; Brown and Ryan 2003) and the *Five Facet Mindfulness Questionnaire* (FFMQ; Baer et al. 2006). Both the MAAS and the subscale of “Act with Awareness” in the FFMQ primarily measure one's awareness and attention of trait mindfulness. Although the FFMQ is a multidimensional measure of mindfulness, in this study we only focused on awareness and attention, which underlie the foundation of mindfulness (Brown et al. 2007; Kabat-Zinn 2003).

Effect Size

In general, all point estimates of ES_r (i.e., mean value) between awareness and attention (AA) of trait mindfulness and sub-traits of impulsivity were significantly larger than zero, and for AA and sensation seeking, $Q = .73$, $df = 2$, $p = .68$. This non-significant result implied that the variation of ES_r s within three corresponding articles was minimal, and thus a fixed-effect model might be good enough to describe the mean ES_r , which was equal to $-.15$ with 95% CI ($-.06$, $-.23$).

Regarding publication bias, both Rosenthal's *Fail-safe N*, and Orwin's *Fail-safe N* yielded a number of six. Rosenthal (1991) suggested using a threshold of $5n + 10$ to determine whether or not publication bias existed based on the result of the Fail-safe test, in which n is equal to the number of articles. Given this standard, although mean ES_r was statistically less than zero, it may be influenced by publication bias since six is less than 25 (5×3 [three articles] + 10).

AA and perseverance had $Q = 5.06$, $df = 2$, $p = .08$. The non-significant p -value also indicated that a random-effects model might not be necessary. The mean ES_r was $-.27$ with 95% CI ($-.19$, $-.35$), Rosenthal's *Fail-safe N* = 33, and Orwin's *Fail-safe N* = 14. The calculated cut-off point was also 25 (5×3 [three articles] + 10). Since 25 is in between 14 and 33 , it is possible that the mean ES_r was influenced by publication bias and, therefore, the significant result might not hold up on that account.

AA and positive urgency had $Q = 6.0$, $df = 2$, $p = .05$. This outcome supported the random-effects model. In particular, 66% (I^2) of the total sample variance could be accounted for by true difference between study ES_r s, which had a standard deviation (τ) of $.12$. The mean ES_r was $-.44$ with 95% CI ($-.30$, $-.57$), and Rosenthal's *Fail-safe N* = 85, and Orwin's *Fail-safe N* = 29, both of which surpassed the cut-off of 25 (5×3 [three articles] + 10).

AA and negative urgency yielded $Q = 16.20$, $df = 4$, $p = .003$, which made the random-effects model reasonable. The result of I^2 indicated that 75% of the total sample variance could

be accounted for by true difference between study ES_s s, which had a standard deviation (τ) of .12. The mean ES_s was $-.45$ with 95% CI ($-.35, -.54$), and Rosenthal's *Fail-safe* $N = 321$, and Orwin's *Fail-safe* $N = 43$, both of which were over the cut-off of 35 (5×5 [five articles] + 10).

Finally, AA and premeditation reached $Q = 110.30$, $df = 10$, $p < .001$, which supported the random-effects model. The result of I^2 indicated that 91% of the total sample variance could be accounted for by true difference between study ES_s s, which had a standard deviation (τ) of .23. The mean $ES_s = -.49$ with 95% CI ($-.37, -.59$), and Rosenthal's *Fail-safe* $N = 1164$, and Orwin's *Fail-safe* $N = 110$, both of which were above the cut-off of 65 (5×11 [11 articles] + 10).

Discussion

This meta-analysis aimed to reach a firmer understanding of the relationship between trait mindfulness and impulsivity. Although the number of studies involved was limited, the results obtained from them are informative. Awareness and attention (AA) is the key mechanism that underlies mindfulness (Brown and Ryan 2003). In order to control a person's impulsive urge, it is reasonable to expect him or her firstly to be aware of and pay attention to the said urge.

Among five sub-traits of impulsivity, we found that not all of them reached a substantial mean ES_s with AA (e.g., moderate to high correlations). For example, the mean ES_s between AA and sensation seeking was about $-.15$, far below the moderate degree ($r = -.30$; Cohen 1988). Sensation seeking attends to one's searching for excitement or novel experiences, which may or may not involve danger. In Whiteside and Lynam's study (Whiteside and Lynam 2001), scales loading on this dimension included Dickman's (1990) functional impulsivity subscale and the venturesomeness subscale in the *Eysenck's Impulsivity Inventory* (Eysenck and Eysenck 1985). The former focuses on the efficiency side of being impulsive (e.g., fast thinking) and the latter correlates significantly with the personality trait of extraversion, which rarely has a negative connotation.

Meanwhile, sensation seeking can also lead to dangerous or risky behaviors. Nevertheless, the low mean ES_s , as well as the potential issue of publication bias, calls into attention that AA may not have a significant correlation with sensation seeking in a practical sense. In addition, the mean ES_s between AA and perseverance was $-.27$ and this finding was suspected to be due to the existence of publication bias. Perseverance attends to "one's ability to remain with a task until completion and avoid boredom" (Whiteside and Lynam 2001, p. 677). Persons with high trait mindfulness tend to be present-focused. Therefore, a mindful person can pay attention to each bite of food; feel each step while walking; and experience each inhalation and exhalation of breath. This focus on the present ought to counteract one's tendency toward getting distracted and experiencing feelings of boredom. However, the current result only presented a moderate degree of association. In fact, owing to the issue of publication bias, it is possible that there was little actual correlation between the two. Strictly speaking, the current outcomes cast doubts on the effect of the principal trait of mindfulness (i.e., AA) in relation to one's impulsive behaviors that are induced by sensation seeking and perseverance.

In comparison, the results of the mean correlations (mean ES_s) between AA and positive urgency, negative urgency, and premeditation were not only statistically significant, but had a 95% CI ranged in between a moderate ($r = -.30$) and large degree ($r = -.50$; Cohen 1988). Moreover, the results of all Q statistics supported a random-effects model and the tests on publication bias upheld the validity of these mean ES_s .

Positive and negative urgencies describe a person who acts impulsively under the influence of strong emotions, whether good or bad. In particular, Smith and Cyders (2016) noted that urgency tends to associate with risk-taking behaviors that reach a problematic level, such as drug abuse, risky sexual behaviors, and over consumption of alcohol. Although there are researchers who conceptualize impulsivity from an affect-free perspective (e.g., Patton et al. 1995), more and more studies have underscored the crucial role of emotion in driving one's impulsive behaviors (Whiteside and Lynam 2001). On the other hand, there is ample evidence to support a high correlation between one's trait mindfulness and emotions (Brown and Ryan 2003). In fact, successful emotion regulation is one of the major goals of mindfulness practice (Kabat-Zinn 2003). The current findings of mean ES_s confirmed substantial relationships between AA and both urgencies, thus shedding light on the potential effect of mindfulness in dealing with one's impulsivity that is affect-laden. It is also interesting to mention that a random-effects model was appropriate for both analyses of mean ES_s between positive/negative urgencies and AA. The results showed that 66% (I^2) of total sample variance could be accounted for by heterogeneity among study ES_s regarding positive urgency and AA. This value was 75% for studies on negative urgency and AA. Given these magnitudes of I^2 , it is reasonable to posit that there are other factors that influence the degree of association between AA and positive/negative urgency.

Lastly, premeditation attends to "the tendency to think and reflect on the consequences of an act before engaging in that act" (Whiteside and Lynam 2001, p. 685). A lack of premeditation represents the most typical form of impulsivity – acting without thinking. The mean ES_s obtained in this analysis between premeditation and AA reached a high magnitude, with a 95% CI in between moderate to high degree. These outcomes strongly upheld a substantial relationship between AA and this common form of impulsivity. Acting without thinking features in a number of disorders found in the fifth edition of the American Psychiatric Association's diagnostic and statistical manual of mental disorders (DSM-5), especially under the chapter on Disruptive, Impulse-Control, and Conduct Disorders (American Psychiatric Association 2013). In addition, clients with attention-deficit hyperactivity disorder (ADHD) often experience difficulty acting/reacting with deliberate thinking (Fineberg et al. 2014).

The current finding reveals a critical role of AA in relation to this impulsive sub-trait. Meanwhile, the large magnitude of I^2 (91%) disclosed that there exists other factors which account for this variation, beyond random error. Since there were 11 studies involved, the result of the estimated standard deviation ($\tau = .23$) of those ES_s were more reliable than those based on three or five articles (e.g., $\tau = .12$ for AA with both urgencies) (Borenstein et al. 2009).

Implication

For Research

The moderate-to-large mean ES_s discovered in this study between AA of the trait mindfulness and several key dimensions of impulsivity disclose a promising realm that researchers need to further investigate. Future investigations can/should focus on factors that contribute to the variation among sample ES_s found in this study (as indicated by significant Q and I^2 statistics). Moreover, researchers can design experimental studies to explore the effects of mindfulness practices on individuals' impulsive behaviors. Until recently, there have been several study reports regarding how mindfulness interventions impacted an individual's impulsivity (cf., Barnert et al. 2014; Le and Proulx 2015). However, these studies did not yield statistically

significant outcomes. Other than the issue of small sample sizes recruited in those studies, the inattention toward the domain-specific aspect of impulsivity might also play a role. As implied in this analysis, not all sub-traits of impulsivity had moderate to large mean *ES*, when correlating with AA of trait mindfulness. This awareness should assist researchers in employing more delicate measures of impulsivity when examining the effect of mindfulness practice on it.

In addition, this study revealed that two sub-traits of impulsivity (i.e., sensation seeking and perseverance) yielded mean correlations with AA lower than a moderate degree. Meanwhile, these outcomes were susceptible to the influence of publication bias. A straight interpretation to these findings is that we need more research endeavors to help clarify the magnitude of those relationships. For instance, sensation seeking can lead to either healthy (e.g., hiking) or unhealthy (e.g., binge drinking) behaviors, which may associate with mindfulness oppositely. A mindful person is more likely to conduct healthy than unhealthy behaviors. Is it possible, then, that sensation seeking can have both positive and negative correlations with AA of trait mindfulness, given the nature of these behaviors? If so, the current finding of small *ES*, might reflect a counterbalanced effect.

Another facet we need to highlight is that AA is just one aspect of trait mindfulness, although it appears to be the most fundamental. It is imperative for future studies to extend their investigations to the association between other aspects of trait mindfulness (e.g., non-judgement; Kabat-Zinn 2003) and impulsivity. These results would provide guidance to follow-up feasibility research that aims to employ appropriate mindfulness activities to regulate one's problematic behaviors featured by one or more impulsive sub-traits.

For Counseling

The results of this study have unique implications for counseling practice. Counseling professions have embraced a wellness model when working with clients (Hattie et al. 2004). This model pays more attention to human strength/potential than weakness/problems. The correlations found in this study between AA of trait mindfulness and sub-traits of impulsivity provide both counselors and clients an opportunity to use a wellness perspective to understand excessive impulsivity that leads to trouble.

For example, a client might disclose that he/she frequently acts impulsively without forethought, or even is not aware of his/her impulsive urges until bad consequences occur. A counselor, who is problem-focused, may help clients recall those incidences and probably identify cues that trigger one's impulsive urges and consequences of acting upon such urges. As illustrated, this whole process could be seen to primarily center on impulsivity, which may have bothered this client for a while, and thus may automatically induce uncomfortable feelings about this topic, although it would seem essential to discuss. Meanwhile, a counselor may instantly relate impulsivity with a major personality trait of neuroticism, which underlies a sizable amount of mental health problems (Ormel et al. 2013). In essence, both parties engage in a discussion on impulsivity, and the whole counseling process aims to solve this problem.

In comparison, the results of this study support the potential role of mindfulness as being an antidote to impulsivity. Counselors with this mindset can introduce mindfulness to their clients with impulse-control problems, and highlight the close relationship between the two. As for clients, the concept of mindfulness may be new to them or perhaps links with its adjective form – (being) mindful, which is little likely to indicate something aversive. Thus, a discussion of mindfulness and impulsivity may avoid revolving around a problem-centered communication between counselors and clients, and even encourage clients to try mindfulness practice.

Regarding practice, counselors might selectively use different mindfulness activities to help clients modulate or adjust their impulsive urges or behaviors. For instance, activities such as mindful eating, mindful walking, and mindful breathing chiefly attend to awareness and attention (Stahl and Goldstein 2010). Although thus far a causal model has not been developed to confirm the effect of mindfulness practice on impulsivity control, there were no reports (to our knowledge) that demonstrate any negative consequence of practicing these mindfulness activities in regard to clients' general well-being. On the contrary, study evidence has greatly supported the effects of various mindfulness-centered interventions (e.g., mindfulness-based stress reduction, acceptance and commitment therapy) to alleviate clients' stress levels and enhance physical or mental health (Brown et al. 2007). Therefore, counselors may incorporate these evidence-based practices into the regular treatment plan of clients who disclose impulse control problems.

From a holistic perspective toward health, even though those mindfulness practices may not directly lead to a decline of impulsive activities, it can still help with general health promotion, which may indirectly be conducive to one's control of impulsivity. The instructions of those mindfulness practices that particularly pertain to awareness and attention can be found in various places, from online resources to self-help workbooks. Thus, counselors may feel comfortable to introduce those practices to their clients without an excessive concern of professional competence. However, formal mindfulness training and regular practice are still desirable for counselors to pursue since these experiences would definitely be beneficial in enhancing counselors' self-efficacy toward assigning such practices to their clients. Finally, due to the fact that there are so many mindfulness resources, counselors need to be cautious when suggesting any particular mindfulness practices to their clients. The tenet of evidence-based practice is critical when making a suggestion.

Limitations

Several limitations of this paper need to be stressed. First, the number of articles identified in this study is limited ($n = 13$), given the nature of the studied variables. Therefore, the results mainly serve as a reference, rather than offering definite conclusions on the correlations between AA of trait mindfulness and impulsivity. Second, this study only focused on one facet of trait mindfulness. Due to the fact that trait mindfulness is a multidimensional concept (Baer et al. 2006), readers should avoid over-interpreting the current results and treat these findings as reflecting an overall relationship between trait mindfulness and impulsivity. Finally, this study aimed towards the mindfulness trait and dispositional impulsivity, both of which attend to individual characteristics, rather than an actual mindful state or impulsive responses. Readers should keep this in mind when interpreting the results.

Conclusion

In conclusion, the current study initiated a synthesis of contemporary research results on the correlations between awareness and attention (AA) of trait mindfulness and sub-traits of impulsivity. The results indicated moderate-to-large correlations between AA and impulsive sub-traits of negative/positive urgencies, as well as (lack of) premeditation, while there were small correlations with sensation seeking and (lack of) perseverance. These outcomes highlight the necessity to explore the relationship between trait mindfulness and impulsivity from a

multidimensional perspective, and hopefully encourage and direct future studies to investigate the potential role of mindfulness in modulating one's impulsive urges.

Compliance with Ethical Standards

Conflict of Interest The author declares that there is no conflict of interest.

References

- Agarwal, S., de Araujo, P., & Jayash, P. (2013). HIV-related knowledge and risky sexual behaviour in sub-Saharan Africa. *Oxford Development Studies*, *41*(2), 173–189.
- American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. Washington, DC: American Psychiatric Association.
- Bachoo, S., Bhagwanjee, A., & Govender, K. (2013). The influence of anger, impulsivity, sensation seeking and driver attitudes on risky driving behaviour among post-graduate university students in Durban, South Africa. *Accident Analysis and Prevention*, *55*, 67–76.
- Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*, *10*, 125–143.
- Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: The Kentucky inventory of mindfulness skills. *Assessment*, *11*(3), 191–206.
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*, 27–45.
- Barnert, E. S., Himelstein, S., Herbert, S., Garcia-Romeu, A., & Chamberlain, L. J. (2014). Exploring an intensive meditation intervention for incarcerated youth. *Child and Adolescent Mental Health*, *19*(1), 69–73.
- Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., et al. (2004). Mindfulness: A proposed operational definition. *American Psychological Association*, *11*, 230–241. doi:10.1093/clipsy/bph077.
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. West Sussex: John Wiley & Sons Ltd..
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822–848.
- Brown, K. W., Ryan, R. M., & Creswell, J. D. (2007). Mindfulness: Theoretical foundations and evidence for its salutary effects. *Psychological Inquiry*, *18*(4), 211–237.
- Carmody, J., & Baer, R. A. (2009). How long does a mindfulness-based stress reduction program need to be? A review of class contact hours and effect sizes for psychological distress. *Journal of Clinical Psychology*, *65*(6), 627–638.
- Chen, C., Li, C., Wang, H., Ou, J., Zhou, J., & Wang, X. (2014). Cognitive behavioral therapy to reduce overt aggression behavior in Chinese young male violent offenders. *Aggressive Behavior*, *40*, 329–336. doi:10.1002/ab.21521.
- Christopher, M., Ramsey, M., & Antick, J. (2013). The role of dispositional mindfulness in mitigating the impact of stress and impulsivity on alcohol-related problems. *Addiction Research and Theory*, *21*(5), 429–434. doi:10.3109/16066359.2012.737873.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale: Erlbaum.
- Cook, D. J., Mulrow, C. D., & Haynes, R. B. (1997). Systematic reviews: Synthesis of best evidence for clinical decisions. *Annals of Internal Medicine*, *126*(5), 376–380.
- Corruble, E., Benyamina, A., Bayle, F., Falissard, B., & Hardy, P. (2003). Understanding impulsivity in severe depression? A psychometrical contribution. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *27*(5), 829–833.
- Costa Jr., P. T., & McCrae, R. R. (1992). *Revised NEO personality inventory manual*. Odessa: Psychological Assessment Resources.
- Cyders, M. A., Smith, G. T., Spillane, N. S., Fischer, S., Annus, A. M., & Peterson, C. (2007). Integration of impulsivity and positive mood to predict risky behavior: Development and validation of a measure of positive urgency. *Psychological Assessment*, *19*, 107–118.
- Dickman, S. J. (1990). Functional and dysfunctional impulsivity: Personality and cognitive correlates. *Journal of Personality and Social Psychology*, *58*, 95–102.

- Eysenck, H. J., & Eysenck, M. W. (1985). *Personality and individual differences: A natural science approach*. New York: Plenum Press.
- Eysenck, S. B. G., Pearson, P. R., Easting, G., & Allsopp, J. F. (1985). Age norms for impulsiveness, venturesomeness, and empathy in adults. *Personality and Individual Differences*, 6, 613–619.
- Fetterman, A. K., Robinson, M. D., Ode, S., & Gordon, K. H. (2010). Neuroticism as a risk factor for behavioral dysregulation: A mindfulness-mediation perspective. *Journal of Social and Clinical Psychology*, 29(3), 301–321.
- Fineberg, N. A., Chamberlain, S. R., Goudriaan, A. E., Stein, D. J., Vanderschuren, L. J. M. J., Gillan, C. M., Shekar, S., et al. (2014). New developments in human neurocognition: Clinical, genetic, and brain imaging correlates of impulsivity and compulsivity. *CNS Spectrums*, 19, 69–89. doi:10.1017/S1092852913000801.
- Hattie, J. A., Myers, J. E., & Sweeney, T. (2004). A factor structure of wellness: Theory, assessment, analysis, and practice. *Journal of Counseling and Development*, 82(3), 354–364.
- Hofmann, S. G., Sawyer, A. T., Witt, A. A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, 78(2), 169–183. doi:10.1037/a0018555.
- Holas, P., & Jankowski, T. (2013). A cognitive perspective on mindfulness. *International Journal of Psychology*, 48(3), 232–243. doi:10.1080/00207594.2012.658056.
- Kabat-Zinn, J. (2003). Mindfulness-based interventions in context. *Clinical Psychology: Science and Practice*, 10(2), 144–156. doi:10.1093/clipsy/bpg016.
- Katie, W., Allen, M. G., & Denise, W. (2005). Mindfulness-based relapse prevention for alcohol and substance use disorders. *Journal of Cognitive Psychotherapy*, 19(3), 211–228.
- Kotov, R., Gamez, W., Schmidt, F., & Watson, D. (2010). Linking "big" personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*, 136(5), 768–821. doi:10.1037/a0020327.
- Lattimore, P., Fisher, N., & Malinowski, P. (2011). A cross-sectional investigation of trait disinhibition and its association with mindfulness and impulsivity. *Appetite*, 56, 241–248.
- Le, T. N., & Proulx, J. (2015). Feasibility of mindfulness-based intervention for incarcerated mixed-ethnic native Hawaiian/Pacific islander youth. *Asian American Journal of Psychology*, 6(2), 181–189. doi:10.1037/aap0000019.
- Linehan, M. M., Camper, P., Chiles, J. A., Strosahl, K., & Shearin, E. (1987). Interpersonal problems solving and para-suicide. *Cognitive Therapy and Research*, 11, 1–12.
- Lynam, D. R., Smith, G. T., Whiteside, S. P., & Cyders, M. A. (2006). *The UPPS-P: Assessing five personality pathways to impulsive behavior (technical report)*. West Lafayette: Purdue University.
- Lyvers, M., Hinton, R., Gotsis, S., Roddy, M., Edwards, M. S., & Thorberg, F. A. (2014a). Traits linked to executive and reward systems functioning in clients undergoing residential treatment for substance dependence. *Personality and Individual Differences*, 70, 194–199.
- Lyvers, M., Makin, C., Toms, E., Thorberg, F. A., & Samios, C. (2014b). Trait mindfulness in relation to emotional self-regulation and executive function. *Mindfulness*, 5, 619–625.
- Mantzios, M. (2014). Exploring the relationship between worry and impulsivity in military recruits: The role of mindfulness and self-compassion as potential mediators. *Stress and Health*, 30, 397–404. doi:10.1002/smi.2617.
- McCrae, R. R., & Costa Jr., P. T. (1990). *Personality in adulthood*. New York: Guilford.
- Murphy, C., & MacKillop, J. (2012). Living in the here and now: Interrelationships between impulsivity, mindfulness, and alcohol misuse. *Psychopharmacology*, 219, 527–536.
- Ormel, J., Jeronimus, B. F., Kotov, R., Riese, H., Bos, E. H., Hankin, B., et al. (2013). Neuroticism and common mental disorders: Meaning and utility of a complex relationship. *Clinical Psychology Review*, 33(5), 686–697. doi:10.1016/j.cpr.2013.04.003.
- Papies, E. K., Barsalou, L. W., & Custers, R. (2012). Mindful attention prevents mindless impulses. *Social Psychological and Personality Science*, 3(3), 291–299.
- Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt impulsiveness scale. *Journal of Clinical Psychology*, 51, 768–774.
- Peters, J. R., Erisman, S. M., Upton, B. T., Baer, R. A., & Roemer, L. (2011). A preliminary investigation of the relationships between dispositional mindfulness and impulsivity. *Mindfulness*, 2, 228–235. doi:10.1007/s12671-011-0065-2.
- Rajesh, S. K. (2013). Psychological correlates of yoga and its application to impulsivity (Unpublished master's thesis). Swami Vivekananda Yoga Anusandhana Samsthana, Bangalore, India.
- Rajesh, S. K., Llavarasu, J. V., & TM, S. (2013). Dispositional mindfulness and its relation to impulsivity in college students. *International Journal of Yoga - Philosophy, Psychology and Parapsychology*, 1, 49–51.
- Robinson, J. M., Ladd, B. O., & Anderson, K. G. (2014). When you see it, let it be: Urgency, mindfulness and adolescent substance use. *Addictive Behaviors*, 39(6), 1038–1041.
- Rosenthal, R. (1991). *Meta-analytic procedures for social research*. Newbury Park: Sage.
- Smith, G. T., & Cyders, M. A. (2016). Integrating affect and impulsivity: The role of positive and negative urgency in substance use risk. *Drug and Alcohol Dependence*, 163, S3–S12.

- Stahl, B., & Goldstein, E. (2010). *A mindfulness-based stress reduction workbook*. Oakland: New Harbinger Publications, Inc..
- Toneatto, T., & Nguyen, L. (2007). Does mindfulness meditation improve anxiety and mood symptoms? A review of the controlled research. *The Canadian Journal of Psychiatry*, *52*(4), 260–266.
- Townshend, J. M., Kambouropoulos, N., Griffin, A., Hunt, F. J., & Milani, R. M. (2014). Binge drinking, reflection impulsivity, and unplanned sexual behavior: Impaired decision-making in young social drinkers. *Alcoholism: Clinical and Experimental Research*, *38*(4), 1143–1150. doi:10.1111/acer.12333.
- Vogel, M., & Barton, M. S. (2013). Impulsivity, school context, and school misconduct. *Youth and Society*, *45*(4), 455–479. doi:10.1177/0044118X11421941.
- Waxman, S. E. (2009). A systematic review of impulsivity in eating disorders. *European Eating Disorders Review*, *17*(6), 408–425. doi:10.1002/erv.952.
- Whiteside, S. P., & Lynam, D. R. (2001). The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences*, *30*, 66–689.
- Williams, A. D., & Grisham, J. R. (2012). Impulsivity, emotion regulation, and mindful attentional focus in compulsive buying. *Cognitive Therapy and Research*, *36*, 451–457.
- Wupperman, P., Neumann, C. S., & Axelrod, S. R. (2008). Do deficits in mindfulness underlie borderline personality features and core difficulties? *Journal of Personality Disorders*, *22*(5), 466–482.