

The Yale Review of
Undergraduate Research in
Psychology,
Volume 7
Spring 2017

Editors-in-Chief:

John Baxter

Michael Berry

Ayotunde Ifaturoti

Journal Staff

Editors-in-Chief

John Baxter, Yale College '17

Michael Berry, Yale College '17

Ayotunde Ifaturoti, Yale College '18

Associate Editors

Rob Colgate, Yale College '18

Sierra Conine, Yale College '18

Luca Eros, Yale College '18

Special thanks to the Yale University Undergraduate Department of Psychology for assisting us in recruiting both journal authors and editors! This effort would also not have been possible without the diligent work of our three associate editors, who each helped to select, edit and format the seven articles that we have chosen to publish this year. Finally, we would like to thank all of our journal authors for the effort they put forth to produce these compelling pieces of academic work!

Please feel free to contact us at yrurpeditors@gmail.com if you have questions, comments, concerns or want to know more about how to make it into next year's edition!

Table of Contents

PAGE 4: Cognitive, Social, Physiological, and Neural Mechanisms Underlying
Self-affirmation: An Integrative Review

*Michelle M. Lee, Kate M. Turetsky, Julie Spicer
Columbia University*

PAGE 20: Polydrug use: Prevalence, Predictors, Pharmacology,
Psychopharmacology

*Ryan Bamsey
Swansea University*

PAGE 48: Self-distancing as an Adaptive Mechanism for Processing Negative
Feedback

*Lena Etzel
Queens University of Charlotte*

PAGE 64: The Effects of Image Priming and BMI on Food and Monetary
Discounting

*Courtney Brewer, Shelby Nichols, Steven B. Wroten
University of Central Arkansas*

Page 74: Music Induced Chills

*Will Halimou
Oberlin College*

Page 78: Depressed People Need Not Apply: Mental Health Stigma Decreases
Perceptions of Employability of Applicants with Depression

*Arunima Kapoor
University of Toronto*

Cognitive, Social, Physiological, and Neural Mechanisms Underlying Self-affirmation: An Integrative Review

Michelle M. Lee, Kate M. Turetsky, Julie Spicer
Columbia University

ABSTRACT. People are motivated to feel that they are adequate—that they are good, competent, and efficacious. When demanding environments threaten this sense of personal adequacy, they may experience stress that can hinder their wellbeing and performance in various contexts. To combat the negative consequences of this type of stress, researchers have explored using self-affirmation interventions that engage participants in an act that reminds them that they are globally adequate in threatening situations. Despite the wide body of literature examining the effects of self-affirmation from a variety of perspectives, the underlying mechanisms of this intervention are still unclear, with investigations into this question relatively disjointed across fields. Thus, the primary aim of this review is to synthesize research on the cognitive, social, physiological, and neurological mechanisms of self-affirmation. This integration illuminates patterns that have emerged from mechanistic examinations of this intervention across different disciplines, highlighting reduction in defensive processing and broadened perspective as particularly important consequences of affirmation that may, in part, drive its beneficial effects. We suggest that integrative research approaches examining the mechanisms of affirmation on multiple levels of analysis and in multiple domains would further our understanding of the key ingredients of this intervention's effects.

People are motivated to feel adequate—in other words, to feel good, competent, and efficacious (Steele, 1988). Yet at some point, all individuals face threats to their sense of personal adequacy, resulting in stress that may hinder wellbeing and performance (Steele & Aronson, 1995). Threats to perceived adequacy come in many different forms, such as receiving critical feedback at school (Yeager et al., 2014), obtaining a diagnosis of a serious illness (Sherman, Nelson, & Steele, 2000), undergoing a high-stakes performance evaluation (Steele & Aronson, 1995; Tajfel & Turner, 1986), or facing negative stereotypes about the intelligence or competence of one's social group (i.e.,

lower self-esteem (Cohen & Garcia, 2005), among other negative effects.

To insulate individuals from psychological threat, researchers have developed interventions based on self-affirmation theory (Steele, 1988)—specifically, the tenet that people are motivated not to maintain perceived adequacy in one specific context (e.g., being a “good enough” *student*), but rather to maintain a global narrative of oneself as morally and adaptively adequate (e.g., being a “good enough” *person*). These interventions capitalize on this idea by engaging participants in an act that reminds of their adequacy in threatening situations. For example, struggling in class may make a

is less likely to get under his/her skin and impact his/her core self-concept. Affirming one's adequacy in a context unrelated to the source of threat shores up one's global sense of adequacy and self-integrity, strengthening self-concept against threat (Harris & Napper, 2005; Steele, 1988).

Researchers have implemented affirmation interventions in different forms. One common version is the values-affirmation intervention, which consists of an exercise requiring participants to think and write about their personal values (McQueen & Klein, 2006). Participants review a list of values, rank them from most-to-least important, then write a brief essay about why their top-ranked value is meaningful to them. Values commonly selected by participants include "relationships with friends and family," "independence," and "religion" (Cohen & Sherman, 2014).

Self-affirmation interventions have successfully mitigated the harmful consequences of threatening situations in prior studies (e.g., Cohen et al., 2006; Cohen et al., 2009). Relative to those who did not self-affirm in conditions of high stress and threat, affirmed individuals have demonstrated improved grades, test scores, and academic motivation (e.g., Cohen et al., 2006; Sherman et al., 2013), better health and increased engagement in healthy habits (e.g., Harris & Epton, 2009), and improved psychological states, including heightened sense of belonging (Cook et al., 2012) and reduced negative thinking (Koole et al., 1999). In general, self-affirmation insulates participants from threats to personal adequacy, rendering them more able to adaptively cope in challenging situations (Cohen & Sherman, 2014).

Despite the wide body of literature examining the effects of self-affirmation, the

(e.g., Taylor & Walton, 2011), allostatic load (Sterling, 2004), reward pathways in the brain (Cascio et al., 2015; Dutcher et al., 2016), and more. Notwithstanding these efforts, however, investigations of affirmation's mechanisms have been relatively disjointed across fields.

Our primary aim is thus to synthesize and review research on cognitive, social, physiological, and neurological mechanisms of the affirmation intervention to build a comprehensive picture of the work thus far. In undertaking this review, we hope to illuminate patterns that have emerged from mechanistic examinations of affirmation across different disciplines. This integration across cognitive, social, physiological, and neural fields will allow for better assessment of prevalent explanations of how affirmation exerts its effects, potentially illustrate cross-disciplinary links, and unveil mechanistic explanations that enhance our understanding of this intervention.

Cognitive Mechanisms of the Affirmation Intervention

Many studies have investigated the cognitive underpinnings of the affirmation intervention. This work clusters into four mechanistic themes: (1) affirmation reduces cognitive load, freeing up mental resources for more adaptive coping; (2) affirmation curbs defensive processing; (3) affirmation shifts information construal from concrete to abstract; (4) affirmation promotes a broader perspective on self-concept and threat. In this section, we review findings across these themes.

Affirmation Reduces Cognitive Load

When individuals encounter threats to their personal adequacy, they may experience an array of cognitive consequences, including negative rumination (e.g., McIntosh & Martin, 1992), impaired inhibition of intrusive thoughts (e.g., Hilt

2003). Previous work revealing these cognitive consequences have focused on stereotype threat (e.g., Johns, Inzlicht, and Schmader, 2008; Schmader & Johns, 2003), but research on other stressors suggests that these cognitive processes broadly occur in response to threat (e.g., performance pressure or social evaluative threat: Beilock & Carr, 2005; psychosocial threat: Kuhlmann, Piel, & Wolf, 2005; physical threat: Mahoney, Castellani, Kramer, Young, & Liberman, 2007). Rumination, intrusive thoughts, and other cognitive disruptions in response to threat can have serious repercussions for performance and wellbeing (e.g., Croizet et al., 2004). These disruptions result in an increased mental load that can distract individuals from the task at hand (Mrazek et al., 2011) and deplete cognitive resources required for adaptive coping, self-regulation, and performance under pressure (Logel & Cohen, 2012).

Research on the cognitive mechanisms of self-affirmation suggests that these interventions improve performance and wellbeing in part by curbing rumination (and thus cognitive load) in threatening conditions. For instance, in studies by Koole and colleagues (1999), affirmed participants ruminated less relative to control participants after receiving failure feedback from an alleged IQ test. Decreased rumination following affirmation may be explained by reductions in the accessibility of threat-related thoughts (as measured through a word-fragment completion task; Schmeichel & Martens, 2005). These findings suggest that the intervention allows individuals to deal with threat by limiting cognitive load engendered by rumination and intrusive threat-related thoughts, allowing mental energy to be directed more constructively to other tasks.

That affirmation reduces cognitive

pressure (Creswell et al., 2013). Furthermore, in paradigms meant to deplete cognitive resources—such as the cold pressor test and arduous numeric puzzle tasks (Schmeichel & Vohs, 2009)—affirmed participants showed less evidence of depletion, keeping their hands submerged in ice water and working on onerous puzzles longer than unaffirmed participants. This heightened self-control in demanding circumstances may be additional evidence that affirmation reduces cognitive load and depletion due to environmental stressors, unfettering cognitive resources to adaptively cope and focus on other goals.

Affirmation Curbs Defensive and Biased Processing

In addition to freeing up cognitive resources that augment coping capacity, self-regulation, and ability to focus on the task at hand, affirmation may also reduce defensive, biased processing in threatening conditions (for an in-depth review, see Sherman & Cohen, 2006). When individuals encounter threatening or counter-attitudinal information, they may be motivated to defensively discount the source and content of threat to protect their own existing beliefs and self-regard (e.g., Cohen, Aronson, & Steele, 2000; Reed & Aspinwall, 1998; Sherman, Nelson, & Steele, 2000). This can result in close-mindedness and a lower likelihood of changing maladaptive thoughts and behaviors in response to new information, even when adaptive change would result in greater health or other positive outcomes (Sherman & Cohen, 2002).

For example, when someone receives health-risk information from a doctor or another source—such as a smoker being told about the health risks of smoking—their sense of feeling smart, healthful, and adaptive may be threatened by the

Chaikin, 1992; Reed & Aspinwall, 1998; Sherman & Hartson, 2011). For instance, in one study that presented alcohol drinkers with information linking alcohol consumption with breast cancer, those who were not affirmed were more likely to discount the message, less likely to see themselves as being at risk for breast cancer despite their high levels of consumption, and less likely to form intentions to reduce alcohol consumption (Harris & Napper, 2005). In contrast, affirmed alcohol drinkers showed long-lasting message acceptance (believing that they were at higher risk for breast cancer due to their alcohol consumption), more easily imagined themselves developing the disease, and reported greater intentions to reduce alcohol consumption. Affirmation thus reduced biased processing, allowing affirmed individuals to adaptively process health-risk information in a way that motivated them to engage in healthier behaviors. Other studies have shown that affirmed participants show less biased and defensive behavior at health messages (e.g., Harris et al., 2007; Reed & Aspinwall, 1998), even at the implicit level (Koningsbruggen, Das, & Roskos-Ewoldsen, 2009).

Reductions in defensive processing have emerged in non-health contexts as well, such as in research examining how individuals process politically partisan information. For instance, affirmed participants were more open to evidence challenging their views on capital punishment than non-affirmed individuals, more critical of information that confirmed their own views on abortion (Cohen, Aronson, & Steele, 2000), and more willing to compromise in negotiations over political policies (Cohen et al., 2007). Similar reductions in defensive processing have been documented when people are affirmed

allow individuals to engage in more balanced central route information processing by shifting attentional bias away from threat. Instead of defensively using peripheral cues, such as whether or not the information aligns with their own perspective, affirmed individuals may be able to focus on the facts, content, and strength of the argument to update their own beliefs in an unbiased manner (Correll, Spencer, & Zanna, 2004; Petty & Cacioppo, 1986).

Affirmation Shifts Construal From Concrete To Abstract

In addition to information processing, researchers have explored shifts in construal as a potential cognitive mechanism of affirmation. Schmeichel and Vohs (2009) explored the effect of self-affirmation on construal level, finding that affirmed individuals interpreted stimuli at a higher (i.e., more abstract) construal level than unaffirmed individuals; when asked to describe behaviors such as “locking a door,” affirmed individuals were more likely to focus on abstract, big-picture interpretations such as “securing the house,” while unaffirmed individuals focused on more concrete, detail-oriented interpretations such as “putting a key in the lock.” The affirmation-induced shift from low to high construal levels may be a key mechanism in the effects of this intervention on self-regulatory function, as high levels of construal are thought to promote goal pursuit and reduce impulsivity in threatening circumstances (Schmeichel & Vohs, 2009).

Researchers have also suggested that shifts in construal may drive reductions in defensive processing, as focusing on the bigger picture may help affirmed people resist the urge for the immediate gratification of asserting self-worth (e.g., being right) in favor of reaching more important long-term

Affirmation Promotes a Broadened Perspective

Consistent with shifts to higher-level construal that are thought to allow focus on the “bigger picture,” research has examined the perspective-broadening effects of affirmation. Critcher and Dunning (2015) found that, while threat induced a narrow perspective on the self, affirmation expanded the working self-concept. Facing a threat to personal adequacy (e.g., a challenging task framed as testing a skill important for professional success) led unaffirmed individuals to view their self-worth narrowly in line with how well they thought they performed on the task. In contrast, affirmed individuals took a broader perspective; their perceived self-worth was not related to their assessment of ability on the threatening task, but instead reflected their broader dispositional self-esteem (Critcher & Dunning, 2015).

In a more tangible example, another study found that when evaluating physical distance from a threatening stimulus—a live tarantula—unaffirmed participants cognitively fixated on the threat, viewing it as physically closer than it actually was (similar to the weapon focus effect; see Steblay, 1992), while affirmed participants avoided this narrow fixation, accurately evaluating its distance (Harber et al., 2011). Further research examining temporal perspective in the language of intervention essays has shown that unaffirmed individuals (writing about an unimportant value) are more narrowly focused on the present, while affirmed individuals display a more expansive sense of time in their language, using a greater proportion of past and future tense words (Raskind, Turetsky, & Purdie-Vaughns, 2017). The broadened, affirmation-induced perspective may mediate the effect of the intervention on

reducing distraction and freeing up cognitive resources, 2) minimizes defensive and biased processing of threatening information, 3) hoists individuals into higher, abstract levels of thinking, and 4) promotes broader perspectives on self-worth and threat.

Combined, these findings suggest that self-affirmation diminishes cognitive fixation on threat, allowing individuals to flexibly view stressors in a bigger-picture context (Schmeichel & Vohs, 2009; Wakslak & Trope, 2009). Affirmation essentially may allow individuals to “zoom out” from threat by focusing on another domain of themselves that reinforces their self-integrity, leading to a broader perspective and shift toward central route processing enabling them to adaptively direct cognitive resources in dealing with threat.

Social Mechanisms of the Affirmation Intervention

Considering the social mechanisms of affirmation in addition to cognitive processes that operate at a more individual level is important, given that threats to personal adequacy typically involve a social component. Specifically, judgment of one’s worth by others or compared to others is involved in many types of psychological threat (e.g., social evaluative threat arises from the concern that one will be judged negatively by observers; stereotype threat arises from concern that others are judging an individual through the lens of negative stereotypes). Here we review two general mechanistic themes emerging from research on the social underpinnings of affirmation: (1) affirmation promotes a stronger sense of belonging, and (2) affirmation attenuates defensive social distancing.

Affirmation Promotes a Sense of Belonging

Facing threats to personal adequacy repeatedly in a given environment, such as a

one has in the environment (e.g., in school, low grades, tests with high difficulty, and critical feedback). Moreover, low sense of belonging, or social isolation more generally, can harm achievement, along with wellbeing and health (see Walton & Cohen, 2011), paving the way for a harmful cycle of low belonging and low achievement.

Research on self-affirmation has shown that the intervention can interrupt this cycle. For instance, in a series of longitudinal field experiments studying identity threat in middle school students, Cook and colleagues (2012) found that unaffirmed African American students felt a decreasing sense of belonging during middle school, which was linked to their declining grades. In contrast, affirmed African American students' sense of belonging was less contingent on academic performance and fluctuated less over the course of middle school (Cook et al., 2012). These studies suggested that affirmations insulated participants' sense of belonging from threat during a key developmental period.

Studies have also shown that belonging-related feelings drive effects of the affirmation intervention. For example, affirmed individuals reported feeling more connectedness following the intervention than unaffirmed individuals; these feelings mediated the effects of affirmation on acceptance of a potentially threatening health message (Crocker, Niiya, & Mischkowski, 2008). Moreover, an analysis by Shnabel and colleagues (2013) showed that students who wrote their affirmation essays about social belonging—that is, wrote about feeling connected to others and having positive social bonds (e.g., “My family gives me love and understanding.”)—were the students most likely to show performance improvements following affirmation, compared to those who wrote about other

others performed better on a threatening exam (an extremely difficult math test presented as diagnostic of their ability) than those who completed a standard affirmation or wrote about how their top-ranked value made them feel independent (Shnabel et al., 2013). This work suggests that bolstering one's sense of social belonging may be one mechanism of the affirmation intervention.

Affirmation Reduces Defensive Social Distancing

Conditions that threaten one's sense of adequacy and self-efficacy may lead to relationship instability and an increase in relationally destructive behaviors (Randall & Bodenmann, 2009). For example, after undergoing a relational threat manipulation (writing about negative aspects of themselves they wanted to keep secret from their romantic partner and being told “partners eventually discover one another's more negative sides and conflicts could develop as a result”), unaffirmed individuals with low self-esteem engaged in defensive distancing from their partners (Jaremka, Bunyan, Collins, & Sherman, 2011). Specifically, they reported less willingness to invest effort into their partners' wellbeing, rated their partners more negatively, and reported greater intentions to participate in relationally destructive behaviors (e.g., acting selfishly and ignoring partners' feelings). In contrast, affirmed individuals did not show evidence of defensive distancing, showing outcomes almost identical to those in a control condition who did not experience the relational threat.

Similarly, Stinson and colleagues (2011) examined the effect of affirmation on the social behavior of chronically insecure individuals, whose relational insecurity often causes them to behave in ways that may result in the social rejection they fear experiencing (e.g., acting tense or cold)

observer in a series of social interactions in the laboratory over a two-month post-intervention period.

Finally, recent research has found that affirmation can prevent defensive social distancing in individuals' real-world social networks (Turetsky, Cook, Curley, Cohen, & Purdie-Vaughns, in preparation). In a threatening biology course, unaffirmed students' friendship networks decayed over the course of the semester; they lost friendships and reported less closeness with the friends they retained over time. In contrast, affirmed students were buffered from this social erosion, maintaining their number and closeness of friendships over the course of the semester. Moreover, friendship networks at the end of the semester mediated the effect of the intervention on likelihood of taking the second course in the biology sequence, with 83% affirmed students taking the next class compared to 72% of unaffirmed students.

Social Mechanisms: Summary

Studies on the social mechanisms of affirmation suggest that insulating social belonging from threat and reduced defensive social distancing may mediate at least some of the intervention's effects. By promoting feelings of connectedness and positive social behavior, affirmation may exert its positive effects in part by facilitating the perception of social resources (i.e., having high quality social relationships one can turn to), which can improve coping by providing a buffer against stress (Achat et al., 1998; Haslam et al., 2008; Kamarck, Annunziato, & Amateau, 1995).

Physiological Mechanisms of the Affirmation Intervention

Threatening situations trigger a wide range of physiological responses, such as increases in heart rate and blood pressure. While stress system responses are adaptive

and tear on the body perpetrated by repeated or chronic activation of physiological stress systems has been coined the allostatic load, and can accelerate hypertension and heart disease, weaken the body's immune system, and otherwise damage health (Cohen, Kessler, & Gordon, 1995; McEwen & Stellar, 1993). Mechanistic studies of affirmation have shown that the intervention reduces allostatic load by promoting more adaptive patterns of (1) the hypothalamic-pituitary-adrenocortical axis, the body's primary stress response system, and (2) the sympathetic-adrenal-medullary system, which regulates fight-or-flight responses, as well as (3) prevents stress-induced endothelial cell damage. These physiological mechanistic processes may drive the positive effects of affirmation on reducing perceived stress, improving health outcomes, and reducing negative physical symptoms (Creswell et al., 2007; Keough & Markus, 1999), along with other positive effects like performance improvement (Sherman et al., 2009).

Affirmation Regulates the Hypothalamic-Pituitary-Adrenocortical (HPA) Axis

Several studies have shown that threat—particularly stereotype and social evaluative threat—affects heart rate, blood pressure, and cortisol levels, which are several major physiological indicators of health associated with the body's primary stress response system, the hypothalamic-pituitary-adrenocortical (HPA) axis (Blascovich et al., 2001; Creswell et al., 2005; Croizet et al., 2004; Osborne, 2006; 2007). Specifically, threat decreases heart rate variability (HRV; high HRV is a sign of healthy, adaptive functioning, while low HRV is less adaptive and is typically a sign of increased mental workload), which has been shown to mediate the relationship between threat and poor performance

2001), all of which can contribute to allostatic load.

Examinations of these stress markers following affirmation show that affirmed individuals' HPA axis responses are more adaptively regulated under threat (Creswell et al., 2005). For example, affirmed individuals had significantly lower cortisol responses to a social evaluative threat paradigm (the Trier Social Stress Task) than unaffirmed individuals, and maintained this lower level of cortisol for at least 45 minutes after the onset of the task. Improved regulation of the body's stress response system may be a mechanism for affirmation's beneficial effects in reducing stress-induced health symptoms (Keough & Markus, 1999; Sherman & Hartson, 2011).

Affirmation Reduces Sympathetic-Adrenal-Medullary (SAM) Response

Catecholamines from the sympathetic-adrenal-medullary (SAM) system—especially epinephrine and norepinephrine, which are released by the sympathetic nervous system—deploy energy for the body's fight-or-flight response to a stressor (Lundberg, 2000), and are critical in the short run for protective inflammatory responses (Cavanaugh & Cavanaugh, 2009). However, while SAM activation may be beneficial in moderation, excessive or chronic exposure to catecholamines has been shown to have toxic effects on organs such as the heart and lungs (Sapolsky, 1988), and can make the body more vulnerable to illnesses such as cardiovascular disease (Moura et al., 2008) and infectious agents (Cavanaugh & Cavanaugh, 2009).

In a study examining whether self-affirmation could buffer individuals from sympathetic nervous system activation under stress, Sherman, Bunyan, and colleagues (2009) measured students' urinary catecholamine excretion in 15-hour intervals

show differences in catecholamine levels from baseline. The affirmation was most effective in buffering SAM response for students who were most concerned about negative evaluation, i.e., those under the most threat from their exam. This reduction in SAM activation due to affirmation could be one mechanism explaining why affirmed individuals have reported reduced health symptoms in prior studies (e.g., Creswell et al., 2007; Keough & Markus, 1999).

Affirmation Attenuates Endothelial Cell Injury

Another demonstration of the effect of self-affirmation on attenuation of stress-oriented biomarkers is a recent study by Spicer and colleagues (2015), the first to demonstrate that the self-affirmation intervention prevents stress-induced endothelial damage. Following a social evaluative threat paradigm, Spicer and colleagues examined plasma levels of endothelial cell-derived microparticles (EMPs)—markers of endothelial cell injury in humans that have a role in the onset of cardiovascular disease and other disorders like stroke. Unaffirmed participants who underwent social evaluative threat had higher plasma levels of stress-related EMPs (as well as higher cortisol levels and reported stress) than affirmed participants, suggesting increased endothelial cell death. In contrast, affirmed individuals did not differ in EMP levels from control condition participants who did not undergo the social evaluative threat, indicating that self-affirmation protected endothelial cells from threat-induced injury.

Physiological Mechanisms: Summary

The studies described above suggest that affirmation buffers individuals from stress and sympathetic nervous system activation, and prevents stress-induced endothelial cell injury. Self-affirmation not

Neural Mechanisms of the Affirmation Intervention

Researchers have recently turned to neuroscience methods to examine the underlying neural mechanisms of the affirmation intervention. This work is comprised of three primary areas: (1) affirmation activates the anterior cingulate cortex, enabling the individual to be responsive rather than defensive to error, (2) affirmation is associated with regions that subserve self-related processing and value-based decision making that increase openness to threatening information, and (3) affirmation recruits brain regions involved in reward-processing and regulation.

Affirmation Facilitates Error Responsiveness Via the Anterior Cingulate Cortex

One of the first studies investigating the neurophysiological mechanisms of self-affirmation examined the influence of the intervention on error monitoring (Legault, Al-Khindi, and Inzlicht, 2012). In this study, participants completed a go/no-go task that induced threat by providing negative visual feedback when they committed an error, while researchers used an electroencephalogram (EEG) to record brain electrophysiological responses to making errors. Specifically, the researchers measured error-related negativity (ERN; Gehring, Goss, Coles, Meyer, & Donchin, 1993), a pronounced negative deflection on the EEG that occurs within 100 ms of making an error on a task, which is thought to be generated by the anterior cingulate cortex (ACC; Dehaene, Posner, & Tucker, 1994). ERN is an adaptive response to making errors, thought to involve a temporary halt in dopaminergic neuron firing in the midbrain (which projects to the ACC). This in turn is thought to signal performance monitoring, serving to increase

attending more to errors and performing better on the task (Legault, Al-Khindi, and Inzlicht, 2012). This increase in error responsiveness could in part explain performance boosts due to self-affirmation and decreases in defensiveness.

Affirmation Increases Self-Related and Valuation Processing Via the VMPFC

Falk and colleagues (2015) sought to identify the neural systems underlying the intervention's positive influence on response to health messages and subsequent behavior change. Participants from a community sample of sedentary adults completed a self-affirmation or control exercise and were exposed to potentially threatening health messages about the risks of sedentary behavior while neural activity was recorded through fMRI. Results of region-of-interest (ROI) analyses showed differences in brain activity between conditions in regions associated with self-related and positive value processing; specifically, affirmation was associated with increased activation in the ventromedial prefrontal cortex (VMPFC), which is involved in self-related processing (Lieberman, 2010) and positive valuation (Bartra, McGuire, & Kable, 2013).

Consistent with previous work suggesting that successfully implementing behavioral change in response to health messages may be rooted in individuals' ability to process such information as self-relevant and important (Falk, Berkman, & Lieberman, 2012; Falk, et al., 2010; Falk et al., 2011; Chua et al., 2011), affirmed individuals were also more likely to engage in active behavior one month following the intervention, with greater VMPFC activity predicting this shift (Falk et al., 2015). The threatening health messages were essentially likely to be perceived as more self-relevant following affirmation, leading to more VMPFC activation, which subsequently

Affirmation Activates Reward Pathways Via the Ventral Striatum and VMPFC Network

In addition to self-related processing, the activation of reward pathways has also been proposed as a potential neural mechanism of affirmation. In one study, after reflecting on core values and viewing threatening messages concerning the importance of physical activity, ROI analyses showed that affirmed participants displayed increased activation relative to unaffirmed participants in regions implicated in reward processing (the VMPFC and ventral striatum), in addition to those associated with self-related processing (Cascio et al., 2016). Additional research supports the idea that affirmation activates reward pathways. Whole-brain analyses in a within-subjects study by Dutcher and colleagues (2016) showed that individuals display greater ventral striatum activation while ranking their most important values (affirmation task) compared to when they ranked qualities of a kitchen appliance (control task). Activation also occurred in the MPFC, precuneus, and posterior cingulate cortex, which are implicated in self-processing (Dutcher et al., 2016).

Past work has found that the ventral striatum exhibits functional connectivity with the VMPFC, which plays a key role in emotion regulation and stress-mitigation processes (Di Martino et al., 2008). Given this connectivity, Dutcher and colleagues proposed that the reward response triggered by affirmation in the ventral striatum indirectly activates self-regulatory processes associated with the VMPFC, enabling greater self-regulation—and therefore improved learning, decision-making, and coping in general—under threat (Dutcher et al., 2016). In other words, affirmation may exhibit a beneficial two-pronged effect

Neural Mechanisms: Summary

These studies on the neural mechanisms of self-affirmation suggest that affirmation reduces people's tendency to act defensively towards error, promotes an openness to threatening information by encouraging self-related processing and positive valuation, and improves the ability to cope by activating reward and self-regulatory processes. These neural findings corroborate findings in other areas suggesting that reduced defensiveness and increased self-regulation are important mechanisms of self-affirmation.

Discussion

This review highlights several patterns across fields in mechanistic studies of affirmation. Specifically, cognitive, social, physiological, and neural research all single out reductions in defensive processing and broadened perspective as important consequences of affirmation that, at least in part, drive its beneficial effects.

These findings are consistent with existing mechanistic models of affirmation (e.g., Sherman & Hartson, 2011; Sherman, 2013) that have highlighted the role of the intervention in allowing individuals to view threat from a broader perspective. These models suggest that affirmation counteracts cognitive resource depletion under stressful or threatening circumstances, allowing individuals to view their self-worth from a broader perspective, instead of evaluating themselves solely on the basis of their performance or perceived adequacy in the domain of threat (Sherman & Hartson, 2011). Affirmation essentially uncouples threat and self-perception, reducing the threat's potency at damaging one's self-concept (Sherman & Hartson, 2011; Sherman, 2013). New research on the mechanisms of affirmation that we have outlined in this review—especially

affirmation (Sherman & Hartson, 2011). Effects such as improved problem-solving performance under pressure (Creswell et al., 2013), improved working memory performance (Harris, Harris, & Miles, 2015), curbed defensive processing (Harber et al., 2011), and increased focus on the bigger picture (Critcher & Dunning, 2015) support the idea that affirmation increases cognitive resources and reduce the need for defensiveness, thus broadening perspectives in threatening circumstances. Additionally, recent social findings support the notion that this broader perspective uncouples self-perception from threat, showing that affirmation makes feelings of social belonging less contingent on academic performance (Cook et al., 2012).

Physiological findings indicating that affirmation promotes adaptive regulation of stress responses and prevents endothelial cell damage are consistent with the idea that affirmation bolsters self-resources in threatening circumstances, according to the biopsychosocial model of challenge and threat (Blascovich & Mendes, 2000). This model suggests that people perceive stressful situations as threatening when they feel that they have insufficient resources to meet the demands of the stressor, and challenging when they feel they have enough resources to meet demands (Blascovich & Mendes, 2000). Threat appraisal is accompanied by more maladaptive physiological responses that can result in increased allostatic load and negative downstream health consequences, while challenge appraisal is associated with more adaptive physiological response patterns. Affirmation may thus shift individuals from threat to challenge appraisals by increasing self-resources—or at least, the perception of self-resources—promoting a more adaptive stress response, consistent with the idea that self-resources

that affirmation facilitates adaptive responses to errors at the neural level (Legault et al., 2012) parallels cognitive evidence that affirmation reduces defensive processing. Neural research demonstrating affirmation-induced activation of self-regulatory pathways (e.g., through the connected ventral striatum and VMPFC network) also supports the idea that affirmation bolsters cognitive resources that enable better coping and self-regulation under threat. These patterns at the neural level may contribute to limiting fixation on threats to personal adequacy and improving functioning in stressful conditions.

However, some recent findings highlighted in this review do not fit as neatly into prevalent models of self-affirmation's mechanism. For instance, neural findings on the ventral striatum and VMPFC network suggest that affirmation activates self-regulation processes, consistent with existing models; however, the intervention also activates reward-processing processes. This finding suggests that there may be two dissociable pathways that drive the positive effects of affirmation. This duality could explain mixed results in the literature regarding the mediating effect of mood and self-esteem in affirmation's effects (see McQueen & Klein, 2006). It is possible that small shifts in the intervention's presentation or content may lead to greater or more modest activation of reward compared to self-regulatory pathways, or that people may have dominant responses in one or the other. Broadly, these recent neural findings suggest that affirmation effects change through multiple routes, which could account for discrepancies in the literature on the effects of affirmation as well as the field's difficulty in pinning down a single clear mechanism.

Similarly, recent findings showing that affirmation-induced changes in social

enables positive social behavior and relationships, as recent research suggests (Stinson et al., 2011; Turetsky et al., in preparation), changes at the broader social level could mediate some of affirmation's long-term effects on health, retention, and achievement, given the known benefits of social relationships on these outcomes (e.g., Bolger & Amarel, 2007; Berkman, 1995; Moynihan & Pandey, 2008). Recent research supports the idea of affirmation as a social process by showing that it has spillover effects that can improve outcomes for unaffirmed others in the same social environment as people who are affirmed (Powers et al., 2016). These findings suggest that studying the effects and long-term mechanistic processes of affirmation at the broader social level may be a rich area for future research.

This review highlights the value in looking at affirmation as a multidimensional process that occurs cognitively, socially, physiologically, and neurologically. Research should continue to combine approaches across fields to build an integrated understanding of the multiple ways in which affirmation operates mechanistically. For example, is an intervention that activates regulatory processes, but not reward processes, in the brain enough to produce positive cognitive, social, and physiological effects? Or is the reward component a necessary, heretofore overlooked ingredient for affirmation's effects? Does an intervention that builds social resources without considering important values also build cognitive resources and buffer physiological stress? Answering questions such as these from a multidisciplinary perspective may help researchers understand which of the many changes caused by affirmation are necessary in achieving its effects and which are more

References

- Achat, H., Kawachi, I., Levine, S. Berkey, C., Coakley, E., & Colditz, G. (1998). Social networks, stress and health-related quality of life. *Quality of Life Research*, 7(8), 735–750.
- Bartra, O., McGuire, J. T., & Kable, J. W. (2013). The valuation system: a coordinate-based meta-analysis of BOLD fMRI experiments examining neural correlates of subjective value. *Neuroimage*, 76, 412–427.
- Beilock, S. L., & Carr, T. H. (2005). When high-powered people fail: Working memory and “choking under pressure” in math. *Psychological Science*, 16, 101–105.
- Beilock, S. L., Rydell, R. J., & McConnell, A. R. (2007). Stereotype Threat and Working Memory: Mechanisms, Alleviation, and Spillover. *Journal of Experimental Psychology: General*, 136(2), 256–276.
- Berkman, L. F. (1995). The role of social relations in health promotion. *Psychosomatic Medicine*, 57, 245–254.
- Binning, K. R., Sherman, D. K., Cohen, G. L., & Heitland, K. (2010). Seeing the other side: reducing political partisanship via self-affirmation in the 2008 presidential election. *Analyses of Social Issues and Public Policy*, 10, 276–292.
- Blascovich, J., & Mendes, W. B. (2000). Challenge and threat appraisals: The role of affective cues. In J. Forgas (Ed.), *Feeling and thinking: The role of affect in social cognition* (pp. 59–82). Paris: Cambridge University Press.
- Blascovich, J., Spencer, S. J., Quinn, D. & Steele, C. (2001). African Americans and high blood pressure: the role of stereotype threat. *Psychological Science*, 12(3), 225–229.
- Bolger, N., & Amarel, D. (2007). Effects of Social Support Visibility on Adjustment to Stress: Experimental Evidence. *Journal of Personality and Social Psychology*, 92(3), 458–475.
- Cascio, C. N., O'Donnell, M. B., Tinney, F. J., Lieberman, M. D., Taylor, S. E., Strecher, V. J., & Falk, E. B. (2016). Self-affirmation activates brain systems associated with self-related processing and reward and is reinforced by future orientation. *Social Cognitive and Affective Neuroscience*, 11(4), 621–629.
- Cavanaugh, J. C. & Cavanaugh, C. D. (2009). *Ageing in America: Psychological, Physical, and Social Issues*. Westport, CT: Greenwood Publishing Group.
- Chua, H. F., Ho, S. S., Jasinska, A. J., Polk, T. A., Welsh, R. C., Liberzon, I., & Strecher, V. J. (2011). Self-related neural response to tailored smoking-cessation messages predicts quitting. *Nature Neuroscience*, 14(4), 426–427.
- Cohen, G. L., Aronson, J., & Steele, C. M. (2000). When Beliefs Yield to Evidence: Reducing Biased

Yale Review of Undergraduate Research in Psychology

- psychological intervention. *Science*, 313, 1307–1310.
- Cohen, G. L., Garcia, J., Purdie-Vaughns, V., Apfel, N., & Brzustoski, P. (2009). Recursive processes in self-affirmation: intervening to close the minority achievement gap. *Science*, 324, 400–403.
- Cohen, G. L., & Sherman, D. K. (2014). The psychology of change: Self-affirmation and social psychological intervention. *Annual Review of Psychology*, 65, 333–371.
- Cohen, G. L., Sherman, D. K., Bastardi, A., Hsu, L., McGoey, M., & Ross, L. (2007). Bridging the partisan divide: self-affirmation reduces ideological closed-mindedness and inflexibility in negotiation. *Journal of Personality and Social Psychology*, 93, 415–430.
- Cohen, S., Kessler, R., & Underwood Gordon, L. (eds.) (1995). *Measuring Stress: A guide for health and social scientists*. New York: Oxford University Press.
- Cook, J. E., Purdie-Vaughns, V., Garcia, J., & Cohen, G. L. (2012). Chronic threat and contingent belonging: protective benefits of values affirmation on identity development. *Journal of Personality and Social Psychology*, 102, 479–496.
- Correll, J., Spencer, S. J., & Zanna, M.P. (2004). An affirmed self and an open mind: self-affirmation and sensitivity to argument strength. *Journal of Experimental Social Psychology*, 40, 350–356.
- Creswell, J. D., Dutcher, J. M., Klein, W. M. P., Harris, P. R., & Levine, J. M. (2013). Self-Affirmation Improves Problem-Solving under Stress. *PLoS ONE*, 8(5), e62593.
- Creswell, J. D., Lam, S., Stanton, A. L., Taylor, S. E., Bower, J. E., & Sherman, D. K. (2007). Does self-affirmation, cognitive processing, or discovery of meaning explain cancer-related health benefits of expressive writing? *Personality and Social Psychology Bulletin*, 33(2), 238–250.
- Creswell, J. D., Welch, W., Taylor, S. E., Sherman, D., Gruenewald, T., & Mann, T. (2005). Affirmation of personal values buffers neuroendocrine and psychological stress responses. *Psychological Science*, 16, 846–851.
- Critcher, C. R., & Dunning, D. (2015). Self-affirmations provide a broader perspective on self-threat. *Personality and Social Psychology Bulletin*, 41, 3–18.
- Crocker, J., Niiya, Y., & Mischkowski, D. (2008). Why does writing about important values reduce defensiveness? Self-affirmation and the role of positive other-directed feelings. *Psychological Science*, 19, 740–747.
- Croizet, J., Després, G., Gauzins, M., Huguet, P., Leyens, J., & Méot, A. (2004). Stereotype threat undermines intellectual performance by triggering a disruptive mental load. *Personality and Social Psychology Bulletin*, 30, 721–731.
- resting state fMRI study. *Cerebral Cortex*, 18(12), 2735–2747.
- Dutcher, J. M., Creswell, J. D., Pacilio, L. E., Harris, P. R., Klein, W. M. P., Levin, J. M., Bower, J. E., Muscatell, K. A., & Eisenberger, N. I. (2016). Self-Affirmation Activates the Ventral Striatum: A Possible Reward-Related Mechanism for Self-Affirmation. *Psychological Science*, 27(4), 1–12.
- Falk, E. B., Berkman, E. T., & Lieberman, M. D. (2012). From neural responses to population behavior: Neural focus group predicts population-level media effects. *Psychological Science*, 23(5), 439–445.
- Falk, E. B., Berkman, E. T., Mann, T., Harrison, B., & Lieberman, M. D. (2010). Predicting persuasion-induced behavior change from the brain. *Journal of Neuroscience*, 30(25), 8421–8424.
- Falk, E. B., Berkman, E. T., Whalen, D., & Lieberman, M. D. (2011). Neural activity during health messaging predicts reductions in smoking above and beyond self-report. *Health Psychology*, 30(2), 177–185.
- Falk, E. B., O'Donnell, M. B., Cascio, C. N., Tinney, F., Kang, Y., Lieberman, M. D., Taylor, S. E., An, L., Resnicow, K., & Strecher, V. J. (2015). Self-affirmation alters the brain's response to health messages and subsequent behavior change. *Proceedings of the National Academy of Sciences of the USA*, 112(7), 1977–1982.
- Harber K., Yeung D., & Iacovelli A. (2011). Psychosocial resources, threat and the perception of distance and height: Support for the resources and perception model. *Emotion*, 11, 1080–1090.
- Harris, P. R., & Epton, T. (2009). The impact of self-affirmation on health cognition, health behaviour and other health-related responses: a narrative review. *Social and Personality Psychology Compass*, 3, 962–978.
- Harris, P., Harris, P., & Miles, E. (2015) The impact of self-affirmation on working memory and self control. *Bulletin of the European Health Psychology Society*, 17 Supp., 917.
- Harris, P. R., Mayle, K., Mabbott, L., & Napper, L. (2007). Self-affirmation reduces smokers' defensiveness to graphic on-pack cigarette warning labels. *Health Psychology*, 26(4), 437–446.
- Harris, P. R., & Napper, L. (2005). Self-affirmation and the biased processing of threatening health-risk information. *Personality and Social Psychology Bulletin*, 31, 1250–1263.
- Haslam, C., Holme, A., Haslam, S. A., Iyer, A., Jetten, J., & Williams, W. H. (2008). Maintaining group memberships: social identity continuity predicts well-being after stroke. *Neuropsychological Rehabilitation*, 18(5–6), 671–691.
- Hilt, L. M., Leitzke, B. T., & Pollak, S. D. (2014). Cognitive Control and Rumination in Youth: The Importance of Emotion. *Journal of Experimental*

Yale Review of Undergraduate Research in Psychology

- Personality and Social Psychology Bulletin*, 28(5), 659–670.
- Inzlicht, M., & Kang, S. K. (2010). Stereotype Threat Spillover: How Coping With Threats to Social Identity Affects Aggression, Eating, Decision Making, and Attention. *Journal of Personality and Social Psychology*, 99(3), 467–481.
- Jaremka, L. M., Bunyan, D. P., Collins, N. L., & Sherman, D. K. (2011). Reducing defensive distancing: Self-affirmation and risk regulation in response to relationship threats. *Journal of Experimental Social Psychology*, 47, 264–268.
- Jemmot, J. B., Ditto, P. H., & Croyle, R. T. (1986). Judging health status: effects of perceived prevalence and personal relevance. *Journal of Personality and Social Psychology*, 50(5), 899–905.
- Johns, M. J., Inzlicht, M., & Schmader, T. (2008). Stereotype threat and executive resource depletion: Examining the influence of emotion regulation. *Journal of Experimental Psychology: General*, 137, 691–705.
- Kamarck, T. W., Annunziato, B., & Amateau, L. M. (1995). Affiliation moderates the effects of social threat on stress-related cardiovascular responses: boundary conditions for a laboratory model of social support. *Psychosomatic Medicine*, 57(2), 183–194.
- Keough, K. A., & Markus, H. R. (1999). The role of the self in building the bridge from philosophy to biology. *Psychological Inquiry*, 9, 49–53.
- Koole, S. L., Smeets, K., van Knippenberg, A., & Dijksterhuis, A. (1999). The cessation of rumination through self-affirmation. *Journal of Personality and Social Psychology*, 77, 1237–1242.
- Kuhlmann, S., Piel, M., & Wolf, O. T. (2005). Impaired memory retrieval after psychosocial stress in healthy young men. *Journal of Neuroscience*, 25(11), 2977–2982.
- Kunda, Z. (1987). Motivated inference: Self-serving generation and evaluation of causal theories. *Journal of Personality and Social Psychology*, 53, 636–647.
- Legault, L., Al-Khindi, T., & Inzlicht, M. (2012). Preserving Integrity in the Face of Performance Threat: Self-Affirmation Enhances Neurophysiological Responsiveness to Errors. *Psychological Science*, 23(12), 1455–1460.
- Liberman, A., & Chaiken, S. (1992). Defensive processing of personally relevant health messages. *Personality and Social Psychology Bulletin*, 18, 669–679.
- Lieberman, M. (2010). Social Cognitive Neuroscience. In S. Fiske, D. Gilbert, & G. Lindzey (Eds.), *Handbook of social psychology* (5th ed., pp. 143–193). New York: McGraw-Hill.
- Logel, C., & Cohen, G. L. (2012). The role of the self in physical health. *Psychological Science*, 23, 53–
- decrements during cold exposure. *Physiology & Behavior*, 92(4), 575–582.
- Martens, A., Johns, M., Greenberg, J., & Schimel, J. (2006). Combating stereotype threat: The effect of self-affirmation on women’s intellectual performance. *Journal of Experimental Social Psychology*, 42, 236–243.
- McEwen, B. S., & Gianaros, P. J. (2010). Central role of the brain in stress and adaptation: links to socioeconomic status, health, and disease. *Annals of the New York Academy of Sciences*, 1186, 190–222.
- McEwen, B. S., & Stellar, E. (1993). Stress and the individual. Mechanisms leading to disease. *Archives of Internal Medicine*, 153(18), 2093–2101.
- McIntosh, W. D., & Martin, L. L. (1992). The cybernetics of happiness: The relation between goal attainment, rumination, and affect. In: M. S. Clark (Ed.), *Review of personality and social psychology* (Vol. 14, pp. 222–246). Newbury Park, CA: Sage.
- McQueen, A., & Klein, W. M. (2006). Experimental manipulations of self-affirmation: a systematic review. *Self and Identity*, 5, 289–354
- Moura, L. M., Rocha-Gonçalves, F., Zamorano, J. L., Barros, I., Bettencourt, P., & Rajamannan, N. (2008). New cardiovascular biomarkers: clinical implications in patients with valvular heart disease. *Expert Review of Cardiovascular Therapy*, 6(7), 945–954.
- Moynihan, D. P., & Pandey, S. K. (2008). The Ties that Bind: Social Networks, Person-Organization Value Fit, and Turnover Intention. *Journal of Public Administration Research and Theory*, 18(2), 205–227.
- Mrazek, M. D., Chin, J. M., Schmader, T., Hartson, K. A., Smallwood, J., & Schooler, J. W. (2011). Threatened to distraction: Mind-wandering as a consequence of stereotype threat. *Journal of Experimental Social Psychology*, 47, 1243–1248.
- Osborne, J. W. (2006). Gender, stereotype threat and anxiety: Psychophysiological and cognitive evidence. *Journal of Research in Educational Psychology*, 8, 109–138.
- Osborne, J. W. (2007). Linking stereotype threat and anxiety. *Educational Psychology*, 27, 135–154.
- Petty, R. E., & Cacioppo, J. T. (1986). *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*. New York, NY: Springer.
- Powers, J. T., Cook, J. E., Purdie-Vaughns, V., Garcia, J., Apfel, N., & Cohen, G. L. (2016). Changing Environments by Changing Individuals: The Emergent Effects of Psychological Intervention. *Psychological Science*, 27(2), 150–160.
- Purdie-Vaughns, V., Steele, C.M., Davies, P., Ditlemann, R., & Randall Crosby, J. (2008). Identity contingency threat: How diversity cues signal threat or safety

Yale Review of Undergraduate Research in Psychology

- traces of an expanded sense of time. Poster to be presented at the Annual Convention of the Society for Personality and Social Psychology, San Antonio, TX.
- Reed, M. B., & Aspinwall, L. G. (1998). Self-Affirmation Reduces Biased Processing of Health-Risk Information. *Emotion, 22*, 99–132.
- Sapolsky, R. M. (1988). Lessons of the Serengeti: Why Some of Us Are More Susceptible to Stress. *New York Academy of Sciences, 28*(3), 38–42.
- Schmader, T., & Johns, M. (2003). Converging evidence that stereotype threat reduces working memory capacity. *Journal of Personality and Social Psychology, 85*, 440–452.
- Schmeichel, B. J., & Martens, A. (2005). Self-affirmation and mortality salience: Affirming values reduces worldview defense and death-thought accessibility. *Personality and Social Psychology Bulletin, 31*, 658–667.
- Schmeichel, B. J., & Vohs, K. D. (2009). Self-affirmation and self-control: affirming core values counteracts ego depletion. *Journal of Personality and Social Psychology, 96*, 770–782.
- Sherman, D. K. (2013). Self-Affirmation: Understanding the Effects. *Social and Personality Psychology Compass, 7*, 834–845.
- Sherman, D. K., & Cohen, G. L. (2002). Accepting threatening information: Self-affirmation and the reduction of defensive biases. *Current Directions in Psychological Science, 11*, 119–123.
- Sherman, D. K., & Cohen, G. L. (2006). The psychology of self-defense: self-affirmation theory. In: *Advances in Experimental Social Psychology* (Ed. M. P. Zanna), 38 (pp. 183–242). San Diego, CA: Academic.
- Sherman, D. K., Cohen, G. L., Nelson, L. D., Nussbaum, A. D., Bunyan, D. P., & Garcia, J. (2009). Affirmed yet unaware: exploring the role of awareness in the process of self-affirmation. *Journal of Personality and Social Psychology, 97*, 745–64.
- Sherman, D. K., & Hartson, K. A. (2011). Reconciling self-protection with self-improvement: self-affirmation theory. In: *The Handbook of Self-Enhancement and Self-Protection*, ed. M. Alicke, C. Sedikides (pp. 128–51). New York: Guilford.
- Sherman, D. K., Hartson, K. A., Binning, K. R., Purdie-Vaughns, V., Garcia, J., Taborsky-Barba, S., Tomassetti, S., Nussbaum, A. D., & Cohen, G. L. (2013). Deflecting the trajectory and changing the narrative: How self-affirmation affects academic performance and motivation under identity threat. *Journal of Personality and Social Psychology, 104*, 591–618.
- Sherman, D. A. K., Nelson, L. D., & Steele, C. M. (2000). Do messages about health risks threaten the self? Increasing the acceptance of threatening health messages via self-affirmation. *Personality and Social Psychological Bulletin, 26*, 1046–58.
- change, and defensiveness: do self-affirmations make a difference to people's motives and beliefs about making a difference? *British Journal of Social Psychology, 49*(3), 553–568.
- Spicer, J., Shimbo, D., Johnston, N., Harlapur, M., Purdie-Vaughns, V., Cook, J., Fu, J., Burg, M. M., Wager, T. D. (2015). Prevention of Stress-Provoked Endothelial Injury by Values Affirmation: a Proof of Principle Study. *Annals of Behavioral Medicine, 50*(3), 471–479.
- Stebly, N. M. (1992). A Meta-Analytic Review of the Weapon Focus Effect. *Law and Human Behavior, 16*(4), 413–424.
- Steele, C. M. (1977). A threat in the air: How stereotypes shape intellectual identity and performance. *American Psychologist, 52*(6), 613–629.
- Steele, C. M. (1988). The psychology of self-affirmation: sustaining the integrity of the self. In *Advances in Experimental Social Psychology*, ed. L. Berkowitz, 21, 261–302. New York: Academic.
- Steele, C. M., & Aronson, J. (1995). Stereotype threat and the intellectual test performance of African Americans. *Journal of Personality and Social Psychology, 69*(5), 797–811.
- Sterling P. (2004). Principles of allostasis: Optimal design, predictive regulation, pathophysiology, and rational therapeutics. In: Schulkin J, editor. *Allostasis, homeostasis, and the costs of physiological adaptation* (pp. 17–64). Cambridge, MA: Cambridge University Press.
- Stinson, D. A., Logel, C., Shepherd, S., & Zanna, M. P. (2011). Rewriting the Self-Fulfilling Prophecy of Social Rejection: Self-Affirmation Improves Relational Security and Social Behavior up to 2 Months Later. *Psychological Science, 22*(9), 1145–1149.
- Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behaviour. In S. Worchel & W. G. Austin (Eds.), *Psychology of intergroup relations* (2nd ed., pp. 7-24). Chicago: Nelson-Hall.
- Taylor, V. J., & Walton, G. M. (2011). Stereotype threat undermines academic learning. *Personality and Social Psychological Bulletin, 37*, 1055–1067.
- Turetsky, K. M., Cook, J. E., Curley, J. P., Cohen, G. L., and Purdie-Vaughns, V. (in preparation). Values affirmation buffers academic social networks from threat.
- van Koningsbruggen, G. M., Das, E., & Roskos-Ewoldsen, D. R. (2009). How self-affirmation reduces defensive processing of threatening health information: evidence at the implicit level. *Health Psychology, 28*(5), 563–568.
- Wakslak, C. J., & Trope, Y. (2009). The effect of construal-level on subjective probability estimates. *Psychological Science, 20*, 52–58.
- Walton, G. M., & Cohen, G. L. (2011). A Brief Social-Belonging Intervention Improves Academic and Health Outcomes of Minority Students. *Science,*

Yale Review of Undergraduate Research in Psychology

Yeager, D. S., Johnson, R., Spitzer, B. J., Trzesniewski, K. H., Powers, J., & Dweck, C. S. (2014). The far-reaching effects of believing people can change: implicit theories of personality shape stress, health, and achievement during adolescence. *Journal of Personality and Social Psychology*, *106*(6), 867–884.

Polydrug Use: Prevalence, Predictors, Pharmacology and Psychopharmacology

Ryan Bamsey
Swansea University

ABSTRACT. This is a brief review of polydrug use (the simultaneous or concurrent usage of more than one drug). Reviewed areas are listed below. As a result of its nature and structure, this review provides a superficial yet wide-ranging review of polydrug use as a behavioural and psychological phenomenon, covering an extensive body of research spanning decades.

- The prevalence of polydrug use: Identifying and discussing the populations that exhibit these particular behaviours, and discriminating between populations that use one drug from another.
- The predictors of polydrug use: Identifying and discussing some of the risk factors and at-risk populations for polydrug use, especially problematic use.
- The pharmacology of polydrug use: Examining research into the effects of combining multiple drugs on the body. Pharmacodynamics and pharmacokinetics are discussed but not specified.
- The psychopharmacology of polydrug use: Examining research into the effects of combining multiple drugs on behaviour, cognition and psychopathology, and the mechanisms behind these effects.

I. Introduction

Monodrug has been widely researched and its effects extensively documented. In comparison, polydrug use research is more limited. Some common drug combinations, such as alcohol with cannabis or alcohol with ecstasy, are backed by a wide range of literature. However, the vast number of possible drug combinations that can be used in addition to the wide range of possible timeframes for intake seriously limit polydrug use research. To extensively document and study each possible interaction with the multitude of variables that could affect the outcomes would be a titanic undertaking. It is, however, still an important field of research, as it is widely understood that with combinations of drugs come increased risks of adverse health effects. For example,

alcohol than normal for the individual under its effects, leading to a greater risk of alcohol poisoning and other adverse effects of the overconsumption of alcohol (Farré et al., 1997). This is just one example of the unique findings that are sometimes documented in polydrug research.

To that extent, this will serve as a brief review of polydrug use. Firstly some of the more common drugs are touched upon, before a review of research that examines the prevalence of polydrug use, on both macro (continental) and micro (small subsections of the population) levels. Predictors and risk factors of polydrug use are then reviewed, in order to investigate what may predispose individuals to initiate polydrug use. Concurrently, the

future of polydrug research and related issues are discussed, as well as potential gaps in research that are worthy of further investigation.

It is important to define some terms that will be used often throughout this review: the term 'polydrug use' refers to the intake of more than one substance within a certain timeframe. Many studies distinguish between simultaneous polydrug use (SPU) and concurrent polydrug use (CPU) as different behaviours, separate from each other (Ives & Ghelani, 2006):

Simultaneous polydrug use covers events where two or more substances are taken in the same session of drug taking, for example smoking cannabis whilst already intoxicated on alcohol. Concurrent polydrug use refers to the taking of more than one drug throughout the lifetime drug-using history of an individual (Earleywine & Newcomb, 1997). Much of the relevant research on polydrug use focuses on SPU as opposed to CPU. One possible compelling reason for this trend could be that the unique effects of drugs are larger and more numerous in SPU than in CPU (Earleywine & Newcomb, 1997), presenting a greater need for immediate research on the subject.

II. Drugs of Note in Polydrug Use Research

Licit drugs of common use include alcohol and nicotine, with both drugs often appearing in polydrug research. Rates of use for these drugs are generally high, even in samples of schoolchildren (Choquet, Morin, Hassler, & Ledoux, 2004). Illicit substances most frequently include cannabis, ecstasy, amphetamine and cocaine, as documented by a longitudinal study into the drug-user habits of the UK (Dawson, Dalen, Coulter, Shaw, & Smith,

Alcohol is a central nervous system (CNS) depressant and is the most widely used psychoactive substance across many populations surveyed (Presley, 1993; Thomas, Farrell, & Barnes, 1996). It has been concluded that alcohol has been used intentionally since at least the Neolithic Period, based on findings of Stone Age jugs and ancient tablets depicting alcohol consumption (Patrick, 1952, pp. 12-13). Alcohol is a problematic drug for many: the prevalence of DSM-IV identified alcohol abuse and dependence in 2001–2002 were 4.65 and 3.81% in a large national survey (Grant et al., 2004). Alcohol intoxication results in deficits to behavioural inhibition (Field, Wiers, Christiansen, Fillmore, & Verster, 2010) and motor skills (Fogarty & Vogel-Sprott, 2015). Decreased inhibition is an important characteristic of alcohol use to study, as it has implications for the initiation of subsequent polydrug use. Marr (1999) observed that drug court clients often often transition into drug use following a period of sobriety from alcohol. Alcohol can also act as a 'gateway drug', with both licit and illicit drug use usage rates tending to increase after alcohol use begins (Kirby & Barry, 2012).

b. Nicotine

Nicotine is a stimulant drug that acts as a nicotinic acetylcholine receptor agonist (Malenka, Nestler, & Hyman, 2008, p.234) and is a powerful addictive substance with an estimated 1.3 billion smokers worldwide (Smith, 2015). The most popular delivery method for nicotine is smoking. Smoking is a trend that is on the decline in recent times (Syamlal et al., 2015), a trend that is thought to be due to numerous acts of legislation and public information schemes. For example, in Australia, legislation has recently been put into action that will

introduction of plain packaging had significant and consistent effects on cognitive, emotional and avoidant responses to the on-pack health warnings in line with the scheme's intentions (Dunlop, Dobbins, Young, Perez, & Currow, 2014). Despite many public interventions and information about nicotine's association with cardiovascular disease, respiratory system cancers and potential birth defects (Jerry, Collins, & Strem, 2015) there is still a large portion of the general public still using the drug (AIHW, 2011).

c. Cannabis

Cannabis is the most prolific of the illicit drugs used worldwide (Ramsay, Baker, Goulden, Sharp, & Sondhi, 2001; EMCDDA, 2015) and is often used recreationally for relaxation, to induce euphoria and to increase sexual libido (Osborne & Fogel, 2008). It is also used medicinally, with positive effects such as increasing appetite in the sufferers of HIV/AIDS, treating chronic pain in those with multiple sclerosis or acting as an anti-emetic for those undergoing chemotherapy (Consroe, Musty, Rein, Tillery, & Pertwee, 1997; Parrott, Morinan, & Moss, 2004, p255; Borgelt, Franson, Nussbaum, & Wang, 2013). Trends indicate that cannabis use is a growing phenomenon in most of the world, with large and consistent increases in the incidence of cannabis use amongst college students (Gledhill-Hoyt, Lee, Strote, & Wechsler, 2000) and increases in the overall number of cannabis use disorders in recent years (Compton, Stinson, Grant, Colliver, & Glantz, 2004). In the UK however, trends indicate that cannabis use is decreasing (EMCDDA, 2015). These trends, alongside with popular conceptions of cannabis as "the ultimate

party drug" (Gledhill-Hoyt et al., 2000) enjoyed a positive reputation in the 1980s as a party drug and was used by many college students in America. Before long, the risks of MDMA abuse began to be identified, including its association with premature death, impairments in responding to water intake and highly dangerous neurotoxicity, prompting debates about its safety and legality (Dowling, Bost, & McDonough, 1987; Baggott et al., 2015; García-Cabrerizo & García-Fuster, 2015). MDMA has neurochemical similarities to amphetamines and some hallucinogens; hence it causes a mixture of stimulant and hallucinogenic effects. It enhances serotonergic signalling in the brain by activating serotonin receptors, inhibiting serotonin reuptake and stimulating the release of intracellular serotonin from the presynaptic vesicles. (de Bruin et al., 2001). A large acute dose of MDMA can release 80% of the brain's intracellular serotonin stores into the synaptic cleft (de Bruin et al., 2001). MDMA also has neurotoxic effects, depleting the amount of serotonin available in the body over time and reducing the density of serotonin reuptake sites (McCann, Shaham, Ricaurte, & Ridenour, 1994; García-Cabrerizo & García-Fuster, 2015).

e. Amphetamine and Cocaine

Amphetamine and cocaine are two similar drugs that act as stimulants. Historically, amphetamine has been available as a general tonic and depression cure, with its problematic properties not fully recognised until around the 1950s. Amphetamine acts as a dopamine agonist and a noradrenaline agonist, increasing their release and inhibiting their reuptake. Its physiological effects include increased heart rate, increased respiration, increased

anaesthetic, though in modern times its only accepted medical use is as a topical anaesthetic in minor surgeries (Grinspoon & Bakalar, 1981; Redman, 2011; Docimo et al., 2014). It is the most commonly used recreational drug worldwide, after cannabis (Karila et al., 2014) which is problematic from a public health perspective, as its use frequently leads to addiction (Adams, Gfroerer, Rouse, & Kozel, 1986; Ghodse, 2009).

f. LSD

Lysergic acid diethylamide (LSD) is a hallucinogenic drug, the use of which is known to alter cognition, particularly the user's perception of time (Vollenweider & Geyer, 2001). Its other effects include synaesthesia and hallucinations, both of which can occur even at very small doses (Grossenbacher & Lovelace, 2001). LSD is not considered addictive (Lüscher & Ungless, 2006) but it can have adverse acute effects. Emotionally distressing flashbacks are often reported, some of which may be experienced days, weeks or sometimes months following LSD use despite the quick absorption rate of the drug and its very short half-life (Smart & Bateman, 1967; Halpern & Pope, 2003).

g. Other Drugs

Opiates such as heroin are often mentioned in the polydrug use literature. Opiates are highly addictive drugs that reduce negative affect and pain and increase pleasure (Dickenson, 1991). They are often used as analgesics in pharmaceutical environments (codeine, oxycodone, etc.). The terms opioid and opiate are used almost interchangeably, but while opioids refer to all substances that act directly on opioid receptors in the brain, opiates only include opioids that are derived

form. It can be used as an anaesthetic, but also finds use as an intoxicant and a date rape drug, often in the context of clubbing (Nicholson & Balster, 2001).

Ketamine is an NDMA receptor antagonist that acts as a dissociative and hallucinogen. At very high doses, users experience what is known as a 'K-hole' which is characterised by extreme dissociation and hallucinations (Muetzelfeldt et al., 2008).

III. Prevalence of Polydrug Use

Research on the prevalence of polydrug use has expanded in recent years as the range of cheap and easily-attainable drugs (both licit and illicit) has rapidly grown. Polydrug research can be performed for both large populations (e.g. for an entire country) and small populations (e.g. amongst rave-attendees). This review will examine both types and discuss the validity and usefulness of both.

A large section of the population could be considered polydrug users in the concurrent sense when alcohol and tobacco are included, as 86.6% of people report drinking alcohol at some point in their lifetime (NIH, 2015) and 19% of the population are self-reported smokers (ASH, 2015). A survey carried out in 1999 found that 68% of a 11,331 strong sample had taken alcohol and tobacco in their life, with 5.7% stating they took them both regularly (Choquet, Morin, Hassler, & Ledoux, 2004). This trend of high numbers of polydrug users continues when looking at simultaneous use too, in fact it has been reported that 20% of a 70,000-strong sample of teenagers had used alcohol and tobacco simultaneously (EMCDDA, 2011). Alcohol is of particular interest within this line of research, given that 37% of males and 22% of females between the ages of

There have been reports on wider drug use in specific large populations. For example, a study on illicit drug use in the UK found that participants were far more likely to have partaken in polydrug use than monodrug use and that hazardous drinking was more prevalent in polydrug users, demonstrating an association between illicit polydrug use and problematic levels of alcohol consumption (Smith, Farrell, Bunting, Houston, & Shevlin, 2010). Similarly, a large scale American study found that 1.1% of a 43,093-strong sample had either polydrug dependency or abused multiple drugs (Agrawal, Lynskey, Madden, Bucholz, & Heath, 2007). Specifically, they found that a large number of those identified were dependent on sedatives, tranquilisers and opiates (Daniulaityte, Carlson, & Kenne, 2006). Grant and Harford (1990) found that a sizeable population of Americans used alcohol and cocaine both simultaneously and concurrently, and identified socioeconomic factors that played a large part in predicting the extent to which the participants used the substances.

Polydrug use is highly prevalent in Spain, sample where an estimated 28.6% of individuals report using at least one drug and 13.9% report polydrug use, with a large majority of polydrug users consuming cannabis with either alcohol and/or tobacco (Font-Mayolas et al., 2013). This study noted that more females were polydrug users than males, which contradicts much research on gender disparity in polydrug use (Epstein, Botvin, Griffin, & Diaz, 1999). This may imply that the 'gender gap' in polydrug has diminished in recent years. Additionally, research in Latin America (specifically Argentina, Bolivia, Chile, Ecuador, Honduras and Peru) has found that

who use alcohol and tobacco are less likely to use three or more substances than those who use more illicit drugs, such as cannabis, cocaine and paste cocaine.

Finally, MDMA use was significantly associated with polydrug use with both legal and illegal substances, a common finding in European and North American research that can now be applied to further populations thanks to this study.

A large majority of studies on polydrug use and abuse focus on more specific groups of individuals than the population of an entire nation. In particular, popular nightlife settings have become one area of focus (Calafat & Koller, 2003). Many recreational situations are conducive to SPU, explaining why a large portion of polydrug research focuses on the recreational context specifically (Boys, Lenton & Norcross, 1997; Barrett, Gross, Garand & Pihl, 2005; Grov, Kelly & Parsons, 2009). A problem with these smaller, targeted studies is that while they can provide insight into the patterns of polydrug use for these specific populations, they do not provide much information about polydrug use in wider populations.

Another study that looked at a specific slice of a larger population was a study looking into the 12-month prevalence for polydrug use including alcohol and prescription drugs in American undergraduate students. 12.1% of students were found to be polydrug users who abused drugs (McCabe, Cranford, Morales, & Young, 2006), which worryingly represents an increase from previous studies. Studies such as those performed by McCabe et al. allow for the compilation datasets about specific populations, and can be used to identify risk factors and mediating variables specific to these

result of polydrug use in comparison to other polydrug using populations.

A study on younger American students (12th graders) found that more than 33% of the sample took part in CPU, and as many as 33% had taken part in SPU. Additionally, a higher percentage of students were found to be involved in polydrug use than non-alcohol and non-cannabis monodrug use (Collins, Ellickson, & Bell, 1998). In Denmark, it was found that 41.8% of a large sample of children between the ages of 12 and 16 were polydrug users in the sense that they had taken multiple drugs (studied substances were alcohol, tobacco, cannabis, ecstasy, amphetamines, opiates and cocaine) within the last four weeks (Smit, Monshouwer, & Verdurmen, 2002). Most of the students only used alcohol and cannabis, though around 21,000 participants reported combining alcohol, cannabis or tobacco with at least one hard drug. Additional evidence (see Table 1) suggests that adolescents are indeed prolific polydrug users (Wu, Schlenger, & Galvin, 2006). In fact, 99.3% of participants in this study that reported using any “club drug” also reported using alcohol, with 97% also using cannabis at some point in their life.

A report on polydrug use across three clubs in Belgium found that participants who reported using an illicit drug said they 'regularly combined alcohol and an illicit drug, and one in four users regularly combined different illicit drugs' (EMCDDA, 2011). Polydrug use has similarly been reported in clubbing populations worldwide. Approximately 20% of youths aged 16-23 (in an American sample) reported having concurrently used more than one drug out of a choice of MDMA, LSD, ketamine, GHB, and

than bar-goers (Measham & Moore, 2009), which implies that there may be “culturally, spatially and pharmacologically distinct local leisure scenes operating within the contemporary night time economy” (Measham & Moore, 2009). Significant portions of those using so-called ‘dance drugs’ (MDMA, amphetamine, LSD) have been found to mix these drugs with other substances in both Western Australia (Boys, Lenton, & Norcross, 1997) and Canada (Barrett, Gross, Garand, & Pihl, 2005), showing that increased rates of polydrug use at raves and clubs is a phenomenon that can probably be generalized across much of the developed world.

Ives and Ghalani (2006) proposed that the 'normalization' of drug culture was one of the main reasons that people indulged in SPU and quoted the behaviours of those in the rave scene of the 90s as an example of this. A study into the drug habits of an annual rock festival found that 35.5% of the attendees were using three or more drugs simultaneously at the event, supporting that raves and concerts are conducive to polydrug use (EMCDDA, 2002).

MDMA features prominently in polydrug research, being the most commonly used drug in cases of polydrug use at clubs and other dance-related situations (86.6% of MDMA users reported combining MDMA with another drug; Grov, Kelly & Parsons, 2009). This study found that the most common combinations of drugs used at clubs were MDMA and Ketamine, MDMA and cocaine, and MDMA and GHB. Other frequently cited drug combinations included cocaine and cannabis, MDMA and cannabis, LSD and cannabis, and cocaine

A study on the illicit use of opioid drugs in Ohio (Daniulaityte, Falck, Wang, & Carlson, 2009) found that 81% of participants reported lifetime misuse, and 31% reported current misuse of opioid drugs. The study also suggested that opioid misuse was most often just a part of a wider polydrug use behaviour pattern, as common predictors for opioid misuse included the illicit use of pharmaceutical tranquilisers and pharmaceutical stimulants. College students are also noted to be a population at risk of pharmaceutical opioid abuse, with prescription pain medicine often being misused for both recreational purposes and self-medication (McCabe, Teter, & Boyd, 2005).

Alcohol use seems to increase directly in parallel with the use of other psychoactive substances, particularly MDMA, cannabis and amphetamine (Parrott, Morinan, & Moss, 2004, p.120). Due to this relationship, the most intensive patterns of alcohol abuse are reported by younger illicit polydrug users (Parrott, Milani, Parmar, & Turner, 2001). However, O'Malley and Johnston (2015) found that heavy alcohol use did not precipitate the use of other psychoactive substances, suggesting that non-alcoholic psychoactive substances may pre-empt heavier rates of alcohol use, and not vice versa.

A longitudinal study (Brecht, Huang, Evans, & Hser, 2008) examining ten-year trajectories for heroin, cocaine, alcohol, cannabis and methamphetamine polydrug users found that in the cases of primary heroin and meth use, drug usage rates have declined over time, but rates of alcohol and cannabis use have remained fairly constant. Additionally, usage of non-primate heroin, cocaine and meth was found

primary heroin, cocaine, or meth use trajectories over time may present valid information about drug use patterns in general. A study on drug use patterns in participants who used either primarily heroin or amphetamine found that as age increases, rates of drug use decrease (Hall & Darke, 1995). Research identifying trends in drug use over time is generally important because it may aid in the development of health-focused interventions against substance abuse.

A 2015 report on trends in drug use did indeed find that between 10% and 48% of all drug-related emergency presentations involved cannabis and in addition to that, 90% of those presentations included another drug alongside cannabis, indicating that polydrug use may be a significant health risk (EMCDDA, 2015a) and that interventions are required to reduce the negative impact that it has on individual health. It is not a surprise that cannabis is present in most polydrug related health cases, as cannabis is the most common illicit drug in the world (Hall & Degenhardt, 2007). Despite this fact, it has been noted that much of the literature pertaining to cannabis use ignores findings that cannabis users are very often prolific polydrug users (Parrott, Morinan, & Moss, 2004, p.92). Smith, Farrell, Bunting, Houston and Shevlin (2010) carried out research into the most frequent patterns of polydrug use when cannabis was involved (see Figure 1) and found that cannabis is most often combined with MDMA, but also commonly with amphetamines and cocaine. It is important to note, however, that this study found that cannabis was most often used singularly, with only 6.3% of cannabis users reporting polydrug use.

IX. Distribution of Polydrug Use

‘prototypical’ users of different classes of drugs. For example, research on undergraduate students at a university in the Midwestern United States found that SPU was most common within white students, male students, and students who had reported early initiation to alcohol use (McCabe, Cranford, Morales, & Young, 2006). Other studies have suggested the existence of many other polydrug use predictors, and it is to the findings of these studies that we shall turn next.

Gender seems to predict polydrug use, despite the factors leading to this association not being well-understood. Collins, Ellickson, and Bell (1998) found in their study on young American college students that females were less likely to take part in polydrug use than males even after controlling for other predictors, but also concluded that polydrug use involving hard drugs exhibited no gender differences.

Instead, Collins et al. cited environmental factors to explain the lack of gender differences for hard drug use, proposing that females often enjoy social protections (e.g. stronger social circles, lower rates of deviance) that apply to some forms of drug use but not others. Smit, Monshouwer and Verdurmen (2002) described males as having a ‘specific’ risk for polydrug use for both “soft” (alcohol and cannabis) and hard drugs. Other research has supported that gender differences in polydrug use are on the decline, for example in the case of simultaneous alcohol and cigarette use (Hoffman, Welte, & Barnes, 2001). It can be concluded the role of gender in determining the probability of polydrug use may depend on which particular pattern of polydrug use is being examined.

with psychological distress being more significantly related to extended drug use (White et al., 2013). It seems reasonable that peer behaviour would predict drug use, as adolescents are highly impressionable and may use drugs more frequently under social pressures (Kelly et al., 2010). The role that psychological distress may play in predicting polydrug use is more intriguing. Indeed, Smith, Farrell, Bunting, Houston and Shevlin (2010) have reported that poor mental health can predict polydrug usage. Going forward, it will thus be important for drug use interventions to focus on psychological problems that adolescents commonly face, including anxiety and depression.

Psychopathology has been found to predict polydrug use in general, and not just in adolescents. For example, it has been noted that individuals with previously-existing mental health conditions are less likely to use a combination of MDMA and alcohol, but are actually more likely to use a combination of MDMA and opiates (Schifano, Furla, Forza, Minicuci, & Bricolo, 1998) which could suggest that combining MDMA and opiates may help the individuals cope with mental illness in ways not yet understood.

Another study on young students from grades 7 to 10 (Brière, Fallu, Descheneaux, & Janosz, 2011) found that alcohol and cannabis use at a young age predicts polydrug use with the two substances at later grades and beyond. Additionally, the study found that simultaneous alcohol and cannabis use is predicted by multiple psychosocial risk factors, including depressive symptoms, low school grades, delinquency, parental conflict and drug use by peers. SPU may thus be influenced by both internal and

stress leading students to use drugs to emotionally cope with academic and social demands (Quintero, 2009). However, other evidence suggests that it is this drug use itself that contributes to perceived stress in college-aged polydrug users (Pierceall & Keim, 2007). Self-reported stress in college students also appears related to risky decision-making and reduced social competence, potentially maintaining cannabis, alcohol and general polydrug use (Fishbein et al., 2006). If it is true that stress increases polydrug usage, there are implications for monodrug users who use MDMA, as it increases stress exponentially (Parrott, Sisk, & Turner, 2000; Parrott, 2009). Additionally, polydrug users are more likely than monodrug users to report using drugs to deal with unpleasant emotions such as stress (Kelly & Parsons, 2008), further supporting the hypothesis that stress may pre-empt polydrug use.

Factors related to family life can have an effect on the likelihood that an individual will become dependent on multiple drugs. A study carried out by Humes and Humphrey (1994) analysed families which either had a polydrug-dependent daughter or a normal daughter. They found no differences in the behaviours from the daughters, but did find differences in the parents. The parents of the polydrug-dependent daughters exhibited greater affirmation and condemnation of their daughter's autonomy, and in those families both the parents and the daughters themselves blamed the drug-dependent daughter for the family's problems. These findings confirm general socio-developmental (Hussong, Jones, Stein, Baucom, & Boeding, 2011) and psychoanalytic (Stanton et al., 1978) theories of drug dependence. Some of

related psychiatric diagnosis, alcohol dependents and alcohol abusers have higher rates of polydrug use (69% and 72% respectively, compared to 45%), a trend which was associated with high levels of behavioural undercontrol and negative emotionality (Martin, Kaczynski, Maisto, & Tarter, 1996). This finding is further supported by research showing that alcohol abuse/dependence is associated with depression (Fergusson, Boden, & Horwood, 2009) though Fergusson et al. hypothesized that alcohol dependence may also directly cause depression symptoms.

A common theme throughout drug prevalence research is that of the "gateway drug," referring to substances whose use may easily lead into more serious drug abuse problems. In the early 1980s, the term 'gateway drugs' usually included alcohol and cigarettes, as these drugs were often identified as being the precursors to illicit drug use. Since then, cannabis has come to be included in this category (Kandel, 2002). Indeed, at least one study has concluded that alcohol, cannabis and tobacco use may directly contribute to the emergence of a new substance use pattern (Olthuis, Darredeau, & Barrett, 2012; see Figure 2). Furthermore, Olthuis et al. found that illicit drug initiations vary by which other pre-existing drug use patterns they are most tightly associated with. For example, heroin initiation was accompanied by cigarette use in 87.5% of occasions, compared to alcohol and cannabis, both only present at 62.5% of initiation events. It is, of course, also important to isolate predictors for initiation of each of these substances. The use of cannabis, commonly considered in modern times to be a "gateway" drug, is

the initiation of dangerous polydrug use behaviours.

Various other predictors exist for polydrug abuse, and some will be described very briefly here. For example, users of anabolic-steroids were found to be more likely to use multiple other drugs, with the frequency of steroid use correlating positively with both cocaine and heroin use (Heath, Escobedo, & DuRant, 1995). Legislation can be a factor in determining whether an individual has easy enough access to a drug, as accessibility is a large predictor in polydrug use (Hser, Maglione, Polinsky, & Anglin, 1998). Legislation illegalizing mephedrone played a significant role in lowering general levels of its usage due to a decrement in the quality of mephedrone available and an increase in its price (Polwin, 2013). A large-scale report on polydrug use found that some of the main factors that can predict polydrug use include truancy rates and family risk (EMCDDA, 2011). The misuse of methylphenidate was also related to misuse of both prescription and non-prescription drugs concurrently (Barrett, Darredeau, Bordy, & Pihl, 2005).

V. The Pharmacology of Polydrug Use

It is widely known that drugs can have very significant effects on bodily functioning, both acute and chronic. Polydrug combinations may potentiate these effects, and much data exists describing polydrug use pharmacology and physiology. This review will look at some of the pharmacological effects induced by certain combinations of illicit drugs, prescription drugs and even some foods.

According to the EMCDDA's 2015 report on the trends and developments in drug use in 2015, veteran polydrug opioid

(kidney) dysfunction, both of which have serious implications for the long-term health of polydrug users (Reece, 2007). Additionally, opiate dependence has been linked to early emergence of other markers of aging, such as erosive periodontitis and hair greying (Reece, 2010).

The neurochemical effects of opiates on the human body are more pronounced in polydrug users. Polydrug users have been found to have abnormal brain metabolism and as a result, an irregular cerebral phospholipid balance (Kaufman et al., 1999). Similar results have been found for cocaine users (MacKay, Meyerhoff, Dillon, Weiner, & Fein, 1993). Since phospholipid integrity is important for the maintenance of associated cortical cholinergic structures, cognitive and motor skills may both be impaired in cases of irregular phospholipid balance (Casacchia, Meco, Corona, Castellana, & Cusimano, 1981). However, these physiological irregularities were not found in long-term patients in a methadone maintenance treatment (MMT) program, implying that MMT may be associated with neurochemistry recovery, and that drug use must be ongoing for brain neurochemistry to be altered. Drug interventions for cocaine-dependent individuals could thus potentially reverse the neurochemical effects of chronic cocaine use similarly to opiate interventions.

The co-use of cocaine and heroin (colloquially known as 'speedball') does not produce a novel set of subjective effects, and yet it is still common in practice (Leri, Bruneau, & Stewart, 2003). Both drugs have an effect on the same biological systems, but typically manifest some opposing effects within these systems.

elevation in extracellular dopamine concentration at the nucleus accumbens, a brain area that plays a central role in drug addiction and positive reinforcement, following the simultaneous administration of both heroin and cocaine (Smith, Hemby, Co, & Dworkin, 1999).

The combination of cocaine and alcohol is common, and has a unique effect *in vitro* (Hearn et al., 1991). In the presence of alcohol, cocaine is metabolised into cocaethylene in the liver. Cocaethylene is similar to cocaine in its ability to blockade dopamine reuptake, but is a more potent mediator of lethality than cocaine alone (Hearn, Rose, Wagner, Ciarleglio, & Mash, 1991).

Alcohol produces behavioural disinhibition, and thus it stands to reason that a cocaine and alcohol simultaneous polydrug user would be more likely to consume an excessive quantity of both drugs, introducing more cocaethylene into the body and potentially putting the user at risk of death.

Chemotherapy patients often suffer from vomiting as a side effect of the intense regime of drugs they are required to take. It has been found that cannabis can reduce the emetic effects of chemotherapy drugs, leading many patients to use cannabis to reduce nausea and vomiting (Parrott, Morinan, & Moss, 2004, p.225). These findings have persisted for decades (Sallan, Zinberg, & Frei, 1975), leading influenced many researchers to support the use of medicinal cannabis, especially for chemotherapy patients (Doblin & Kleiman, 1991). Indeed, the use of cannabis as an anti-emetic provides a strong case for its approval in a medical setting.

MDMA and methamphetamine are two

alterations (Clemens, Cornish, Hunt, & McGregor, 2007). The combination of MDMA and methamphetamine appears to induce oxidative stress and the production of free- radicals in cell bodies, particularly when a large quantity is consumed in a short time period. Other consequences of this form of polydrug use include significant depletion of serotonin, dopamine and noradrenaline across multiple brain regions (Clemens, Cornish, Li, Hunt, & McGregor, 2005). Additionally, concurrent MDMA and methamphetamine use may lead to increased symptoms of social anxiety, even in the absence of marked neurochemical depletion (Clemens et al., 2007).

Cross-tolerance may lead some individuals to initiate polydrug use (Parrott, Morinan, & Moss, 2004, p.46). Many stimulant users become tolerant to their drugs of choice and therefore start to mix and combine stimulants with other drugs to more easily acquire an “increasingly elusive hit” (Parrott, Morinan & Moss, 2004). Polydrug users who use hallucinogens may also suffer from cross-tolerance effects. Indeed cross-tolerance has been demonstrated between LSD, psilocybin (Isbell, Wolbach, Wikler, & Miner, 1961) and mescaline (Wolbach, Isbell, & Miner, 1962), prompting hallucinogen users to pursue higher doses over time to acquire the same effect.

Prescription drugs often have complex drug profiles that require a great deal of caution in care on the part of medical professionals. Due to the vast quantity of prescription drugs currently available, only a few common drugs will be considered in this review. One commonly prescribed class of drugs are the

many possible interactions with other drugs that can either be beneficial to the patient (e.g. in the case of SSRIs, lithium, L- tryptophan) or problematic for health (e.g. in the case of antiepileptics, which may counteract the effects of TCAs). Patients and doctors alike thus must be careful to monitor the substances that are being concurrently introduced into a patient's body (Anderson & Reid, 2004).

Another category of antidepressant, the selective serotonin reuptake inhibitors (SSRIs), have also exhibit potentially problematic interactions with other drugs. The main effect of SSRIs is to increase the amount of serotonin present in the synaptic cleft at any given moment by inhibiting serotonin reuptake. Too much serotonin in the system can cause serotonin syndrome, which is characterised by headaches, agitation, hypomania, hyperthermia, vasoconstriction, tachycardia, nausea, myoclonus and tremor (Boyer & Shannon, 2005). Some forms of polydrug use can increase the risk of developing serotonin syndrome and thus should be avoided, such as taking both SSRIs and MAOIs at the same time (Anderson & Reid, 2004). A study of five cases of serotonin syndrome in elderly depression patients found that many had been taking St. John's Wort in addition to their usual SSRI medication (Lantz, Buchalter, & Giambanco, 1999), implying that the two substances have an additive effect and can prove dangerous.

Cholinesterase inhibitors that are used for treating dementia are antagonised by multiple other drugs, such as procainamide (an antiarrhythmic medication), aminoglycosides (antibiotics) and antimuscarinic drugs (anti- Parkinson's drugs). Interactions between these drugs

al., 2003; Anderson & Reid, 2004; Schubert et al., 2006; Riedel et al., 2010). With dementia being such a complex and difficult to treat disease, further work is needed to elucidate which factors can predict the optimal treatment regime for an individual patient.

Certain types of food can contain 'drugs' that interact with other drugs or medications, and these interactions may prove problematic for health. It is, for example, widely known that MAOIs interact with tyramine-containing foods (including cheese, chocolate, alcoholic beverages and most fermented foods), causing hypertension (Simpson & White, 1984). The effects of this interaction are potentially so serious that diet counselling is advised prior to undergoing drug therapy with MAOIs (McCabe, 1986).

The interaction between alcohol and grapefruit juice, discovered inadvertently in a study that assessed for the effects of alcohol on the hemodynamics of Felodipine, appears to cause the bioavailability of certain compounds such as Felodipine to greatly increase (Bailey, Edgar, Arnold, Spence, & Bayliff, 1990). It since been determined that grapefruit juice has clinically relevant interactions with other drugs such as cyclosporine, midazolam, terfenadine, saquinavir and many other drugs that have low oral bioavailability. These findings have implications for patients who are administered these drugs during transplant surgeries, during surgeries requiring anaesthesia and for patients who sleeping problems, allergies, HIV/AIDS and a variety of other conditions. Research on grapefruit juice interactions, though limited in utility, demonstrate that drug interactions

VI. The Psychopharmacology of Polydrug Use

Psychopharmacology is a major area of polydrug use research that examines issues related to behavior, cognitive function and mental health. This section of the review will highlight and discuss some studies that have explored the psychopharmacology of polydrug use.

Polydrug use in the UK is significantly associated with mental health problems (See Table 3), in particular with lifetime suicide attempts (Smith, Farrell, Bunting, Houston, & Shevlin, 2010), which can occur independently from substance abuse or dependence (Borges, Walters, & Kessler, 2000). In a sample of 533 opiate addicts (Kleber, Eyre, Rounsaville, Murphy, & Eyre, 1983), risk factors for suicidality identified included a history of alcohol, sedative and amphetamine abuse, implicating polydrug use. Similar results were found by Darke and Ross (2001) who determined that participants who had attempted suicide had a history of wider polydrug use, and by Rossow and Lauritzen (1999), who concluded that polydrug use had similar effects on the likelihood to attempt suicide as poor social functioning and HIV risk-taking behavior. It will be important to identify whether these trends are a result of polydrug use itself or a consequence of the environments that tend to coincide with polydrug use. Many drugs often used by polydrug users (particularly MDMA) are linked with suicidality when used in isolation, and thus future studies may wish to isolate the factors that lead to suicidal outcomes in these users.

Polydrug use can also influence drug dosage. Barrett, Darredeau and Pihl (2006) found that when alcohol was used with

investigate polydrug use among alcohol-dependent individuals (Staines, Magura, Foote, Deluca, & Kosanke, 2001).

Martinotti et al. (2009) carried out a study on substance-dependent individuals and compared the incidence of social factors, childhood trauma, personality, suicidal behaviour, and comorbid Axis I diagnoses between monodrug and polydrug dependents. Almost half of the sample were found to be polydrug dependents, most of whom relatively young, likely to be unemployed and/or divorced and scored highly on scores of childhood neglect, psychoticism, aggression and impulsivity compared to monodrug dependents. Thus, the socio-demographic, developmental and personality factors that distinguish polydrug use in isolation from monodrug use suggest that polydrug use and/or dependence is often associated with adverse circumstances early in life.

Polydrug use can also have highly negative effects on cognition. Polydrug use has been linked to deficits in concept tracking, rule shifting and learning and other forms of prefrontal cortex-mediated processing (Brandt & Doyle, 1983). Chronic primary-cocaine polydrug dependence is associated with lower scores on working memory tests, attention tests and concept formation (Rosselli & Ardila, 1996). Working memory also appears to be impaired in cannabis polydrug abuse (Fletcher et al., 1996). Impairments to cognition in polydrug use serves to further highlight the significant negative repercussions that using combinations of drugs simultaneously can have at the individual level. Furthermore, many studies have focused specifically on adolescent polydrug users, as the still-maturing brain may be highly susceptible to the effects of

heroin- dependent individuals, as the combination can potentiate the alleviating effects of cocaine on heroin withdrawal symptoms, and the motivational effects of cocaine may also mediate dependence on and withdrawal from opioid drugs (Leri, Bruneau, & Stewart, 2003). The “speedball” combination is highly dangerous, and has serious implications for mental health: an investigation into differences in psychopathology between cocaine and speedball users found that the latter displayed far greater problems with depression, anxiety and related symptoms (Lott, Pena, Corrigan, Malow, & West, 1992).

Polydrug use can also exacerbate the problems caused by individual drugs. For example, the psychobiological decrements associated with cannabis use can be potentiated by concurrent alcohol use (Chait & Pierri, 1992; Ramaekers et al., 2010), among other drugs (Parrott, Milani, Parmar, & Turner, 2001). In the case of alcohol and cannabis, Ronen et al. (2010) found that the combination produces an intense subjective experience of sedation, hunger and “feeling high” greater than that for each drug used in isolation, suggesting an additive effect as the primary motivation for co-use of cannabis and alcohol. The combination of alcohol and cannabis has also been found to increase rates of both alcohol dependence and depression, mirroring trends that suggest younger populations use alcohol and drugs in part as a form of self- medication or to cope with distress (Midanik, Tam, & Weisner, 2007).

Similarly, recreational cocaine polydrug use potentiates the impairment that cocaine has on cognitive flexibility (Colzato, Huizinga, & Hommel, 2009),

abuse in the past (Giancola & Tarter, 1999), and thus cocaine polydrug use and cognitive decrements may interact cyclically, with each reinforcing the other. Primary cocaine polydrug use has also been found to cause the development of abnormal brain perfusion (Mendelson et al., 1991) which could be related to observed cognitive deficits.

LSD use is characterised by hallucinations and, for an extended period following use, what is colloquially known as “LSD flashback syndrome.” Markel, Lee, Holmes and Domino (1994) studied the case histories of two LSD abusers who had comorbid major depression and were treated with SSRIs, and found that antidepressants use seemed to exacerbate LSD-induced flashbacks. It is thought that the culprit for this interaction is the similarity in physiology between LSD and serotonin. This research has important implications for patients with depression who also have a history or a proclivity to take LSD, though the cited study only examined reports from two patients, which does not represent a large enough sample to be able to generalise the results to larger populations.

Parrott, Sisk and Turner (2000) found that polydrug use in MDMA users most likely contributes to the adverse psychobiological profiles observed in MDMA-using populations. These results were supported by another study which examined MDMA polydrug abuse and comorbid depression, psychotic disorders, cognitive disturbances, bulimic episodes, impulse control disorders, panic disorders and social phobia (Schifano, Furia, Forza, Minicuci, & Bricolo, 1998). Other problems experienced by heavy MDMA

Mayfrank & Daumann (2006), who hypothesized that since stimulants (e.g. amphetamine, cocaine) are commonly used alongside MDMA, this form of polydrug use can worsen the already neurotoxic effects of MDMA and act synergistically to worsening the drug's long-term neurobiological effects.

Interestingly, Parrot, Sisk and Turner (2000) also found that cannabis partially blocks MDMA's neurotoxic effects due to its neuro-protective qualities while also potentiating different psychological problems and cognitive failures. As an example of the latter scenario, MDMA polydrug users exhibit impairment on tasks known to be sensitive to temporal functioning (Fox et al., 2002). It is evident, then, that MDMA interacts in a complex manner, producing both positive and negative long-term effects for the user. Simultaneously users of both MDMA and cannabis also appear to have altered neuronal integrity in the Brodman Area 45, an area involved in verbal memory processing (Cowan, Joers, & Dietrich, 2009). Indeed, the cited study found an inverse association between cannabis use and Brodman Area 45 N-acetyl aspartate (NAA) levels in MDMA users.

The combination of MDMA and methamphetamine, both of which are classified as stimulants, may potentiate the effects of both drugs simultaneously, at least in rats (Clemens et al., 2004). For example, hyperthermia is exacerbated in MDMA/methamphetamine compared to MDMA alone, as is stereotypy (persistent repetitive behaviors). Changes to social behavior were also observed following the consumption of both drugs, with rodent models exhibiting greater social-anxiety-

related behaviors and decreased social methamphetamine alongside MDMA may reverse the social potentiation induced by MDMA alone. One potential explanation for this finding is that the introduction of methamphetamine depletes the activity of DOPAC, which is known to participate in the destruction of dopamine storage vesicles in the substantia nigra (Clemens et al., 2004; Hastings, Lewis, & Zigmond, 1996). This particular effect of methamphetamine may have numerous behavioural and psychobiological consequences that could lead to a reversal of social potentiation induced by MDMA.

When used in combination, CNS depressants such as alcohol, barbiturates and opiates may place users at a heightened risk of language and perceptual-motor dysfunction (Grant et al., 1978). Grand and Judd, 1976, also observed that cerebral dysfunction associated with neuropsychological impairment in poly-depressant drug use may persist beyond 5 months following abstinence, indicating that this behavior may have serious long-term consequences for cognitive function.

Seizures can also result from polydrug use. Brust (2006) identified that taking one drug while recovering from the effects of another may have many adverse effects on the body, including the initiation of seizures. Seizures are intensely dangerous, and have been identified as a cause of death resulting from MDMA use (Schifano et al., 2003). Seizures may also result from the use of anticonvulsants to treat alcohol dependence, as alcoholics are prone to erratic drug-taking behaviour and the possible interactions between anticonvulsants and non-alcohol drugs can

and to have more sexual partners (Patterson, Shemple, Zians, & Strathdee, 2005). Additionally, in a sample of HIV-positive men who have sex with men (MSM), most had a pattern of primary methamphetamine polydrug use and tended to be more impulsive than light polydrug users. These findings were supported by Stall et al. (2003) who found that MSM were more likely to exhibit problematic polydrug use and develop associated mental health conditions.

Other risky behaviours that are associated with polydrug use include criminal behavior, which along with alcoholism was concluded to be a result of chronic polydrug use (Wu, Schlenger and Galvin, 2006). Similarly, polydrug use causes an increase in violent behaviour in adolescents (Dornbusch, Lin, Munroe, & Bianchi, 1999). Gender differences were evident in this data, as might be expected, with males tending to be more violent than females, but even after controlling for gender, polydrug use was still found to be a factor associated with an increase in violent behaviour among adolescents and adults alike. Similar results were found in a study carried out by Degenhardt and Topp (2003) who concluded that crystal methamphetamine polydrug use was related to violent behaviour, even in small doses. Finally, early onset polydrug use has been identified as a risk factor for using injection drugs later in life (Trenz et al., 2012).

A novel way that a polydrug interaction can be utilised by the health profession is exemplified in the rise in the use of drugs such as disulfiram or naltrexone to treat alcohol dependence. When disulfiram is taken with alcohol it causes an accumulation of acetaldehyde in the body which in turn causes symptoms of

useful tool in treating dependence in both alcohol-dependent individuals and cocaine-dependent individuals who use alcohol (Carroll, Nich, Ball, Mccance, & Rounsavile, 1998). When naltrexone is taken with alcohol, it reverses its opioid effects and significantly reduces both alcohol cravings and binge drinking (Volpicelli, Alterman, Hayashida, & O'Brien, 1992).

VII. Future Directions

Polydrug use does not seem to be decreasing in prevalence. In fact, problematic polydrug use is increasing across many regions of the world (Klee, Faugier, Hayes, Boulton, & Morris, 1990; Choquet, Morin, Hassler, & Ledoux, 2004; Wish, Fitzelle, O'Grady, Hsu, & Arria, 2006; Brecht, Huang, Evans, & Hser, 2008) and it is therefore not surprising that so much research has already been undertaken to investigate which factors may predispose individuals to engage in polydrug use.

Dosages, frequencies and durations of use all represent factors in need of further exploration on the polydrug use literature (Grant & Harford, 1990), and it would thus be prudent to invest time and money into researching the relationships between these variables and their association with other variables (e.g. psychiatric diagnoses, lifetime polydrug use, lifetime health service utilisation, socioeconomic factors). Such research would be greatly useful towards developing interventions that reduce frequency of polydrug use and educate specific populations about the risks that it entails. Animal studies have been utilized in this respect, particularly studies in which rats have been administered various combinations of drugs and their effects

difference variables such as drug dosages and frequencies of use

Much polydrug research, and indeed drug research on the whole, relies on self-report questionnaires and interviews, which can be problematic in terms of data reliability, particularly since drug users have a tendency to give socially desirable answers. Self-report data can thus be unreliable, particularly with respect to polydrug use initiation and the frequency/severity of use, both of which represent crucial domains for the development of effective interventions. Additionally, much research is carried out via sampling individuals who possess a fixed home address/landline (AIHW, 2011) which can leave high-risk individuals such as those in transient accommodation to be exempt from the sampling process and thus cause an underestimation of the rates of polydrug use in this group. To this extent, assessing drug use through methods that cannot be falsified may be utilized to great effect. One example of an unfalsifiable method is the analysis of hair samples to identify chronic MDMA use (Pichini et al., 2006).

There is also a need for further research on the psychopharmacological effects of mixing illicit drugs with prescription drugs. The research that does exist seems to be generally limited either by sample size or by paucity of other experimental data to support findings (Markel, Lee, Holmes, & Domino, 1994). Given that many prescription and illicit drugs produce a wide range of pharmacological and psychological effects, yet most relevant research included within this review has pertained uniquely to pharmacology, it will be important to

at once (one illicit, one prescription) or a placebo control. Two-way ANOVA hypothesis testing would then permit researchers to easily differentiate psychopharmacological effects that are due to drug interactions (polydrug use) from individual drug effects (monodrug use).

Interventions and legislation are often discussed in the context of polydrug use. Recent furor surrounding the United Kingdom's Psychoactive Substances Bill ('Psychoactive substances act 2016 — UK parliament', 2016) has proved that at least in the UK, the societal implications of drug use is a topic that provokes much debate. It appears that in these cases, for both the public and for government officials involved, education is the best route by which to improve societal understanding of the effects of drug use, including polydrug use. To this end, research into the effects of polydrug and monodrug use alike must become both extensive and accessible to the public. Drug use interventions in the past have proved complex, and no single strategy represents a cure-all for dependency or abuse in a polydrug context (Ives & Ghelani, 2006). Thus, the investment of both time and money into developing multiple types of intervention strategies, each tailored to a different at-risk population, is strongly recommended moving forward.

REFERENCES

- AIHW. (2011). *2010 National Drug Strategy Household Survey report*. Canberra: Australian Institute of Health and Welfare.
- ASH. (2015, July). *Smoking statistics: Who smokes and how much*. Retrieved from <http://www.ash.org.uk/information/facts-and-stats/fact-sheets>
- Adams, E. H., Gfroerer, J., Rouse, B. A., & Kozel, N. J. (1986). Trends of prevalence and consequences of cocaine use. *Advances in Alcohol &*

Yale Review of Undergraduate Research in Psychology

- related conditions. *Addiction (Abingdon, England)*, 1(102). Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/17207127>
- Anderson, I. M., & Reid, I. C. (2004). *Fundamentals of Clinical Psychopharmacology*. United Kingdom: Informa Healthcare.
- Baggott, M. J., Garrison, K. J., Coyle, J. R., Galloway, G. P., Barnes, A. J., Huestis, M. A., & Mendelson, J. E. (2015). MDMA impairs response to water intake in healthy volunteers. *-Infinity*. doi:10.1101/021113
- Bailey, D. G., Edgar, B., Arnold, J. M., Spence, J. D., & Bayliff, C. D. (1990). Edgar B. *Clinical and investigative medicine. Medecine clinique et experimentale*, 12(6), 357–362. Retrieved from <http://europepmc.org/abstract/med/2612087>
- Bailey, D. G., Malcolm, J., Arnold, O., & David Spence, J. (1998). Grapefruit juice-drug interactions. *British Journal of Clinical Pharmacology*, 46(2), 101–110. doi:10.1046/j.1365-2125.1998.00764.x
- Barrett, S. P., Darredeau, C., & Pihl, R. O. (2006). Patterns of simultaneous polysubstance use in drug using university students. *Human Psychopharmacology: Clinical and Experimental*, 21(4), 255–263. doi:10.1002/hup.766
- Barrett, S., Darredeau, C., Bordy, L., & Pihl, R. (2005). Characteristics of methylphenidate misuse in a university student sample. *Canadian journal of psychiatry. Revue canadienne de psychiatrie.*, 50(8), 457–61. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/16127963>
- Barrett, S. P., Gross, S. R., Garand, I., & Pihl, R. O. (2005). Patterns of simultaneous polysubstance use in Canadian rave attendees. *Substance Use & Misuse*, 40(9-10), 1525–1537. doi:10.1081/ja-200066866
- Borgelt, L. M., Franson, K. L., Nussbaum, A. M., & Wang, G. S. (2013). The pharmacologic and clinical effects of medical cannabis. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy*, 33(2), 195–209. doi:10.1002/phar.1187
- Borges, G., Walters, E., & Kessler, R. (2000). Associations of substance use, abuse, and dependence with subsequent suicidal behavior. *American journal of epidemiology*, 8(151), . Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10965975>
- Boyer, E. W., & Shannon, M. (2005). The serotonin syndrome. *New England Journal of Medicine*, 352(11), 1112–1120. doi:10.1056/nejmra041867
- Boyer, A., Lenton, S., & Norcross, K. (1997). Polydrug http://journals.lww.com/jonmd/Abstract/1983/09000/Concept_Attainment,_Tracking,_and_Shifting_in.6.as_px
- Brecht, M. L., Huang, D., Evans, E., & Hser, Y. I. (2008). Polydrug use and implications for longitudinal research: Ten-year trajectories for heroin, cocaine, and methamphetamine users. *Drug and Alcohol Dependence*, 96(3), 193–201. doi:10.1016/j.drugalcdep.2008.01.021
- Brière, F. N., Fallu, J. S., Descheneaux, A., & Janosz, M. (2011). Predictors and consequences of simultaneous alcohol and cannabis use in adolescents. *Addictive Behaviors*, 36(7), 785–788. doi:10.1016/j.addbeh.2011.02.012
- Brust, J. C. M. (2006). Seizures and substance abuse. *Neurology*, 67(12 suppl.), S45–S48. doi:http://dx.doi.org/10.1212/WNL.67.12_suppl_4.S45
- Calafat, A., & Koller, M. (2003). *Enjoying the nightlife in Europe: The role of moderation*. Palma de Mallorca: IREFREA España.
- Carroll, K. M., Nich, C., Ball, S. A., Mccance, E., & Rounsavile, B. J. (1998). Treatment of cocaine and alcohol dependence with psychotherapy and disulfiram. *Addiction*, 93(5), 713–727. doi:10.1046/j.1360-0443.1998.9357137.x
- Casacchia, M., Meco, G., Corona, R., Castellana, F., & Cusimano, G. (1981). [Cerebral phospholipids and Parkinson's disease: Cross-over double-blind study versus placebo]. *Rivista di neurologia.*, 51(2), 101–13. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/7017886>
- Chait, L. D., & Pierri, J. (1992). Effect of smoked marijuana on human performance: A critical review. In A. Bartke & L. Murphy (Eds.), *Marijuana/cannabinoids: Neurobiology and neurophysiology*. Boca Raton, FL: CRC Press.
- Chapman, S. (2015). Plain tobacco packaging in Australia: 26 months on. *Postgraduate Medical Journal*, 91(1073), 119–120. doi:10.1136/postgradmedj-2015-133311
- Choquet, M., Morin, D., Hassler, C., & Ledoux, S. (2004). Is alcohol, tobacco, and cannabis use as well as polydrug use increasing in France? *Addictive Behaviors*, 29(3), 607–614. doi:10.1016/j.addbeh.2003.08.047
- Clemens, K. J., Cornish, J. L., Hunt, G. E., & McGregor, I. S. (2007). Repeated weekly exposure to MDMA, methamphetamine or their combination: Long-term behavioural and neurochemical effects in rats. *Drug and Alcohol Dependence*, 86(2-3), 183–190. doi:10.1016/j.drugalcdep.2006.06.004
- Clemens, K., Cornish, J., Li, K., Hunt, G., & McGregor, I. (2005). MDMA (Ecstasy) and

Yale Review of Undergraduate Research in Psychology

- Clemens, K. J., van Nieuwenhuyzen, P. S., Li, K. M., Cornish, J. L., Hunt, G. E., & McGregor, I. S. (2004). MDMA ('ecstasy'), methamphetamine and their combination: Long-term changes in social interaction and neurochemistry in the rat. *Psychopharmacology*, *173*(3-4), 318–325. doi:10.1007/s00213-004-1786-x
- Collins, R. L., Ellickson, P. L., & Bell, R. M. (1998). Simultaneous polydrug use among teens: Prevalence and predictors. *Journal of Substance Abuse*, *10*(3), 233–253. doi:10.1016/S0899-3289(99)00007-3
- Colzato, L. S., Huizinga, M., & Hommel, B. (2009). Recreational cocaine polydrug use impairs cognitive flexibility but not working memory. *Psychopharmacology*, *207*(2), 225–234. doi:10.1007/s00213-009-1650-0
- Compton, W. M., Stinson, F. S., Grant, B. F., Colliver, J. D., & Glantz, M. D. (2004). Prevalence of marijuana use disorders in the United States. *JAMA*, *291*(17), 2114–2121. doi:10.1001/jama.291.17.2114
- Consroe, P., Musty, R., Rein, J., Tillery, W., & Pertwee, R. (1997). The perceived effects of smoked cannabis on patients with multiple sclerosis. *European Neurology*, *38*(1), 44–48. doi:10.1159/000112901
- Cowan, R. L., Joers, J. M., & Dietrich, M. S. (2009). N-acetylaspartate (NAA) correlates inversely with cannabis use in a frontal language processing region of neocortex in MDMA (ecstasy) polydrug users: A 3 T magnetic resonance spectroscopy study. *Pharmacology Biochemistry and Behavior*, *92*(1), 105–110. doi:10.1016/j.pbb.2008.10.022
- Daniulaityte, R., Carlson, R. G., & Kenne, D. R. (2006). Initiation to pharmaceutical opioids and patterns of misuse: Preliminary qualitative findings obtained by the Ohio substance abuse monitoring network. *Journal of Drug Issues*, *36*(4), 787–808. doi:10.1177/002204260603600402
- Daniulaityte, R., Falck, R. S., Wang, J., & Carlson, R. G. (2009). Illicit use of pharmaceutical opioids among young polydrug users in Ohio. *Addictive Behaviors*, *34*(8), 649–653. doi:10.1016/j.addbeh.2009.03.037
- Darke, S., & Ross, J. (2001). The relationship between suicide and heroin overdose among methadone maintenance patients in Sydney, Australia. *Addiction*, *96*(10), 1443–1453. doi:10.1046/j.1360-0443.2001.961014438.x
- De Bruin, K., Endert, E., Reneman, L., Feenstra, M. G., de Wolff, F. A., Lavalaye, J., & Booij, J. (2001). The acute and chronic effects of MDMA (Ecstasy) on cortical 5-HT_{2A} receptors in rat *Policy*, *14*(1), 17–24. doi:10.1016/s0955-3959(02)00200-1
- Dickenson, A. H. (1991). Mechanisms of the analgesic actions of opiates and opioids. *British medical bulletin*, *47*(3), 690–702.
- Doblin, R. E., & Kleiman, M. A. (1991). Marijuana as antiemetic medicine: A survey of oncologists' experiences and attitudes. *Journal of Clinical Oncology*, *9*(7), 1314–1319. Retrieved from <http://jco.ascopubs.org/content/9/7/1314.short>
- Docimo, T., Davis, A. J., Luck, K., Fellenberg, C., Reichelt, M., Phillips, M., Auria, J. C. D' (2014). Influence of medium and elicitors on the production of cocaine, amino acids and phytohormones by *Erythroxylum coca calli*. *Plant Cell, Tissue and Organ Culture (PCTOC)*, *120*(3), 1061–1075. doi:10.1007/s11240-014-0660-8
- Dornbusch, S. M., Lin, I.-C., Munroe, P. T., & Bianchi, A.J. (1999). Adolescent polydrug use and violence in the United States. *International Journal of Adolescent Medicine and Health*, *11*(3-4). doi:10.1515/ijamh.1999.11.3-4.197
- Dowling, G. P., Bost, R. O., & McDonough, E. T. (1987). 'Eve' and 'ecstasy'. *JAMA*, *257*(12), 1615–1617. doi:10.1001/jama.1987.03390120077027
- Dunlop, S. M., Dobbins, T., Young, J. M., Perez, D., & Currow, D. C. (2014). Impact of Australia's introduction of tobacco plain packs on adult smokers' pack-related perceptions and responses: Results from a continuous tracking survey. *BMJ Open*, *4*(12), 5836. doi:10.1136/bmjopen-2014-005836
- EMCDDA. (2002). *Austria Drug Situation*. Vienna: EMCDDA.
- EMCDDA. (2011, December). *Polydrug use: Patterns and responses*. Retrieved from <http://www.emcdda.europa.eu/publications/selected-issues/polydrug-use>
- EMCDDA. (2015a). *European drug report 2015: Trends and developments*. <http://www.emcdda.europa.eu/publications/edr/trends-developments/2015>
- EMCDDA. (2015b). *Lysergide (LSD) drug profile*. Retrieved January 22, 2016, from <http://www.emcdda.europa.eu/publications/drug-profiles/lsd>
- Earleywine, M., & Newcomb, M. D. (1997). Concurrent versus simultaneous polydrug use: Prevalence, correlates, discriminant validity, and prospective effects on health outcomes. *Experimental and Clinical Psychopharmacology*, *5*(4), 353–364. doi:10.1037/1064-1297.5.4.353
- Epstein, J. A., Botvin, G. J., Griffin, K. W., & Diaz, T. (1999). Role of ethnicity and gender in polydrug use among a longitudinal sample of

Yale Review of Undergraduate Research in Psychology

- metabolism. *The Journal of Pharmacology and Experimental Therapeutics*, 283(1), 164–176.
- Fergusson, D. M., Boden, J. M., & Horwood, L. J. (2009). Tests of causal links between alcohol abuse or dependence and major depression. *Archives of General Psychiatry*, 66(3), 260. doi:10.1001/archgenpsychiatry.2008.543
- Field, M., Wiers, R. W., Christiansen, P., Fillmore, M. T., & Verster, J. C. (2010). Acute alcohol effects on inhibitory control and implicit cognition: Implications for loss of control over drinking. *Alcoholism: Clinical and Experimental Research*. doi:10.1111/j.1530-0277.2010.01218.x
- Fishbein, D. H., Herman-Stahl, M., Eldreth, D., Paschall, M. J., Hyde, C., Hubal, R., Ialongo, N. (2006). Mediators of the Stress–Substance–Use relationship in urban male adolescents. *Prevention Science*, 7(2), 113–126. doi:10.1007/s1121-006-0027-4
- Fletcher, J. M., Morris, R., Satz, P., Page, B. J., Francis, D. J., Copeland, K., Davis, C. M. (1996). Cognitive Correlates of long-term Cannabis use in Costa Rican men. *Archives of General Psychiatry*, 53(11), 1051–1057. doi:10.1001/archpsyc.1996.01830110089011
- Fogarty, J. N., & Vogel-Sprott, M. (2015). Cognitive processes and motor skills differ in sensitivity to alcohol impairment. *Journal of Studies on Alcohol*. doi:10.15288/jsa.2002.63.404
- Font-Mayolas, S., Gras, M. E., Cebrián, N., Salamó, A., Planes, M., & Sullman, M. J. M. (2013). Types of polydrug use among Spanish adolescents. *Addictive Behaviors*, 38(3), 1605–1609. doi:10.1016/j.addbeh.2012.09.007
- Fox, H., McLean, A., Turner, J., Parrott, A., Rogers, R., & Sahakian, B. (2002). Neuropsychological evidence of a relatively selective profile of temporal dysfunction in drug-free MDMA (‘ecstasy’) polydrug users. *Psychopharmacology*, 162(2), 203–214. doi:10.1007/s00213-002-1071-9
- Fu, C., Chute, D., Farag, E., Garakian, J., Cummings, J., & Vinters, H. (2003). Comorbidity in dementia: An autopsy study. *Archives of pathology & laboratory medicine*, 1(128), . Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/14692815>
- García-Cabrerizo, R., & García-Fuster, M. J. (2015). Chronic MDMA induces neurochemical changes in the hippocampus of adolescent and young adult rats: Down-regulation of apoptotic markers. *NeuroToxicology*, 49, 104–113. doi:10.1016/j.neuro.2015.06.001
- Ghodse, H. (2009). *Ghodse’s drugs and addictive behaviour*. doi:10.1017/cbo9780511770814
- Giancola, P. P., & Tartar, P. F. (1999). Executive of three national surveys. *Addiction*, 95(11), 1655–1667. doi:10.1046/j.1360-0443.2000.9511165556.x
- Gouzoulis-Mayfrank, E., & Daumann, J. (2006). The confounding problem of polydrug use in recreational ecstasy/MDMA users: A brief overview. *J Psychopharmacol*, 20(2), 188–193. doi:10.1177/0269881106059939
- Grant, B. F., & Harford, T. C. (1990). Concurrent and simultaneous use of alcohol with cocaine: Results of national survey. *Drug and Alcohol Dependence*, 25(1), 97–104. doi:10.1016/0376-8716(90)90147-7
- Grant, I., & Judd, L. L. (1976). Neuropsychological and EEG disturbances in polydrug users. *American Journal of Psychiatry*, 133(9), 1039–1042. doi:10.1176/ajp.133.9.1039
- Grant, B. F., Dawson, D. A., Stinson, F. S., Chou, S. P., Dufour, M. C., & Pickering, R. P. (2004). The 12-month prevalence and trends in DSM-IV alcohol abuse and dependence: United States, 1991–1992 and 2001–2002. *Drug and Alcohol Dependence*, 74(3), 223–234. doi:10.1016/j.drugalcdep.2004.02.004
- Grant, I., Adams, K. M., Carlin, A. S., Rennick, P. M., Judd, L. L., & Schoof, K. (1978). The collaborative neuropsychological study of polydrug users. *Archives of General Psychiatry*, 35(9), 1063. doi:10.1001/archpsyc.1978.01770330037003
- Grinspoon, L., & Bakalar, J. B. (1981). Coca and cocaine as medicines: An historical review. *Journal of Ethnopharmacology*, 3(s 2–3), 149–159. doi:10.1016/0378-8741(81)90051-9
- Grossenbacher, P. G., & Lovelace, C. T. (2001). Mechanisms of synesthesia: Cognitive and physiological constraints, 5(1), 36–41. doi:10.1016/S1364-6613(00)01571-0
- Grov, C., Kelly, B. C., & Parsons, J. T. (2009). Polydrug use among club-going young adults recruited through time-space sampling. *Substance Use & Misuse*, 44(6), 848–864. doi:10.1080/10826080802484702
- Hall, W., & Darke, S. (1995). Levels and correlates of polydrug use among heroin users and regular amphetamine users. *Drug & Alcohol Dependence*, 39(3), 231–235. doi:10.1016/0376-8716(95)01171-9
- Hall, W., & Degenhardt, L. (2007). Prevalence and correlates of cannabis use in developed and developing countries. *Current Opinion in Psychiatry*, 20(4), 393–397. doi:10.1097/ycp.0b013e32812144cc
- Halpern, J. H., & Pope, H. G. (2003). Hallucinogen persisting perception disorder: What do we know after 0 years? *Drug & Alcohol Dependence*, 60(2), 109–110

Yale Review of Undergraduate Research in Psychology

- 1956–1961. Retrieved from <http://www.pnas.org/content/93/5/1956.short>
- Hearn, W. L., Flynn, D. D., Hime, G. W., Rose, S., Cofino, J. C., Mantero-Atienza, E., Mash, D. C. (1991). Cocaethylene: A unique cocaine metabolite displays high affinity for the dopamine transporter. *Journal of Neurochemistry*, *56*(2), 698–701. doi:10.1111/j.1471-4159.1991.tb08205.x
- Hearn, W. L., Rose, S., Wagner, J., Ciarleglio, A., & Mash, D. C. (1991). Cocaethylene is more potent than cocaine in mediating lethality. *Pharmacology Biochemistry and Behavior*, *39*(2), 531–533. doi:10.1016/0091-3057(91)90222-n
- Heath, G. W., Escobedo, L. G., & DuRant, R. H. (1995). Anabolic-Steroid use, strength training, and multiple drug use among adolescents in the United States. *Pediatrics*, *96*(1), 23–28.
- Hillbom, M. E., & Hjelm-Jäger, M. (1984). Should alcohol withdrawal seizures be treated with anti-epileptic drugs? *Acta Neurologica Scandinavica*, *69*(1), 39–42. doi:10.1111/j.1600-0404.1984.tb07778.x
- Hoffman, J., Welte, J., & Barnes, G. (2001). Co-occurrence of alcohol and cigarette use among adolescents. *Addictive behaviors*, *26*(1), 63–78. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/11196293>
- Hser, Y.-I., Maglione, M., Polinsky, M. L., & Anglin, M. D. (1998). Predicting drug treatment entry among treatment-seeking individuals. *Journal of Substance Abuse Treatment*, *15*(3), 213–220. doi:10.1016/S0740-5472(97)00190-6
- Humes, D. L., & Humphrey, L. L. (1994). A multimethod analysis of families with a polydrug-dependent or normal adolescent daughter. *Journal of Abnormal Psychology*, *103*(4), 676–685. doi:10.1037/0021-843x.103.4.676
- Hussong, A. M., Jones, D. J., Stein, G. L., Baucom, D. H., & Boeding, S. (2011). An internalizing pathway to alcohol use and disorder. *Psychology of Addictive Behaviors*, *25*(3), 390. doi:10.1037/a0024519
- Isbell, H., Wolbach, A. B., Wikler, A., & Miner, E. J. (1961). Cross tolerance between LSD and psilocybin. *Psychopharmacologia*, *2*(3), 147–159. doi:10.1007/bf00407974
- Ives, R., & Ghelani, P. (2006). Polydrug use (the use of drugs in combination): A brief review. *Drugs: Education, Prevention and Policy*, *13*(3), 225–232. doi:10.1080/09687630600655596
- Izco, M., Orio, L., O’Shea, E., & Colado, M. I. (2006). Binge ethanol administration enhances the MDMA induced long term 5-HT neurotoxicity <https://www.ncbi.nlm.nih.gov/pubmed/26270431>
- Kandel, D. B. (Ed.). (2002). *Examining the gateway hypothesis: Stages and pathways of drug involvement*. doi:10.1017/cbo9780511499777.003
- Karila, L., Zarmadini, R., Petit, A., Lafaye, G., Lowenstein, W., & Reynaud, M. (2014). Addiction à la cocaïne: Données actuelles pour le clinicien. *La Presse Médicale*, *43*(1), 9–17. doi:10.1016/j.lpm.2013.01.069
- Kaufman, M. J., Pollack, M. H., Villafuerte, R. A., Kukes, T. J., Rose, S. L., Mendelson, J. H., Renshaw, P. F. (1999). Cerebral phosphorus metabolite abnormalities in opiate-dependent polydrug abusers in methadone maintenance. *Psychiatry Research: Neuroimaging*, *90*(3), 143–152. doi:10.1016/s0925-4927(99)00017-7
- Kelly, B. C., & Parsons, J. T. (2008). Predictors and comparisons of Polydrug and Non-Polydrug cocaine use in club Subcultures. *The American Journal of Drug and Alcohol Abuse*, *34*(6), 774–781. doi:10.1080/00952990802455451
- Kelly, A. B., O’Flaherty, M., Connor, J. P., Homel, R., Toumbourou, J. W., Patton, G. C., & Williams, J. (2010). The influence of parents, siblings and peers on pre- and early-teen smoking: A multilevel model. *Drug and Alcohol Review*, *30*(4), 381–387. doi:10.1111/j.1465-3362.2010.00231.x
- Kirby, T., & Barry, A. E. (2012). Alcohol as a gateway drug: A study of US 12th graders. *Journal of School Health*, *82*(8), 371–379. doi:10.1111/j.1746-1561.2012.00712.x
- Kleber, H. D., Eyre, S., Rounsaville, B. J., Murphy, S. L., & Eyre, O. (1983). Suicide attempts in treated opiate addicts. *Comprehensive Psychiatry*, *24*(1), 79–89. doi:10.1016/0010-440X(83)90053-6
- Klee, H., Faugier, J., Hayes, C., Boulton, T., & Morris, J. (1990). AIDS-related risk behaviour, polydrug use and temazepam. *Addiction*, *85*(9), 1125–1132. doi:10.1111/j.1360-0443.1990.tb03437.x
- Lantz, M. S., Buchalter, E., & Giambanco, V. (1999). St. John’s wort and antidepressant drug interactions in the elderly. *J Geriatr Psychiatry Neurol*, *12*(1), 7–10. doi:10.1177/089198879901200103
- Leri, F., Bruneau, J., & Stewart, J. (2003). Understanding polydrug use: Review of heroin and cocaine co-use. *Addiction*, *98*(1), 7–22. doi:10.1046/j.1360-0443.2003.00236.x
- Lott, C. W., Pena, J. M., Corrigan, S. A., Malow, R. M., & West, J. A. (1992). Cocaine and speedball users: Differences in psychopathology. *Journal of Substance Abuse Treatment*, *9*(4), 287–291. doi:10.1016/0740-5472(92)90021-F

Yale Review of Undergraduate Research in Psychology

- polysubstance abusers. *Biological psychiatry*, 34(4), 261–4. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/8399823>
- Maldonado, R. (1997). Participation of noradrenergic pathways in the expression of opiate withdrawal: Biochemical and pharmacological evidence. *Neuroscience & Biobehavioral Reviews*, 21(1), 91–104. doi:10.1016/0149-7634(95)00061-5
- Malenka, R., Nestler, E., & Hyman, S. (2008). Autonomic nervous system. In *Molecular Neuropsychopharmacology: A foundation for clinical Neuroscience, Second edition* (2nd ed.) (p. 234). New York: McGraw-Hill Companies, Medical Pub. Division.
- Markel, H., Lee, A., Holmes, R. D., & Domino, E. F. (1994). LSD flashback syndrome exacerbated by selective serotonin reuptake inhibitor antidepressants in adolescents. *The Journal of Pediatrics*, 125(5), 817-819. doi:10.1016/s0022-3476(06)80189-7
- Marr, J. N. (1999). *The interrelationship between the use of alcohol and other drugs*. Washington, DC: American University.
- Martin, C. S., Kaczynski, N. A., Maisto, S. A., & Tarter, R. E. (1996). Polydrug use in adolescent drinkers with and without DSM-IV alcohol abuse and dependence. *Alcoholism: Clinical and Experimental Research*, 20(6), 1099–1108. doi:10.1111/j.1530-0277.1996.tb01953.x
- Martinotti, G., Carli, V., Tedeschi, D., Di Giannantonio, M., Roy, A., Janiri, L., & Sarchiapone, M. (2009). Mono- and polysubstance dependent subjects differ on social factors, childhood trauma, personality, suicidal behaviour, and comorbid axis I diagnoses. *Addictive Behaviors*, 34(9), 790–793. doi:10.1016/j.addbeh.2009.04.012
- McCabe, B. J. (1986). Dietary tyramine and other pressor amines in MAOI regimens: A review. *Journal of the American Dietetic Association*, 86(8), 1059–1064. Retrieved from <http://europepmc.org/abstract/med/3525654>
- McCabe, S. E., Cranford, J. A., Morales, M., & Young, A. (2006). Simultaneous and concurrent polydrug use of alcohol and prescription drugs: Prevalence, correlates, and consequences. *Journal of Studies on Alcohol and Drugs*, 67(4), . Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1761923/>
- McCabe, S. E., Teter, C. J., & Boyd, C. J. (2005). Illicit use of prescription pain medication among college students. *Drug and Alcohol Dependence*, 77(1), 37–47. doi:10.1016/j.drugalcdep.2004.07.005
- McCann, U. D., Shaham, Y., Biscorta, G. A., & polydrug use within local leisure scenes across the English night time economy. *Criminology and Criminal Justice*, 9(4), 437–464. doi:10.1177/1748895809343406
- Mendelson, J., Hallgring, E., Nardin, R., Hebben, N., Teoh, S. K., Johnson, K. A., Holman, B. L. (1991). Carvalho PA. *Journal of nuclear medicine : official publication, Society of Nuclear Medicine*, 32(6), 1206–1210. Retrieved from <http://europepmc.org/abstract/med/2045934>
- Midanik, L. T., Tam, T. W., & Weisner, C. (2007). Concurrent and simultaneous drug and alcohol use: Results of the 2000 national alcohol survey. *Drug & Alcohol Dependence*, 90(1), 72–80. doi:10.1016/j.drugalcdep.2007.02.024
- Moussavi, S., Chatterji, S., Verdes, E., Tandon, A., Patel, V., & Ustun, B. (2007). Depression, chronic diseases, and decrements in health: Results from the world health surveys. *The Lancet*, 370(9590), 851–858. doi:10.1016/S0140-6736(07)61415-9
- Muetzelfeldt, L., Kamboj, S. K., Rees, H., Taylor, J., Morgan, C. J. A., & Curran, H. V. (2008). Journey through the k-hole: Phenomenological aspects of ketamine use. *Drug and Alcohol Dependence*, 95(3), 219–229. doi:10.1016/j.drugalcdep.2008.01.024
- Nicholson, K. L., & Balster, R. L. (2001). GHB: a new and novel drug of abuse. *Drug and alcohol dependence*, 63(1), 1-22.
- NIH. (2015, March). *Alcohol facts and statistics*. Retrieved from <http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-facts-and-statistics>
- O'Malley, P. M., & Johnston, L. D. (2015). Epidemiology of alcohol and other drug use among American college students. *Journal of Studies on Alcohol, Supplement*. doi:10.15288/jsas.2002.s14.23
- ONS. (2000). *Living in Great Britain: Results from the 1998 General Household Survey*. HMSO, London: Office of National Statistics.
- Olthuis, J. V., Darredeau, C., & Barrett, S. P. (2012). Substance use initiation: The role of simultaneous polysubstance use. *Drug and Alcohol Review*, 32(1), 1. doi:10.1111/j.1465-3362.2012.00470.x
- Osborne, G. B., & Fogel, C. (2008). Understanding the motivations for recreational marijuana use among adult Canadians. *Substance Use & Misuse*, 43(3-4), 539–572. doi:10.1080/10826080701884911
- Parrott, A. C. (2009). Cortisol and 3, 4-Methylenedioxymethamphetamine:

Yale Review of Undergraduate Research in Psychology

- Psychopharmacology*, 159(1), 77–82.
doi:10.1007/s002130100897
- Parrott, A. S., Morinan, A., & Moss, M. (2004). *Understanding drugs and behaviour* (1st ed.). United States: Wiley, John & Sons.
- Parrott, A. C., Sisk, E., & Turner, J. J. D. (2000). Psychobiological problems in heavy ‘ecstasy’ (MDMA) polydrug users. *Drug and Alcohol Dependence*, 60(1), 105–110.
doi:10.1016/s0376-8716(00)80013-7
- Patrick, C. H. (1952). *Alcohol, Culture, and Society*. Durham, NC: Duke University Press.
- Patterson, T. L., Shemple, S., Zians, J., & Strathdee, S. (2005). Methamphetamine-Using HIV-Positive men who have sex with men: Correlates of polydrug use. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*, 82(1_suppl_1), i120–i126.
doi:10.1093/jurban/jti031
- Perez, C. M., Dowell, M. H., Cumsille, F., Reyes, J. C., & Colon, H. M. (2013). Prevalence and patterns of polydrug use in Latin America: Analysis of population-based surveys in six countries. *Review of European Studies*, 5(1), 10.
doi:10.5539/res.v5n1p10
- Pichini, S., Poudevida, S., Pujadas, M., Menoyo, E., Pacifici, R., Farré, M., & la Torre, R. de (2006). Assessment of chronic exposure to MDMA in a group of consumers by segmental hair analysis. *Therapeutic Drug Monitoring*, 28(1), 106–109.
doi:10.1097/01.ftd.0000189900.01060.92
- Pierceall, E. A., & Keim, M. C. (2007). Stress and coping strategies among community college students. *Community College Journal of Research and Practice*, 31(9), 703–712.
doi:10.1080/10668920600866579
- Pitts, D. K., & Marwah, J. (1987). Cocaine modulation of central monoaminergic neurotransmission. *Pharmacology Biochemistry and Behavior*, 26(2), 453–461. doi:10.1016/0091-3057(87)90147-x
- Polwin, J. (2013). *A study into the recreational use of mephedrone among regular, poly-drug users* (MSc Dissertation thesis). Retrieved from <http://eprints.port.ac.uk/939/>
- Presley, C. A. (1993, January). *Alcohol and drugs on American college campuses. Use, consequences, and perceptions of the campus environment. Volume I: 1989-91*. Retrieved from <http://eric.ed.gov/?id=ED358766>
- Psychoactive substances act 2016 — UK parliament, (2016) Quintero, G. (2009). Controlled release: A cultural analysis of collegiate polydrug use. *Journal of Psychoactive Drugs*, 41(1), 39–47.
doi:10.1080/02791072.2009.10400673
- Ramsay, M., Baker, P., Goulden, C., Sharp, C., & Sondhi, A. (2001). *Drug misuse declared in 2000: Results from the British Crime Survey (Research study 224)*. London: Home Office.
- Ranaldi, R., & Munn, E. (1998). Polydrug self-administration in rats: Cocaine-heroin is more rewarding than cocaine- alone. *NeuroReport*, 9(11), 2463–2466. doi:10.1097/00001756-199808030-00007
- Redman, M. (2011). Cocaine: What is the crack? A brief history of the use of cocaine as an anesthetic. *Anesthesiology and Pain Medicine*, 1(2), .
doi:10.5812/kowsar.22287523.1890
- Reece, A. S. (2007). Evidence of accelerated ageing in clinical drug addiction from immune, hepatic and metabolic biomarkers. *Immunity & Ageing*, 4(1), 6. doi:10.1186/1742-4933-4-6
- Reece, A. S. (2010). Chronic immune stimulation as a contributing cause of chronic disease in opiate addiction including multi-system ageing. *Medical Hypotheses*, 75(6), 613–619.
doi:10.1016/j.mehy.2010.07.047
- Ricaurte, G. A., Sabol, K. E., & Seiden, L. S. (2003). Amphetamine: Effects on catecholamine systems and behavior. .
doi:10.1146/annurev.pa.33.040193.003231
- Riedel, O., Klotsche, J., Spottke, A., Deuschl, G., Förstl, H., Henn, F., Wittchen, H.-U. (2010). Frequency of dementia, depression, and other neuropsychiatric symptoms in 1, 449 outpatients with Parkinson’s disease. *Journal of Neurology*, 257(7), 1073–1082. doi:10.1007/s00415-010-5465-z
- Robledo, P., Trigo, J. M., Panayi, F., la Torre, R. de, & Maldonado, R. (2007). Behavioural and neurochemical effects of combined MDMA and THC administration in mice. *Psychopharmacology*, 195(2), 255–264.
doi:10.1007/s00213-007-0879-8
- Ronen, A., Chassidim, H. S., Gershon, P., Parmet, Y., Rabinovich, A., Bar-Hamburger, R., Shinar, D. (2010). The effect of alcohol, THC and their combination on perceived effects, willingness to drive and performance of driving and non-driving tasks. *Accident Analysis & Prevention*, 42(6), 1855–1865.
doi:10.1016/j.aap.2010.05.006
- Rosselli, M., & Ardila, A. (1996). Cognitive effects of cocaine and polydrug abuse. *Journal of Clinical and Experimental Neuropsychology*, 18(1), 122–135. doi:10.1080/01688639608408268
- Rossow, I., & Lauritzen, G. (1999). Balancing on the edge of death: Suicide attempts and life-threatening overdoses among drug addicts. *Addiction*, 94(2), 209–219. doi:10.1046/j.1360-0443.1999.9422095.x
- Sollan, S. F., Zinberg, N. E., & Fraai, F. (1975)

Yale Review of Undergraduate Research in Psychology

- consumption in the context of polydrug abuse: A report on 150 patients. *Drug and alcohol dependence.*, 52(1), 85–90. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9788011>
- Schifano, F., Oyefeso, A., Corkery, J., Cobain, K., Jambert- Gray, R., Martinotti, G., & Ghodse, A. H. (2003). Death rates from ecstasy (MDMA, MDA) and polydrug use in England and wales 1996-2002. *Human Psychopharmacology: Clinical and Experimental*, 18(7), 519–524. doi:10.1002/hup.528
- Schubert, C. C., Boustani, M., Callahan, C. M., Perkins, A. J., Carney, C. P., Fox, C., Hendrie, H. C. (2006). Comorbidity profile of dementia patients in primary care: Are they sicker? *Journal of the American Geriatrics Society*, 54(1), 104–109. doi:10.1111/j.1532-5415.2005.00543.x
- Simpson, G. M., & White, K. (1984). Tyramine studies and the safety of MAOI drugs. *The Journal of clinical psychiatry*, 45(7 Pt 2), 59–61. Retrieved from <http://europepmc.org/abstract/med/6735997>
- Smart, R. G., & Bateman, K. (1967). Unfavourable reactions to LSD: A review and analysis of the available case reports. , 97(20). Retrieved from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1923615/>
- Smit, F., Monshouwer, K., & Verdurmen, J. (2002). Polydrug use among secondary school students: Combinations, prevalences and risk profiles. *Drugs: Education, Prevention and Policy*, 9(4), 355–365. doi:10.1080/09687630210155313
- Smith, R. (2015). Nicotine addiciton. In *Treatment strategies for substance abuse and process addictions* (pp. 58–59). United States: American Counseling Association.
- Smith, G., Farrell, M., Bunting, B., Houston, J., & Shevlin, M. (2010). Patterns of polydrug use in Great Britain: Findings from a national household population survey. *Drug and alcohol dependence.*. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/20863629>
- Smith, J. E., Hemby, S. E., Co, C., & Dworkin, S. I. (1999). Synergistic elevations in nucleus accumbens extracellular dopamine concentrations during self- administration of cocaine/heroin combinations (Speedball) in rats. *Journal of Pharmacology and Experimental Therapeutics*, 288(1), 274–280. Retrieved from <http://jpet.aspetjournals.org/content/288/1/274.short>
- Staines, G. L., Magura, S., Foote, J., Deluca, A., & Kosanke, N. (2001). Polysubstance use among alcoholics. *Journal of Addictive Diseases*, 20(4), 57–73. doi:10.1300/j069v20n04_06
- Stall, P., Mills, T. C., Williamson, J., Hart, T., Stanton, M. D., Todd, T. C., Heard, D. B., Kirschner, S., Kleiman, J. I., Mowatt, D. T., ... Van Deusen, J. M. (1978). Heroin addiction as a family phenomenon: A new conceptual model. *The American Journal of Drug and Alcohol Abuse*, 5(2), 125–150. doi:10.3109/00952997809027993
- Syamlal, G., Mazurek, J. M., Hendricks, S. A., Jamal, A., MBBS, 1, M., & and, 2 (2015). Cigarette smoking trends among U.S. working adult by industry and occupation: Findings from the 2004–2012 national health interview survey. *Nicotine & Tobacco Research*, 17(5), 599–606. doi:10.1093/ntr/ntu185
- Sydow, K. von, Lieb, R., Pfister, H., Höfler, M., & Wittchen, H. (2002). What predicts incident use of cannabis and progression to abuse and dependence? A 4-year prospective examination of risk factors in a community sample of adolescents and young adults. *Drug and alcohol dependence.*, 68(1), 49–64. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12167552>
- Thomas, G., Farrell, M. P., & Barnes, G. M. (1996). The effects of single-mother families and nonresident fathers on delinquency and substance abuse in black and white adolescents. *Journal of Marriage and Family*, 58(4), 884–894. doi:10.2307/353977
- Thompson, M. R., Callaghan, P. D., Hunt, G. E., Cornish, J. L., & McGregor, I. S. (2007). A role for oxytocin and 5-HT receptors in the prosocial effects of 3, 4 methylenedioxymethamphetamine (‘ecstasy’). *Neuroscience*, 146(2), 509–514. doi:10.1016/j.neuroscience.2007.02.032
- Trenz, R. C., Scherer, M., Harrell, P., Zur, J., Sinha, A., & Latimer, W. (2012). Early onset of drug and polysubstance use as predictors of injection drug use among adult drug users. *Addictive Behaviors*, 37(4), 367–372. doi:10.1016/j.addbeh.2011.11.011
- Vollenweider, F. X., & Geyer, M. A. (2001). A systems model of altered consciousness: Integrating natural and drug-induced psychoses. *Brain Research Bulletin*, 56(5), 495–507. doi:10.1016/S0361-9230(01)00646-3
- Volpicelli, J. R., Alterman, A. I., Hayashida, M., & O’Brien, C. P. (1992). Naltrexone in the treatment of alcohol dependence. *Archives of General Psychiatry*, 49(11), 876–880. doi:10.1001/archpsyc.1992.01820110040006
- White, A., Chan, G. C. K., Quek, L.-H., Connor, J. P., Saunders, J. B., Baker, P., ... Kelly, A. B. (2013). The topography of multiple drug use among adolescent Australians: Findings from the national drug strategy

Yale Review of Undergraduate Research in Psychology

Wolbach, A. B., Isbell, H., & Miner, E. J. (1962). Cross tolerance between mescaline and LSD-25 with a comparison of the mescaline and LSD reactions. *Psychopharmacologia*, 3(1), 1–14.
doi:10.1007/bf00413101

Wu, L.T., Schlenger, W. E., & Galvin, D. M. (2006). Concurrent use of methamphetamine, MDMA, LSD, ketamine, GHB, and flunitrazepam among American youths. *Drug and Alcohol Dependence*, 84(1), 102–113.
doi:10.1016/j.drugalcdep.2006.01.002

Appendix

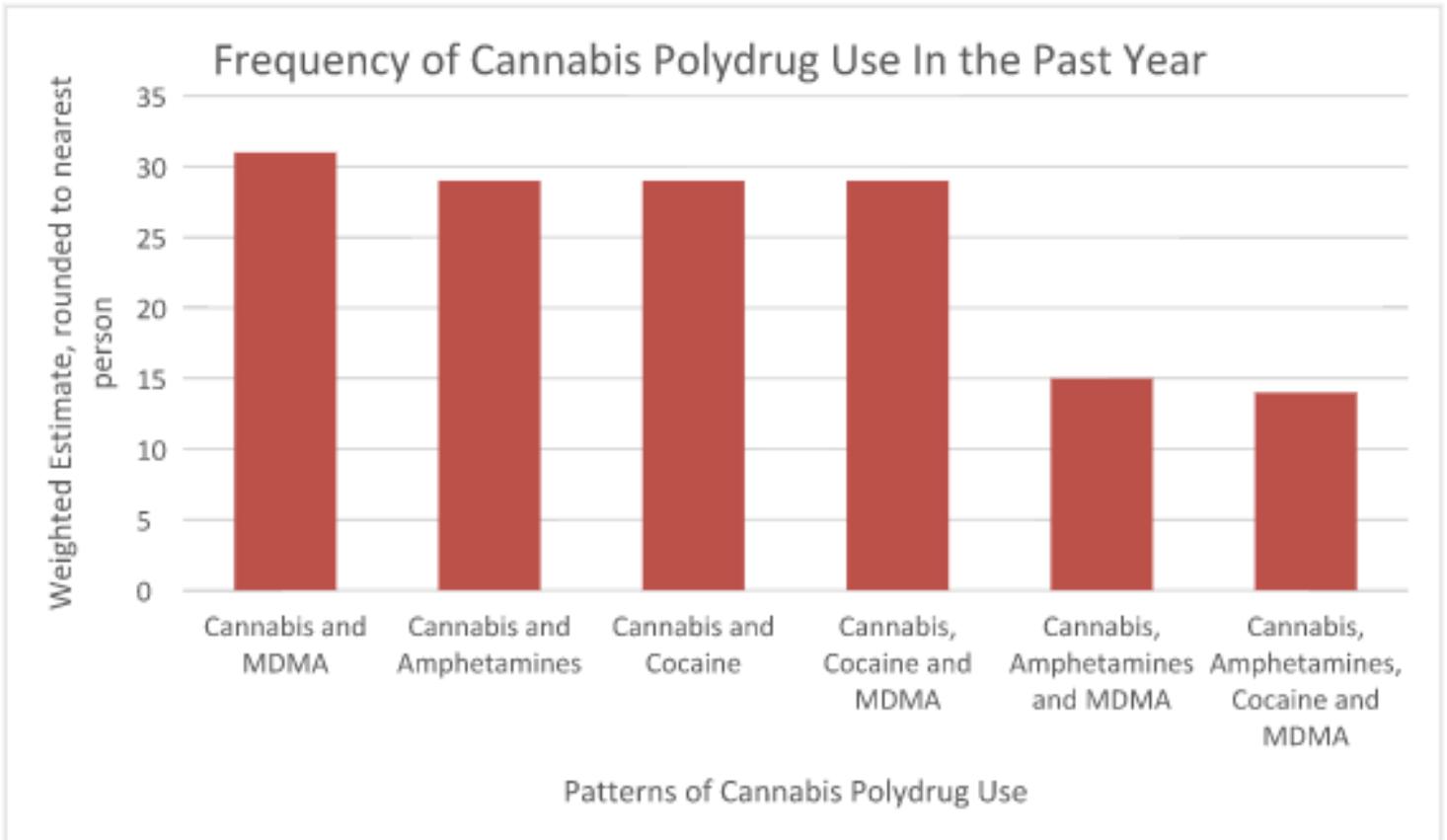
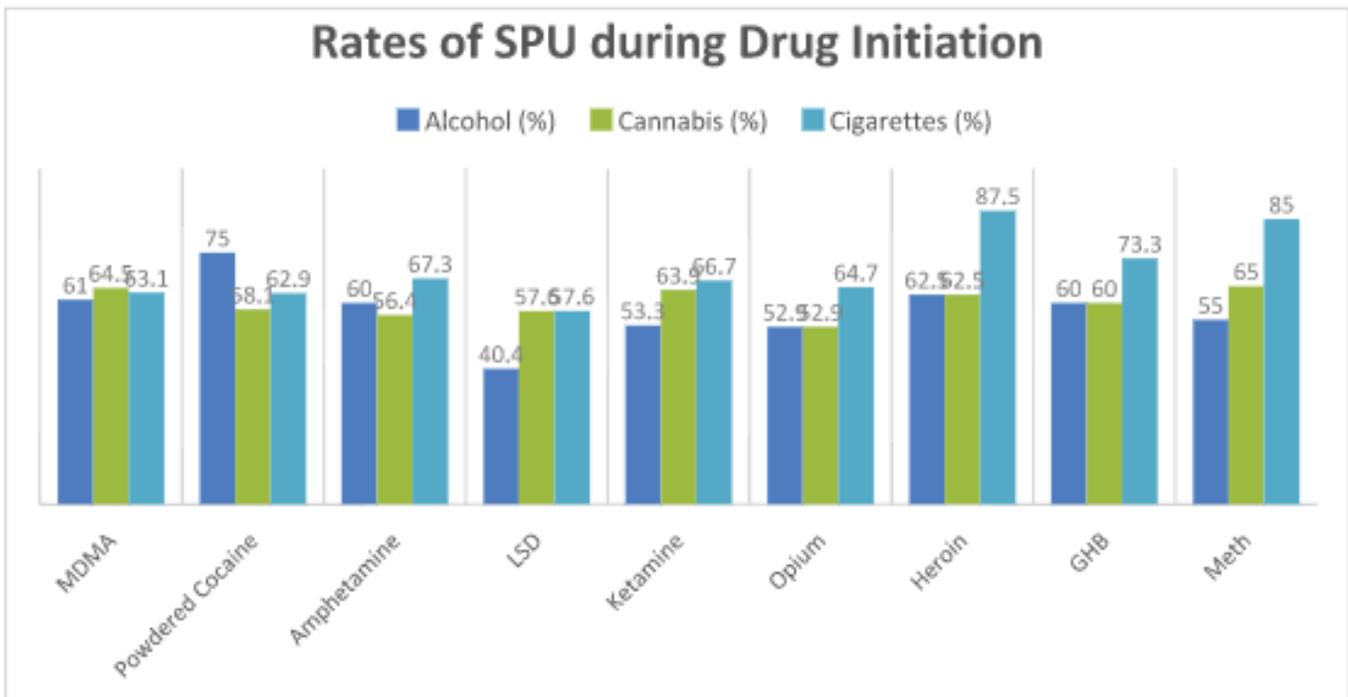


Figure 1: Most frequent patterns of response of illicit drug use in the past year (N=8358). From Smith, Farrell, Bunting, Houston, & Shevlin (2010).



	ANY	METH	MDMA	LSA	KETAMINE	GHB	FLUNITRAZEPAM
ALCOHOL	99.3	99.5	99.5	99.4	100	100	97.8
CANNABIS	97	98.1	97.4	98.4	100	100	99.2
INHALANTS	43.5	56.1	45.1	51.6	71	83.5	57.8
COCAINE/CRACK	53.3	75.9	56.4	61.1	69.2	35.3	78.6
HALLUCINOGENS	96.2	85.7	100	100	98.5	100	87.7
HEROIN	6.4	13.6	7.7	8.4	22.9	20.1	16.6
STIMULANTS	38.3	100	36.5	40.5	54.8	9.4	57.9
SEDATIVES	7.2	15.4	7.9	8.8	18.8	17.5	28.1
TRANQUILISERS	37.5	51.5	40.4	44.2	83.4	94.7	100
PAIN RELIEVERS	57	72.8	59.6	62.9	87	87	81.3

Table 1: Lifetime prevalence (%) of alcohol and drug use among club drug users aged 16-23 (unweighted N = 19,084). From Wu, Schlenger & Galvin (2006).

	COUNT	DURATION (SECONDS)
CONTROL/VEHICLE	84.33 (3.82)	93.77 (8.25)
MDMA	73.83 (4.16)	68.51 (5.96) *
METHAMPHETAMINE	68.83 (5.96) *	53.61 (7.21) ***
MDMA/METHAMPHETAMINE	60.42 (5.04) **	52.51 (7.34) ***

Table 2: Number and duration of social interaction events 7 weeks after chronic drug administration, values represent mean (S.E.M.).

Asterisks indicate differences at the * $p < 0.05$, ** $p < 0.01$ and *** $p < 0.001$ levels of significance. From Clemens, Cornish, Hunt and McGregor (2007).

	WIDE RANGE POLYDRUG USER	MODERATE RANGE POLYDRUG USER
GENERALISED ANXIETY DISORDER	2.26 *	1.82 *
MIXED ANXIETY AND DEPRESSIVE DISORDER	1.22	1.71 *
SUICIDE ATTEMPT IN LIFETIME	2.50 *	1.73 *
DEPRESSIVE EPISODE AT PRESENT	1.39	1.98 *

Table 3: Odds ratios and 95% confidence intervals between mental health/demographic predictors and latent class membership of classes 1 (wide range polydrug user) and 2 (moderate range polydrug user) compared to baseline non-polydrug users. From Smith, Farrell, Bunting, Houston and Shevlin (2010).

Self-distancing as a Mechanism for Processing Negative Emotional Experiences

Lena Etzel

Queens University of Charlotte

ABSTRACT. Human beings share the motivation to analyze and understand their negative emotions in hopes of achieving resolution and ridding themselves of the negative feelings. However, reflecting on such emotions may backfire and instead trigger dysfunctional responses such as cognitive escape or rumination with the intention to protect oneself. A wealth of scholars has examined a strategy known as “self-distancing” as a mechanism that may allow individuals to adaptively process negative events without causing further negative affect. Given the ability of humans to shift their point of view, individuals can distance themselves from their own experience and take on an observer’s perspective. According to this line of work, analyzing stimulating material from a self-distanced perspective allows individuals to reconstrue their experiences in ways that facilitate adaptive processing and promote insight. In contrast, a self-immersed perspective has been linked to a concrete focus on emotionally arousing details, thus making individuals vulnerable to rumination. Researchers have examined the emotional, cognitive and physiological benefits associated with the self-distancing strategy when recalling both depression- and anger-related experiences. More recent studies have also considered its role in the context of different populations (children, clinical populations). Implications and future directions are discussed.

Numerous self-help guides fill the aisles of bookstores in Western societies. They provide readers with a range of resources that are supposed to help them work through various stressors. Indeed, human beings share a general motivation to make sense of their negative feelings; most seek to achieve this resolution by examining the causes and assigning meaning to their experiences (Wilson & Gilbert, 2008). By understanding one’s emotions, it is reasonable to assume that individuals can achieve resolution and create a sense of relief associated with distressing events. This assumption is consistent with previous work, suggesting that processing negative events

Wenzlaff & Wegner, 2000; Wilson & Gilbert, 2008). Successful resolution of negative experiences may then not only change the distressing emotional reaction associated with these events, but insight may also benefit individuals when facing similar situations in the future.

In clinical practice, patients seek professional help in order to better cope with experiences that provoke uncomfortable thoughts and feelings. However, the so-called “self-reflection paradox” highlights a possible underlying problem in this process (Kross et al., 2011; Kross & Ayduk, 2011). Although several studies outline the advantages of emotional processing, others point out that attempting to understand negative experiences can also trigger

ways that may make individuals become particularly vulnerable to their negative experiences.

Recently, a wealth of scholarship has advanced self-distancing as a mechanism that may allow individuals to process negative events in adaptive ways (Ayduk & Kross, 2008a, 2008b, 2010b; Kross & Ayduk, 2008; Kross, Ayduk, & Mischel, 2005; Kross et al., 2011; Kross, Gard, Deldin, Clifton, & Ayduk, 2012; White, Kross, & Duckworth, 2015). Given contradictory findings regarding the efficacy of reflecting on negative experiences, the present paper will review the literature surrounding rumination and distancing for (mal-) adaptive self-regulation. In particular, the review intends to illustrate the adaptive implications associated with self-distanced perspective-taking in the context of past distressing experiences.

1. Maladaptive processing

The motivation to reflect on and process experiences is particularly strong when individuals experience distress (Wilson & Gilbert, 2008). However, it is also assumed that this mental strategy may activate corresponding emotions and thus trigger the need for cognitive escape, avoidance and distraction in order to protect oneself (Kross & Ayduk, 2008). Although distraction and avoidance may initially appear to be adaptive responses, the well-known “white bear” study illustrates their limitations on the basis of a seemingly unimportant topic (Wegner, 2011; Wegner, Schneider, Carter, & White, 1987; Wenzlaff & Wegner, 2000).

Wegner et al. (1987) demonstrated the so-called “rebound phenomenon” by prompting participants to suppress the thought of a white bear. Despite this prompt, individuals not only experienced elevated levels of thought occurrence during

shown to be particularly dominant in the context of (negative) emotional material compared to neutral information (Wenzlaff & Wegner, 2000). Previous work has shown that the attempt to avoid thinking about these negatively-laden events may initially provide benefits, such as emotional relief and reduced depressed moods (Kross & Ayduk, 2008; Nolen-Hoeksema, 1991; Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Nolen-Hoeksema, Wisco, & Lyobomirsky, 2008).

However, this strategy is not only assumed to eventually backfire, but engaging in avoidance predicted unique variance in depression scores among participants (Mischel, Shoda, & Rodriguez, 1989). Further, it has also been linked to increased accessibility of unwanted thoughts and may thus pose disastrous long-term implications by leading individuals to think repeatedly about their negative experiences (Moulds, Kandris, Starr, & Wong, 2007; Wegner et al., 1987; Wenzlaff & Wegner, 2000).

Rumination is defined as “a mode of responding to distress that involves repetitively and passively focusing on symptoms” (Nolen-Hoeksema et al., 2008, p. 400) and thus serves to maintain or worsen depressive episodes. Such responses are often symptom-focused and contemplative as individuals circle around the experiences, causes, and consequences of their negative emotions with no end in sight (Nolen-Hoeksema, 1991). Being fixated on the thoughts and feelings that occupy their inner world prevents individuals from generating alternative cognitive and behavioral pathways that could enable them to initiate change (Cribb et al., 2006; Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008; Moulds et al., 2007). Not surprisingly, Davis and Nolen-Hoeksema (2000) suggested a close link between rumination

interferes with problem-solving and proactive behavior (Nolen-Hoeksema, 1991).

Given its perseverant nature, several researchers conceptualize rumination as a mechanism that serves an affective and cognitive avoidant function (Cribb et al., 2006; Moulds et al., 2007). Ironically, ruminators often share the belief that they are constructively processing and making sense of their negative experiences (Nolen-Hoeksema et al., 2008). Individuals may also feel as if this way of processing their experiences facilitates understanding, while instead they seem to get caught up in a vicious cycle.

Multiple studies have demonstrated the consequences of this dysfunctional and self-focused response (Nolen-Hoeksema, 1991; Morrison & O'Connor, 2008). Rumination has not only been associated with higher levels of depressive symptoms, but researchers also illustrated its predictive force in regards to the onset and maintenance of depressive episodes (Nolen-Hoeksema, 2000; Nolen-Hoeksema et al., 1993). Further, rumination has been shown to negatively affect cardiovascular activity by creating elevated levels of blood pressure and poor physiological recovery (Gerin, Davidson, Christenfeld, Goyal, & Schwartz, 2006). Even more severely, Morrison and O'Connor (2008) conducted a systematic review of 11 studies examining the relationship between rumination and suicidality among clinical and non-clinical samples of varying age groups. With one exception and despite varying methodologies across the studies, researchers consistently found a direct link between these key variables.

Given that avoiding thoughts surrounding negative experiences has previously been demonstrated to undermine adaptive self-reflection, attempting to

Cribb et al. (2006) demonstrated a direct link between avoidance, rumination and depression. Higher levels of depressed mood were linked to a greater ruminative style of thinking and a tendency to engage in various forms of avoidance. These maladaptive responses that frequently result from the attempt to process negative thoughts demonstrate the necessity to find alternative and adaptive processing styles. What can enable individuals to work through negative thoughts and emotions without engaging in avoidance or rumination?

2. Self-distancing as adaptive mechanism

Scientific and clinical interest in the development of mechanisms that allow adaptive emotional regulation has grown in the last decades. Cognitive-behavioral therapy (CBT), coined by Aaron Beck assumes that psychological problems are the result of dysfunctional misconceptions (schemas) that influence one's cognition, affect and behavior in maladaptive ways (Beck, Rush, Shaw, & Emery, 1979). With the help of a therapist, cognitive (self-questioning) techniques are implemented to help clients identify and eventually change their distorted thought patterns. Experts assign importance to "decentering", which is described as the "capacity to take a present-focused, nonjudgmental stance in regard to thoughts and feelings and to accept them" (Fresco, Segal, Buis, & Kennedy, 2007, p. 448). Also labeled as "distancing", it is assumed that an objective perspective allows clients to process thoughts in a controlled mode.

Consistent with this approach, several "third-wave" forms of cognitive therapy, including both mindfulness-based and acceptance and commitment-based therapies, utilize this approach in order to prevent individuals from getting overwhelmed by their thoughts (Avduk &

dysfunctional process. Although work discussed thus far may suggest that focusing on one's internal world will generate negative reactions and should thus be avoided, working with dysfunctional thought patterns has been a component of therapy for several decades (Beck et al., 1979).

Past work on self-control further supports the possibility of adaptive self-regulation without triggering intense levels of affect (Kross et al., 2005; Mischel et al., 1989). Mischel et al. (1989) demonstrated in various studies with children that they were able to cognitively represent arousing stimuli in a way that enhanced their self-control and thus sustain delay of gratification. Compared to a control group that considered the arousing characteristics associated with the desired object, individuals adopting alternative strategies outperformed the former group. Both individuals who distracted themselves or those with an altered perspective and a focus on the abstract qualities were better able to withstand their impulse.

This observation is based on the "hot/cool model" that is said to substantially drive our reaction and our ability to regulate emotions (Metcalf & Mischel, 1999). Focusing on concrete details of an experience may elicit strong (hot) emotional reactions that may, in turn, trigger arousal and protective mechanisms such as avoidance behaviors. In contrast, an abstract, reflective (cool) mode has been associated with a distanced perspective, which in turn, is assumed to inhibit overwhelming emotions in response to the affect-arousing stimuli (Metcalf & Mischel, 1999; Mischel et al., 1989).

Taking these findings together, various experts in social-behavioral and clinical disciplines suggest that one's type of perspective in the context of arousing

egocentric point of view to an ego-decentered perspective (Kross et al., 2005; Kross & Ayduk, 2011). Utilizing the hot/cool model as a foundation, Kross et al. (2005) later transformed this theory when conducting their work on self-distancing and emotion regulation. In order to successfully process distressing material, the researchers suggest that considering mental events from a distanced, ego-decentered perspective would inhibit "hot" emotional reactions, while allowing individuals to stay in an abstract, "cool" space.

Contrary to the work on self-distancing, Cribb et al. (2006) suggested that greater rumination is associated with a focus on less concrete (more abstract) details. Their line of work led to the assumption that rumination allows individuals to cognitively avoid the confrontation with "concrete image-based thought content" (Cribb et al., 2006, p. 172) and that ruminators generally adopt an abstract focus. Therefore, their over-generalized perspective would then be associated with more rumination.

Opposed to this, Kross and Ayduk (2010b) argue that self-immersion makes individuals vulnerable to rumination and that an abstract (distanced) focus would allow adaptive processing. Again, this type of perspective entails that one focuses on the concrete (not abstract) details by recounting the causes and consequences of the distressing memory. Instead of linking rumination to an abstract focus, their train of thought suggests a link between (concrete) self-immersion and rumination. When instructing participants to adopt an immersed or distanced perspective before analyzing a personal, negative experience, self-immersed individuals recounted the detail-oriented, concrete features of an event.

These opposing views demonstrate inconsistencies between the work on

perspective that is geared towards a focus on details of an event that are too specific. This definition would align with Kross and Ayduk's work (2010b).

In support of this, adopting a self-distanced perspective and mentally stepping out of one's point of view presumably requires a substantial amount of cognitive flexibility – an ability that has been shown to be inhibited among ruminators (Davis & Nolen-Hoeksema, 2000). It seems safe to conclude that this compromised perspective taking might force these individuals to attend to the emotionally arousing details which, in turn, trigger maladaptive reactions. It is important to consider that the mood manipulation in the study conducted by Cribb et al. (2006) occurred through an emotion-eliciting film clip. Although the investigators do not differentiate between these mood manipulation techniques, it is reasonable to assume that a film clip would influence participants in a different (and less emotionally relevant) way than recalling a personal, negative experience. Before drawing rash conclusions, future work may want to follow-up with this discrepancy of concrete versus abstract focus during rumination and distancing.

i. Emotional & Cognitive benefits

When reflecting on emotion eliciting experiences, Kross et al. (2012) and Verduyn, Van Machelen, Chezzi, Van Bever, and Kross (2012) suggest the self reflecting on and originally experiencing the event is the same person when adopting an immersed, first-person perspective. Given human's innate ability to shift one's point of view, individuals can distance themselves from their experience and take on an observer's perspective (Kross et al., 2005). Based on the work mainly conducted by Kross and Ayduk, this type of self-perspective is assumed to determine whether

One of the initial studies in this line of work asked participants to recall an interpersonal conflict and then instructed them to adopt an immersed or distanced perspective (Kross et al., 2005). Further, they were asked to focus on their felt emotions (what focus) or on the specific reasons underlying their sensations (why focus) associated with their anger-related memory. Regardless of the conflict status, only individuals in the distanced-why group demonstrated reduced emotional reactivity as their results displayed significantly less (implicit and explicit) anger and global negative affect.

In contrast, having individuals with an immersed perspective question the underlying reasons (why) did not create an effect. Given that concrete vs. abstract construals were previously identified as mechanisms that substantially influence one's emotional response to arousing stimuli, Kross et al. (2005) examined participant's written stream of thoughts. As predicted, adopting a distanced perspective was associated with more abstract construals as individuals utilized a greater proportion of insight and closure statements. The researchers also revealed a mediating relationship in this context by demonstrating that fewer concrete construals mediated the effect of the distanced-why perspective on emotional reactivity. When controlling for construal type, the effect of condition on emotional reactivity diminished. These findings established a basis for subsequent research by suggesting that individuals seem to experience a shift in thought content depending on their perspective which in turn influences their emotional reaction.

A specific example can help clarify this process of distancing that has been demonstrated across multiple studies (Ayduk & Kross 2008b; Kross & Ayduk 2008

on this experience. A self-immersed perspective would entail recounting emotionally arousing details and episodic features of the argument including the chain of events and her specific feelings (Kross, 2009). Assuming that Laura would like to avoid reliving the negative emotions that she associates with this event, researchers argue that a self-distanced perspective would enable her to reconstrue the experience in ways that promote enhanced understanding. Through a distanced perspective, she would be able to perceive the “big picture”, make sense of the event while possibly identifying the causes as well as underlying motivations on both sides.

Several researchers were able to replicate and extend these findings to different sets of emotions. Cueing individuals to take a step back and adopt a “fly on the wall” perspective has been shown to benefit self-regulation following the recall and analysis of negative interpersonal/anger-related (Ayduk & Kross, 2008a, 2008b, 2010b; Kross et al., 2011; White et al, 2015) as well as depression-related (Kross et al., 2012; Kross & Ayduk, 2008) experiences. In contrast, these studies have shown that adopting a self-immersed perspective intensifies one’s emotional reactivity. In support of these findings, Verduyn et al. (2012) demonstrated that self-immersed individuals experienced negative emotions longer compared to the ones who self-distanced. As a result, this strategy may not only buffer against a heightened negative emotional response but it may also be able to shorten the duration of negative emotions.

Although the initial study of Kross and colleagues (Kross et al., 2005) induced a certain type of focus (why vs. what) after manipulating the type of perspective, subsequent work suggests that individuals engaging in self-distancing naturally tend to

decreased as self-distancing increased. Kross and Ayduk (2008) suggested that individuals in both immersed and distanced conditions focus on their emotions (recounting), but they argue that the balance of relatively less recounting and more reconstruing accounts for the regulatory benefits linked to self-distancing (Ayduk & Kross, 2010a).

In support of this, participants in subsequent studies were merely asked to analyze their feelings and thoughts from their assigned perspective without giving further instructions regarding their focus (Ayduk & Kross, 2008b; Kross et al., 2012; Kross & Ayduk, 2008). Manipulating one’s perspective would then be sufficient enough to trigger the shift in thought content and thus lead self-distanced individuals to favor the use of abstract (why) construals without inducing a specific focus.

However, the importance of analyzing a memory after its recall should not be undermined. Prior work suggests that creating mental distance might be comparable with third-wave mindfulness and acceptance-based approaches during which individuals observe and accept, but do not analyze their experience (Ayduk & Kross, 2010b; Kross et al., 2012). As a consequence, individuals may not experience the adaptive benefits associated with self-distancing. This idea may suggest that the analysis of one’s emotions is fundamental when adopting a self-distanced perspective and that immersed individuals may be unable to engage in this high-level, abstract thinking. Drawing from this, it is not surprising that asking immersed individuals to adopt a “why” focus during analysis did not yield an effect (Kross et al., 2005). Consistent with this assumption, experts distinguish between recalling (and observing) as opposed to analyzing an experience as these mental processes are

participant's perspectives, it remains questionable whether individuals spontaneously self-distance outside of the laboratory and without researchers cuing them to adopt a certain perspective.

Collectively, recent research on the external validity of self-distancing seems promising (Ayduk & Kross, 2010b; Verduyn et al. 2012; White et al., 2015).

In two separate studies, Ayduk and Kross (2010b) demonstrated that participants did not only engage in the self-distancing process without being cued, but doing so has also been linked to various adaptive consequences. After recalling a negative, interpersonal experience, participants identified the perspective they adopted when reflecting on the event. This approach differs from other studies by relying on spontaneous perspective-taking rather than induced. Overall, participants were more likely to reflect on their experience from a self-immersed rather than self-distanced perspective.

Given that memory age (duration between experience and experimental recall), baseline negative affect, and the resolution status of the recalled experience can influence the relationship between the key variables, Ayduk and Kross (2010b) controlled for these covariates in their analyses. Consistent with previous studies that have relied on the experimental manipulation of the examined perspectives, higher spontaneous self-distancing was associated with lower emotional reactivity and thought content fully mediated this relationship. Given that these findings were replicated in the second study when participants reflected on an anger-related interpersonal experience, spontaneous self-distancing seems to occur in response to different emotions.

However, it is important to mention

extent to which they adopted a self-immersed vs. self-distanced perspective may not be able to consciously grasp the complexity of this cognitive approach.

Although spontaneous self-distancing seems to be an established process in adult samples, only one study has examined the effects of distancing in a sample of fifth-grade students (Kross et al., 2011). To extend this line of work, White et al. (2015) asked a sample of African-American adolescents to reflect on an anger-related experience and assessed the degree to which (and whether) participants spontaneously adopted a distanced perspective. Similar to past experiments, memory age was treated as a covariate. Past work has demonstrated age-related differences in emotion regulatory control, thus suggesting that maturation may be closely linked to one's ability to regulate emotions (Orgeta, 2009).

The adolescent sample was not only able to spontaneously adopt an observer's perspective, but this cognitive process has also been linked to the same benefits of distancing shown in previous studies with adult samples (Ayduk & Kross, 2008b, 2010b; Kross et al., 2005). Although only three construal items (as opposed to thought content essays) were used to examine the degree of maladaptive (recounting) vs. adaptive (reconstructing) reflection, the researchers were still able to illustrate the relationship between distancing and a predominance of reconstructing over recounting. Further, the researchers demonstrated a growing strength in the relationship between self-distancing and emotional regulation with age, thus supporting previous work suggesting that older individuals may be better able to engage in adaptive regulation.

According to White et al. (2015), this finding may be due to age-dependent

emotional regulation may also explain these age differences. Future studies need to move beyond a predominantly adult sample in order to better understand the generalizability of this strategy to different age cohorts.

Although individuals have generally been shown to favor a self-immersed perspective when reflecting on their experiences, the extent to which participants spontaneously engaged in distancing still yielded significance across various studies (Ayduk & Kross, 2010b; Verduyn et al., 2012). These findings generate two questions that have not received enough attention in the studies conducted up to this point. It is reasonable to assume that adopting a self-distanced perspective requires cognitive flexibility because individuals need to mentally step out of their point of view to take on an observer's perspective. Supporting this assumption, researchers have demonstrated that this ability seems to be inhibited among ruminators (Davis & Nolen-Hoeksema, 2000). Indeed, Ayduk and Kross (2010b) demonstrated that spontaneous self-distancing was associated with more problem-solving behavior, which reasonably requires extensive cognitive resources. In contrast, compromised perspective taking might force these individuals to focus on the emotionally arousing details which may in turn further enhance rumination. On this note, some individuals may be particularly susceptible to rumination because they spontaneously adopt a self-immersed perspective when reflecting on stimulating material and are consequently more likely to re-experience the negative event. To better provide suggestions for these vulnerable populations, future research may need to examine the specific relationship between self-immersion and rumination

responsible for increasing the likelihood of some individuals to self-distance during reflection. Cross-cultural studies have demonstrated differences in types of self-awareness between individuals from individualistic, Western countries or collectivistic, particularly East Asian countries (Heine, 2016). Subjective self-awareness entails that one's attention is directed towards the external world and away from ourselves. In contrast, individuals who focus on themselves and monitor their interactions from an outside perspective would adopt an objective focus.

Given the value of interpersonal connection in collectivistic countries, it is not surprising that individuals in East Asian countries were shown to be more likely to habitually adopt third-person, objective perspective (Heine, 2016). Although the studies discussed in this review were conducted in a Western context which cross-cultural researchers would argue to favor a subjective inside-out perspective, participants still spontaneously engaged in distancing which could be equated with the latter version (objective self-awareness). More research is needed to better understand the role of culture and different tendencies in adopting certain perspectives as this line of work may suggest that socio-environmental factors could play a role in spontaneous self-distancing.

b. Physiological benefits

i. Cardiovascular

Prior work has linked a ruminative style to delayed physiological recovery which may over time contribute to a heightened risk of cardiovascular disease (Gerin et al., 2006). Given these data, researchers have extended their work beyond self-reported measures to examine the effect of distancing on physiological markers (Ayduk & Kross, 2008b). Ayduk and Kross

the entire study including baseline, manipulation and recovery.

Even when controlling for the vividness and the resolution status of the recalled memory, researchers replicated the attenuating effect of self-distancing on emotional reactivity. Preceding the memory recall, the experimental groups did not differ on the variables. However, the self-distanced group displayed lower levels of physiological reactivity during each phase (recall, analysis, and recovery phase). Given the nature of the recalled experience, individuals across both conditions displayed elevated levels of emotional and physiological reactivity, but the scores on these variables were lower for individuals who self-distanced.

To build upon this finding, Ayduk and Kross (2010b) later demonstrated these soothing effects when individuals spontaneously self-distanced. By monitoring participant's blood pressure and cardiac output, researchers computed the amount of constriction occurring in the peripheral autonomic nervous system (TPR). Elevated levels of TPR reactivity demonstrate a maladaptive response to stress. While baseline reactivity did not differ among the groups, spontaneous self-distancing was linked to lower physiological reactivity across all three phases of the study (recall, reflection, recovery).

In contrast to rumination, which has previously been linked to heightened distress and delayed physiological recovery, these findings suggest that the regulatory benefits associated with self-distancing can be extended to physiological markers. It should be noted that both studies examined the effects of self-distancing on physiological recovery in the context of an anger-related (interpersonal) experience. Although it is reasonable to assume that similar outcomes

ii. Health benefits

Although Ayduk and Kross (2008b, 2010b) demonstrated that the beneficial effect of distancing on immediate physiological regulation is promising, future work needs to examine the long-term outcomes in this context. Given that prolonged levels of heightened distress are associated with a greater risk of cardiovascular disease, identifying effective mechanisms can hold important implications for physical health outcomes over time. It seems reasonable that the promising effects of distancing on physiological reactivity can, in turn, positively affect one's overall health.

As an inclusive part of a comprehensive three-part study on expressive writing, Park, Ayduk, and Kross (2015) examine the relationship between distancing and lasting physical health outcomes. In this recent study, combined data of a baseline measure of physical health and health center visit records provide support for the above-mentioned path. Increased self-distancing was linked to lower levels of emotional reactivity which in turn led to fewer physical symptoms over time. Although this study provides a starting point, more research is needed to gain confidence in the prolonged physical health benefits of distancing.

iii. Brain areas

Comparable with the popular idiom of the chicken and the egg, prior work has identified that individuals with a greater degree of depressed mood are more prone to rumination and that this maladaptive response has also been shown to interact with depression in various ways (Nolen-Hoeksema et al., 2008). Rodríguez-Cano et al. (2014) have demonstrated a link between depression and heightened activity in certain brain regions including subgenual anterior cingulate cortex (sgACC). Given that this

rumination (Rodríguez-Cano et al., 2014). In contrast, self-distancing has been shown to facilitate adaptive emotional processing and thus provides a foundation for the assumption that it may also alter the activity in certain brain regions.

Kross, Davidson, Weber, and Ochsner (2008) asked participants to recall a series of negative autobiographical memories and examined the effect of different cognitive strategies on emotional and neural reactions. Although these strategies are only conceptually similar to the “traditional” ways of experimentally inducing distanced and immersed perspectives, authors of previous literature reviews regard this study as a clear cornerstone to demonstrate the neural effects of self-distancing (Kross, 2009; Kross & Ayduk, 2011). The “feel” condition, in which participants were directed to focus on the specific emotions associated with a distressing event can possibly be equated with the process of self-immersion. Indeed, a significant effect of strategy revealed increased brain activity in this region when individuals implemented the “feel” strategy.

Given that self-immersion has been conceptualized as the maladaptive contrast to self-distancing, these findings would provide a neural explanatory approach regarding the regulatory difficulties associated with immersion. Although the relationship has not yet been examined, the results could possibly be interpreted as depressed individuals reflecting on their feelings from a self-immersed perspective.

Nonetheless, the conceptually different strategies require caution when drawing conclusions about the neural effect of self-distancing. In the “accept” condition, experiences were regarded as passing events that are mentally distant from the person. Participants in the “analyze” condition were

is consistently used as a comparison strategy and referred to as the “distancing strategy” (Kross & Ayduk, 2011, p. 189). As individuals observe their experiences from a distance but do not analyze the underlying context, they are missing the analysis component that has previously been said to be crucial in combination with distancing (Ayduk & Kross, 2010b; Kross et al., 2012). Instead, “simply” observing and accepting the mental events that are passing by would then match the conceptualization of mindfulness and acceptance-based approaches. Although individuals in both “accept” and “analyze” strategies reported a down-regulation of self-reported negative affect, neural activity only correlated with the “accept” and “feel” condition. Analyzing the event, which seems to better match a distanced perspective, did not yield a significant correlation.

Given these findings, it is no surprise that these studies conclude that distancing (“accept” condition) lowers the neural activity in the discussed regions; this is a strong indicator for the neural benefits of distancing (Kross, 2009; Kross & Ayduk, 2011). As only mentioned in one review (Ayduk & Kross, 2010a), researchers need to interpret these findings with caution to avoid false conclusions. Future studies that intend to assess neural activity in this context may want to rely on “traditional” strategies to manipulate the type of perspective. Given that distancing may potentially have a buffering effect for neural activity and may thus especially benefit individuals who tend to engage in rumination, conducting further work in this area is much needed.

3. Avoidance and Distraction

Previous work has demonstrated that avoidance mechanisms, including distraction and suppression, may initially provide relief, but could eventually trigger individuals to

in the short-term when exposed to distressing stimuli. However, a majority of the studies on self-distancing have only examined the short-term implications which prevent researchers from making statements about its lasting efficacy. Building on this, researchers have conducted various studies to examine the long-term effects of self-distancing (Ayduk & Kross, 2010b; Kross & Ayduk, 2008).

After having participants recall a depressing event, they were randomly assigned to one of three experimental conditions (Ayduk & Kross, 2010b). The instructions of the distanced- and immersed-analysis were adapted from previous work (Kross et al., 2005). Individuals in the distraction condition were asked to think about a series of neutral statements presented to them. Given that the strength of task engagement presumably influences one's emotional reactivity, the researchers controlled for this variable when analyzing the results.

Compared to the distraction and distancing condition, which did not differ in their effect on emotional reaction, self-immersion was shown to increase depressed affect. In order to examine the long-term effects of these cognitive strategies, participants returned to the laboratory one or seven days later and were asked to recall the same experience without being cued to adopt a specific kind of perspective. At session two, only individuals who self-distanced at session one were able to further facilitate adaptive regulation. Without manipulating the participant's perspective, those in the original distancing condition continued to experience lower levels of depressed affect (at session two) and expressed a reduction in recurring thoughts during the time preceding the second assessment.

Consistent with this having

assessment (Ayduk & Kross, 2008a, 2010b). In contrast, Kross and Ayduk (2008) illustrated that participants previously assigned to the distraction condition reported greater depressed affect as well as elevated levels of recurring thoughts over time. The long-term benefits only associated with distanced-analysis may suggest that only this strategy facilitates emotional processing in ways that can buffer individuals during future recall and may aid coping over time. Although the immediate reduction in depressed affect may be tempting for both strategies, the emotional and cognitive implications of the distraction condition further highlight the long-term limitations associated with this cognitive strategy (Nolen-Hoeksema et al., 2008).

Although distraction, which is a type of avoidance, has been shown to embody long-term limitations, several researchers were interested in further examining whether distancing facilitates emotional processing via avoidance (Ayduk & Kross, 2008a, 2010b; Kross et al., 2011; Kross & Ayduk, 2008). According to Ayduk and Kross (2008a), this motivation was based on a claim suggesting a direct relationship between those variables. However, several studies were able to provide objections to this assumption. Following the analysis of a distressing memory, Kross and Ayduk (2008) revealed a non-significant negative relationship between distancing and avoidance after explicitly asking individuals to indicate the degree to which they tried to avoid thinking about the distressing event. Further, Ayduk and Kross (2010b) found that the initial extent of distancing negatively predicted negative affect at a seven-week follow-up. Conversely, previous work has demonstrated a positive relationship between avoidance and depressed affect (Kross & Ayduk, 2008).

that this cognitive group experienced the largest decrease in avoidance over time. Given that individuals in the distancing condition continuously displayed emotional reactivity across all studies, it seems safe to exclude self-distancing as a form of emotional avoidance which would be associated with the suppression of emotions (Kross et al., 2005). Further, thought essays revealed that individuals in both the distanced- and immersed-analysis groups focused on concrete emotions as indicated by the use of recounting statements (Ayduk & Kross, 2010b; Kross & Ayduk, 2008, 2009; Kross et al., 2005; Kross et al., 2012). However, the balance of people's thought content was shifted as participants adopting a distanced perspective engaged in relatively less recounting than their counterparts. Drawing from these findings, it seems safe to conclude that distancing does not facilitate avoidance among individuals who utilize this strategy (Ayduk & Kross, 2008a).

Given that a majority of the studies discussed thus far restrict the analysis period to 30 to 60 seconds (Park et al., 2015), it is reasonable to question whether individuals would possibly start ruminating when extending the duration to reflect on the memory. By measuring the duration of an open-ended recall and reflection period, Ayduk and Kross (2010b) intended to examine whether their ethnically diverse sample engaged in behavioral avoidance with a shorter response time indicating greater avoidance. The researchers revealed that one's tendency to spontaneously self-distance did correlate with neither of those time periods, thus suggesting that the effect of distancing is not linked to the duration one spends analyzing the experience.

While this may seem like it could be an answer to our question, participants could have possibly stopped their response time

further investigate the effect of duration by possibly extending the reflection period after manipulating the participant's perspective. Seeking clarity in this context allows investigators to better provide suggestions and possibly identify a time period to maximize adaptive benefits.

4. Clinical application

Distancing has long been considered to be a therapeutic precondition in the cognitive behavioral interventions, because it presumably allows patients to constructively work through their irrational and distorted thought patterns (Beck et al., 1979). However, the construct of distancing, as it is presented in this paper, is assumed to require a substantial amount of cognitive flexibility because individuals mentally step out of their experience and then utilize it in a way that allows adaptive and analytic processing. When considering Gotlib and Joormann's findings (2010), the researchers argued that individuals with depression demonstrate inhibitory control deficits when processing negative information as well as difficulties disengaging from unpleasant material. Other scholars have emphasized that clinically depressed individuals who attempt to analyze such experiences often face an overwhelming feeling, which may suggest that they possibly adopt an overly immersed perspective (Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008).

Consistent with these ideas, previous work has highlighted the inverse relationship between trait rumination and spontaneous self-distancing (Ayduk & Kross, 2010b). The researchers concluded that distancing may protect individuals against maladaptive processing styles such as rumination. Building upon this work, it is questionable whether individuals with depression are cognitively able to adapt a distanced perspective and whether this approach is

and Ayduk (2009) analyzed the Beck Depression Inventory data (BDI) collected as part of these studies. Other results of all five studies have been discussed in other parts of this paper and follow the dominant methodology in this line of work (Ayduk & Kross, 2008b; Kross & Ayduk, 2008; Kross et al., 2005). Participants across all five studies were asked to recall an anger-related or depression-related experience and then analyze it from their assigned perspective. Both, emotional reactivity and depressive symptoms were examined in all studies following the manipulation and thought content was assessed in four of the five studies. As a result, the combined sample of high BDI scorers was large enough to provide sufficient power thus allowing the researchers to examine the effect of distancing among participants vulnerable to maladaptive processing styles. In their analyses, researchers controlled for the severity of the experience recalled as it can possibly influence participant's self-reported depressed affect.

Across both perspective conditions, individuals with lower depressive symptom displayed reduced negative emotional reactivity compared to the high BDI scorers. However, a distanced analysis seemed to alleviate this positive relationship, as high BDI individuals in the distanced-analysis group and low BDI individuals in the immersed-analysis group had similar affect scores. This suggests that both, high and low BDI scorers successfully utilized distancing in a way that allowed them to maintain a relatively low score of negative emotional reactivity. In contrast, reported negative affect among participants in the immersed condition increased as depressive symptoms scores increased, thus creating a greater difference between high BDI scorers in both perspective conditions

effect. This suggests that both high and low depression symptom scorers displayed significantly higher levels of reconstruing in the distanced-analysis group. In sum, the study demonstrated that individuals with higher depression symptoms seem to be able to engage in and benefit from a distanced perspective.

To examine the effect of distancing in a population most vulnerable to rumination, Kross et al. (2012) randomly assigned a group of adults clinically diagnosed with major depressive disorder (MDD) and a healthy control group to an immersed or distanced-analysis condition following established procedures. After recalling and analyzing a depressing experience, participants completed a set of dependent variable measures including a lexical-decision task to measure depressotypic thought accessibility and negative affect. MDD participants in the distanced-analysis group reported lower levels of negative affect compared to their counterparts, thus suggesting that individuals with and without depression seem to benefit from the strategy in similar ways.

Using the baseline affect data, the researchers completed a repeated measures analysis of variance (ANOVA) in order to examine the change in negative affect over time. MDD participants in the distanced condition reported a trend toward a decrease in negative affect relative to baseline, whereas MDD participants in the immersed condition reported an increase in negative emotions. This finding supports the assumption that the buffering effect previously demonstrated by Kross and Ayduk (2008) can be extended to vulnerable populations. It seems safe to conclude that this cognitive approach buffered depressed participants against an increase in negative affect when analyzing their negative

the negative information and their difficulties to disengage from unpleasant material (Gotlib & Joormann, 2010).

In light of documented associations, a self-immersed perspective does not only seem to drive a maladaptive response when analyzing negative experiences, but the promising benefits associated with self-distancing can be extended to clinical populations. The findings may hold profound practical implications for therapeutic settings as it may be beneficial to induce this type of perspective when working through negative stimuli. Further investigation is needed in order to examine the efficacy of distancing in the context of other disorders.

Individuals dealing with anxiety disorders could greatly benefit from a strategy that allows them to distance themselves from their overwhelming feelings of fear in regards to past, present and future stressors. Patients diagnosed with PTSD constantly face debilitating flashbacks triggered by traumatic events. It is necessary to examine whether self-distancing would provide therapeutic benefits for this population and whether there are certain clientele groups who may not benefit from this intervention. In fact, features of the self-objectification theory in regards to body image suggest that many women adopt an observer's perspective by habitually monitoring their own appearance (Calogero, Tantleff-Dunn, & Thompson, 2010). According to the authors, there is a substantial wealth of support suggesting the negative effects of self-objectification that may hold serious implications for individuals dealing with eating pathology and disordered eating. Taken together, these areas of work may present certain conditions under which distancing could potentially be harmful and demonstrates avenues for future research

experiences in adaptive ways. By analyzing distressing experiences from a distanced perspective, individuals were shown to experience a shift in thought content and to attenuate their emotional experiences in ways that extended to the regulation of physiological responses. Additionally, the paper lists a number of directions and highlights multiple avenues for future research.

A majority of the studies follow an established process when manipulating the participant's perspectives. Given that the time period for reflection and analysis is quite brief, researchers may want to examine different durations in order to provide suggestions for individuals implementing this strategy outside of a controlled setting. Additionally, more longitudinal research on self-distancing is needed. Although the strategy seems to outperform the initial benefits associated with distraction when placed in a long-term context, future studies may want to follow up with the efficacy of self-distancing over an extended period of time. Further, several studies have relied on people's tendency to spontaneously self-distance. Although this approach has yielded significant findings across various studies, it remains questionable why some individuals were more likely to adopt a distanced or immersed perspective. It is possible that differences in individual dispositions or one's habitual way of dealing with such experiences are responsible for varying tendencies.

Furthermore, studies examining the physiological benefits are limited. In order to draw confident conclusions, future work needs to investigate the effect of self-distancing on physiological as well as physical functions. Lastly, clinical populations seem to be the ones who would most benefit from a strategy that undermines

trauma need to receive attention when conducting further studies in this field. With the refinements of these suggestions for future research avenues, self-distancing can be a powerful mechanism in helping individuals process negative experiences adaptively.

REFERENCES

- Ayduk, Ö., & Kross, E. (2008a). Asking why from a distance facilitates emotional processing: A reanalysis of Wimalaweera and Moulds. *Behavior Research and Therapy, 47*, 88-92. doi: 10.1016/j.brat.2008.06.014
- Ayduk, Ö., & Kross, E. (2008b). Enhancing the pace of recovery: Self-distanced analysis of negative experiences reduced blood pressure reactivity. *Psychological Science, 19*, 229-231. doi: 10.1111/j.1467-9280.2008.02073.x
- Ayduk, Ö., & Kross, E. (2010a). Analyzing negative experiences without ruminating: The role of self-distancing in enabling adaptive self-reflection. *Social and Personality Psychology Compass, 4*, 841-854. doi: 10.1111/j.1751-9004.2010.00301.x
- Ayduk, Ö., & Kross, E. (2010b). From a distance: Implications of spontaneous self-distancing for adaptive self-reflection. *Journal of Personality and Social Psychology, 98*, 809-829. doi: 10.1037/a0019205
- Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy of depression*. New York: Guilford Press.
- Calogero, R. M., Tantleff-Dunn, S., & Thompson, J. K. (2010). *Self-objectification in women: Causes, consequences, and counteractions* (1st ed.). Washington, DC: American Psychological Association
- Cribb, G., Moulds, M. L., & Carter, S. (2006). Rumination and Experiential Avoidance in Depression. *Behaviour Change, 23*, 165-176. doi: <http://dx.doi.org/10.1375/bech.23.3.165>
- Davis, R. N., & Nolen-Hoeksema, S. (2000). Cognitive inflexibility among ruminators and nonruminators. *Cognitive Therapy and Research, 24*, 699-711. doi: <http://dx.doi.org/10.1023/A:1005591412406>
- Fresco, D. M., Segal, Z. V., Buis, T., & Kennedy, S. (2007). Relationship of posttreatment decentering and cognitive reactivity to relapse in major depression. *Journal of Consulting and Clinical Psychology, 75*, 447-455. doi: 10.1037/0022-006X.75.3.447
- Gerin, W., Davidson, K. W., Christenfeld, N. J., Goyal, T., & Schwartz, J. E. (2006). The role of angry rumination and distraction in blood pressure
- Heine, S. (2016). *Cultural Psychology*, W.W. Norton & Company
- Kross, E. (2009). When the self becomes other. *Values, Empathy, and Fairness across Social Barriers, 1167*, 35-40. doi: 10.1111/j.1749-6632.2009.04545.x
- Kross, E., & Ayduk, Ö. (2008). Facilitating adaptive emotional analysis: Distinguishing distanced-analysis of depressive experiences from immersed-analysis and distraction. *Personality and Social Psychology Bulletin, 34*, 924-937. doi: 10.1177/0146167208315938
- Kross, E., & Ayduk, Ö. (2009). Boundary conditions and buffering effects: Does depressive symptomology moderate the effectiveness of self-distancing for facilitating adaptive emotional analysis?. *Journal of Research in Personality, 43*, 923-927. doi: 10.1016/j.jrp.2009.04.004
- Kross, E., & Ayduk, Ö. (2011). Making meaning out of negative experiences by self-distancing. *Current Directions of Psychological Science, 20*, 187-191. doi: 10.1177/0963721411408883
- Kross, E., Ayduk, Ö., & Mischel, W. (2005). When asking „why“ does not hurt: Distinguishing rumination from reflective processing of negative emotions. *Psychological Science, 16*, 709-715. doi: 10.1111/j.1467-9280.2005.01600.x
- Kross, E., Davidson, M., Weber, J., & Ochsner, K. (2008). Coping with emotions past: The neural bases of regulating affect associated with negative autobiographical memories. *Biol. Psychiatry, 65*, 361-366. doi: 10.1016/j.biopsych.2008.10.019
- Kross, E., Duckworth, A., Ayduk, Ö., Tsukayama, E., & Mischel, W. (2011). The effect of self-distancing on adaptive versus maladaptive self-reflection in children. *Emotion, 11*, 1032-1039. doi: 10.1037/a0021787
- Kross, E., Gard, D., Deldin, P., Clifton, J., & Ayduk, Ö. (2012). Asking why from a distance: Its cognitive and emotional consequences for people with major depressive disorder. *Journal of Abnormal Psychology, 121*, 559-569. doi: 10.1037/a0028808
- Metcalf, J., & Mischel, W. (1999). A hot/cool-system analysis of delay of gratification: Dynamics of willpower. *Psychological Review, 106*, 3-19. doi: 10.1037/0033-295X.106.1.3
- Mischel, W., Shoda, Y., & Rodriguez, M. L. (1989). Delay of gratification in children. *Science, 244*, 933-938. <https://ezproxy.queens.edu:2048/login?url=http://search.proquest.com/docview/213543080?accountid=38688>
- Morrison, R. & O'Connor, R. C. (2008). A systematic review of the relationship between rumination and suicidality. *Suicide & Life - Threatening Behavior, 38*, 523-538. doi: 10.1521/suli.2008.38.5.523
- Moulds, M. L., Kandris, E., Starr, S., Wong, A. C. M.

Yale Review of Undergraduate Research in Psychology

- Nolen-Hoeksema, S. (2000). The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology, 109*, 504-511. doi: 10.1037/10021-843X.109.3.504
- Nolen-Hoeksema, S., Morrow, J., & Fredrickson, B. L. (1993). Response styles and the duration of episodes of depressed mood. *Journal of Abnormal Psychology, 102*, 20-28. doi: 10.1037/0021-843X.102.1.20
- Nolen-Hoeksema, S., Wisco, B. E., & Lyobomirsky, S. (2008). Rethinking rumination. *Perspectives on Physiological Science, 3*, 400-424. doi: 10.1111/j.1745-6924.2008.00088.x
- Orgeta, V. (2009). Specificity of age differences in emotion regulation. *Aging & Mental Health, 13*, 818-826. doi: 10.1080/13607860902989661
- Park, J., Ayduk, Ö., & Kross, E. (2015). Stepping back to move forward: Expressive writing promotes self-distancing. *Emotion*, Advance online publication. doi: <http://dx.doi.org/10.1037/emo0000121>
- Rodríguez-Cano, E., Sarró, S., Monté, G.C., Maristany, T., Salvador, R., McKenna, P. J., & Pomarol-Clotet, E. (2014). Evidence for structural and functional abnormality in the subgenual anterior cingulate cortex in major depressive disorder. *Psychological Medicine, 44*, 3263-73. doi: 10.1017/S0033291714000841
- Verduyn, P., Van Machelen, I., Chezzi, C., Van Bever, F., & Kross, E. (2012). The relationship between self-distancing and the duration of negative and positive emotional experiences in daily life. *Emotion, 12*, 1248-1263. doi: 10.1037/a0028289
- Wegner, D. M. (2011). Setting free the bears: Escape from thought suppression. *American Psychologist, 66*, 671-680. doi: 10.1037/a0024985
- Wegner, D. M., Schneider, D. J., Carter, S. R., & White, T. L. (1987). Paradoxical effects of thought suppression. *Journal of Personality and Social Psychology, 53*, 5-13. doi: 10.1037/0022-3514.53.1.5
- Wenzlaff, R. M., & Wegner, D. M. (2000). Thought suppression. *Annual Review of Psychology, 51*, 59-91. doi: 10.1146/annurev.psych.51.1.59
- White, R. E., Kross, E., & Duckworth, A. L. (2015). Spontaneous self-distancing and adaptive self-reflection across adolescence. *Child Development, 86*, 1272-1281. doi: 10.1111/cdev.12370
- Wilson, T. D., & Gilbert, D. T. (2008). Explaining away: A model of affective adaptation. *Perspectives on Psychological Science, 3*, 370-386. doi: 10.1111/j.1745-6924.2008.00085.x

The Effects of Image Priming and BMI on Food and Monetary Discounting

Courtney Brewer, Shelby Nichols, Steven B. Wroten
University of Central Arkansas

ABSTRACT. This study explores the correlation between an individual's body mass index (BMI) and discounting rates for hypothetical food and monetary rewards. One hundred and twenty four (103 females and 21 males) university students completed a two section survey in which they were asked to choose between a) 10 dollars after one of several different delays (1, 2, 30, 180, 365 days) or a lesser amount of money available immediately; b) 10 bites of food after several different delays (1, 2, 5, 10, 20 hours) or a lesser amount of bites available immediately. This study also explored the effects of food image priming by randomizing hamburger or salad image prompts shown to each participant before completion of the surveys. This was done to determine whether image priming had any influence over participants' choice of immediate or delayed hypothetical rewards in either the monetary or food category. Median indifference points for each participant in each hypothetical task were found using area under the curve (AUC). Results showed a significant correlation between food discounting and BMI split into high and low categories: individuals with higher BMIs showed higher levels of discounting than individuals with lower BMIs when presented with the hamburger image prompt in food discounting. However, there was no significant correlation between the split BMI with the salad image prompt and food or monetary decisions.

Reaching for a fifth cookie when your entire week has been devoted to losing five pounds is a relatable scenario for most people. While this choice is a delicious one, it is also an impulsive one that disregards future, desired weight loss for a small but tasty cookie. To better understand impulsivity, lab studies correlate this behavior with delay discounting (DD), also known as temporal discounting, which refers to the decline of value in an object due to delay (Whelan & McHugh, 2009). The inclination to choose smaller rewards if they are given sooner over larger but more delayed rewards shows DD and parallels impulsivity (de Water, Cillessen, & Scheres, 2014). An impulsive individual, or high delay discounter, could be deemed a poor decision maker (Guallimie et al., 2010).

Larkin, 2013; Reynolds, Ortengren, Richards, & Wit, 2006).

In order to determine rates of DD, experimenters ask individuals to choose between an immediate, lesser reward and a delayed, greater reward. With each new question asked, the value given for the reward for the immediate option will increase, while the value given for the delayed option will stay the same. The point at which the individual being tested switches from the larger to the smaller reward is the "indifference point," which represents the subjective view of the larger, delayed reward (Critchfield & Kollins, 2001). Along with incremental changes in the immediate reward, changes in delay are made; after each set of questions regarding choices between a delayed reward and a steadily

less they value it, regardless of the final value of the reward (Critchfield & Kollins, 2001). In order to express the function of delay and its effects on value, DD research deals primarily with monetary decisions. Money is something that most individuals in our society desire and need, making its study fairly universal and relevant. While monetary delay discounting alone gives insight into a person's level of impulsivity and general decision-making, it is usually used as a comparison and foundation in many studies to correlate impulsivity across different factors.

One aspect of DD used as a comparison and correlational factor for monetary discounting is eating. America is facing a staggering epidemic in obesity rates, with 68.8% of its citizens considered overweight, 34% obese, and 6% morbidly obese. Understanding the cause of this obesity epidemic is essential to reverse it (Epstein et al., 2014; Buono, Whiting, & Sprong, 2015). One current theory explaining the cause of obesity is that overweight and obese individuals have poor decision making skills and high levels of impulsivity, what Mike Tordoff calls "obesity by choice" (Davis, Levitan, Muglia, Bewell, & Kennedy, 2004). What Tordoff meant was that, unlike times in humanity's evolutionary past when food was scarce and meals erratic, present-day human eating is not merely a passive response to environmental challenges and physical drives. Instead, eating is essentially about making a choice between short-lived and overabundant rewards in the face of unfavorable long-term outcomes, if done excessively.

Ramussen, Lawyer, and Reily (2009) examined the possibility of impulsivity as a correlate with BMI by giving women with differences in percent body fat two types of

Appelhans et al. (2011) found that women with BMIs that correlated with obesity had extremely high levels of discounting when it came to palatable or pleasurable foods as compared to women with healthy BMIs. However, the women who were considered obese had much lower levels of DD when it came to bland foods as compared to the levels for palatable foods. Additionally, Manwaring, Green, Myerson, Strube, and Wilfley (2011) found that women with binge eating disorder (BED), a disorder characterized by excessive intake of food, had extremely high rates of DD in regards to food as compared to women who did not have the disorder. This study found that women with BED had high levels of discounting in various DD tasks, including money, exercise, and massages, in addition to food.

While all three studies found that women who had either higher levels of body fat, were considered obese, or had been diagnosed with BED had high levels of discounting rates for food, an interesting aspect that was seemingly overlooked was that in Appelhans et al. (2011) study, obese women only discounted high when choosing pleasurable foods, and actually scored lower on discounting when choosing bland foods. This implies that specific foods impair judgment and increase impulsivity; anything that elicits a high pleasure response. Harris, Bargh, and Brownell (2009) explored the effects that food priming via tv commercials have on the amount and type of intake of food when hunger was not present in the participants. The study compared the effects of commercials promoting unhealthy snack foods to healthy snack foods. The study found that individuals who were primed with unhealthy food ate about 45% more and mostly chose unhealthy snack foods when given the option as compared to those

This current study aimed to extend the research of the correlation between individuals' BMI and food and monetary decision-making by means of DD tasks. The expectation for the results of this study was that a higher BMI would result in higher degrees of discounting for both food and money, with a greater degree of correlation for the food condition. This study also intended to investigate the effects that random priming of unhealthy and healthy foods have on delay discounting tasks. The expectation was that image stimuli that featured healthier foods would encourage a lesser degree of delay discounting for both food and money, and the opposite would be true for junk food image prompts.

Method

Participants

The one hundred and twenty four participants (103 females and 21 males) were students enrolled in various Psychology courses at a regional university. Participants had to be at least 18 years old to participate. The average age of the participants was 20.66 ($SD=4.123$). For the study, participants were asked to provide their height and weight so researchers could calculate BMI. Participants were separated by their BMI: upper BMI or lower BMI. The average BMI for the upper section was 29.439 ($SD=4.73$) and the average for the lower section was 21.15 ($SD=1.59$). To encourage participation, students were offered extra credit if it was approved by their psychology professor, or as enrichment credit fulfillment. In order to enroll in the study and complete the survey, students signed up and accessed the study through SONA scheduling systems, a research scheduling system that includes the ability to do questionnaires and other experiments online. Participants were treated in accord with Institutional Review Board approved

the study was created and presented, the research scheduling system, SONA, the standard scale of BMI calculation, and a replication of surveys created by previous researchers to investigate monetary and food discounting delays. The delay discounting survey created using the Qualtrics program was a replication of the survey used by Ramussen, Lawyer, and Reily, (2009). The monetary portion of the survey consisted of 85 questions that asked participants to decide if they would prefer a lesser amount of money at a more immediate time, or a greater amount of money at a later time. The food portion of the survey was comprised of 85 questions determining whether participants would prefer fewer bites of food now versus more bites of food at a later time.

Following the two-part survey, participants completed a demographic questionnaire, also a replication of Ramussen, Lawyer, and Reily, (2009) study demographic section, which included: age, height, weight, and gender. All demographic information was self reported. These demographics were used to make distinctions in gender as well as determine BMI. The BMI calculation, $\text{weight (lb)} / [\text{height (in)}]^2 \times 703$, was taken from the website of Center's of Disease Control and Prevention (2015). A BMI score below 18.5 translates as underweight, 18.5-24.9 as healthy or normal weight, 25-29.9 as overweight, and 30 and above as obese.

The collected data was analyzed using the program SPSS. Area under the curve (AUC) was used to find mean indifference points for food and money discounting. After AUC rates for both food and money were found, a two-tailed t-test was run to address any significant differences between the food and money correlates along with BMI. Another independent samples test was run to address

discounting levels for money and food depending on the categorization of image prompt.

Procedure

Participants logged into their SONA account through the UCA website and clicked on the study “Monetary and Food Discounting.” They were then immediately presented with an informed consent. Participants were asked to either accept or decline what was stated in the consent form; if accept was chosen it took the participant to the beginning of the survey, while a decline directed the participant to the end of the survey.

After the participants accepted the conditions of the study, they were presented with the statement: “During the study you will be asked to answer questions regarding food and monetary decisions. Try to be as honest as possible during your participation of this study.” Underneath this statement was either a picture of healthy food (a salad with grilled chicken) or unhealthy food (a burger with fries). Once the participant clicked okay, they were presented with either the food or money delay discounting survey in randomized order, with the other survey following the completion of the first. If the food discounting survey was first, participants were shown a picture of a .5 inch cube next to a dime for reference scaling and were told to imagine that the cube represents a standardized bite size of their favorite food, and to remember this as they complete the next portion of the study. Following this was the 85 question food delay discounting survey with incremental changes in delays. The questions used a combination of one of five delays (1 hour, 2 hours, 5 hours, 10 hours, 20 hours) and one of thirteen amounts of theoretical food in the no delay condition, starting at two and going up by half a bite each time until reaching ten

between two amounts of money at different times. The delays for the money condition were 1 day, 2 days, 30 days, 180 days, and 365 days, with the same amounts used as in the food condition, this time with the “bites” being replaced with dollars. These surveys were presented in the opposite order as well, randomly and with an equal chance of either condition.

Upon completion of the two-part survey, participants were asked to fill out the demographic portion of the survey asking for age, height, weight, and gender. Once finished, participants were thanked for their participation and debriefed with a stated point of the study, available correspondence regarding the study, as well as a follow up of the APA restrictions and guidelines. Once they had finished reading and clicked ok, they were returned to the UCA homepage.

Results

To analyze the correlation of BMI, with a mean of 25.34 ($SD=5.43$), with the hypothetical food and monetary delay discounting rates, AUC rates for food and money categorized by image prompt were used. No significant difference in delay discounting rates for either food or money hypothetical rewards in either the salad or hamburger prompt categories in regard to the correlate of BMI were found. (food: $r=.013$, $p=.889$, money: $r=.236$, $p=-.108$). Though BMI did not correlate with either monetary and food discounting rates ($r=.408$, $p<.001$).

Area under the curve (AUC) rates were calculated for both food and money. AUC rates were found by using the equation $V=A/1+kD$ where V is the subjective value of the reward, A is the range of reward, D is the delay, and K is the indifference point (Myerson, Greene, & Warusawitharana, 2001). The mean money AUC was 4.23 ($SD=5.44$) and the mean food AUC was 3.84 ($SD=1.84$). There was a significant

In order to assess whether image prompts had a priming effect on participants' delay discounting rates for food or money, area under the curve (AUC) rates for both hypothetical food and monetary rewards were categorized by the image they were presented with (salad or hamburger). There was no difference in either food or monetary delay discounting depending on the image prompt that was shown before the participant completed the survey ($t=.07, p=.95$). Participants in the salad prompt ($n=69$) had a mean AUC for food of 3.84 ($SD=1.76$). Participants in the hamburger prompt ($n=54$) had a mean AUC for food of 3.82 ($SD=1.93$). Participants in the salad prompt ($n=69$) had a mean AUC for money of 4.24 ($SD=2.5$). Participants for the hamburger prompt ($n=54$) had a mean AUC for money of 4.4 ($SD=2.6$). These results were not statistically significant ($t=.393, p=.695$).

However, BMI was represented as a continuous variable in the prior AUC statistical tests, and was separated into a discontinuous variable as low or high levels of BMI in order to analyze the results closer. The low level ($n=62$) was represented by individuals who had a mean BMI of 21.15 ($SD=1.59, min=17.37, max=23.89$). Participants within this group fell into the category of normal BMI (18.5-24.9). The high level ($n=62$) was represented by individuals who had a mean BMI of 29.439 ($SD=4.73, min=24.22, max=43.26$). Participants within this group fell into the category of overweight BMI (25-29.9), though they were bordering obesity levels of BMI (>30).

To examine the relationship of the discontinuous variable of BMI with both food and money rewards, an ANOVA was conducted with BMI and image prompt split, with regards to mean AUC rates in both

($SD=2.14$). For the low level of BMI ($n=24$) with the hamburger prompt the mean AUC for food was 4.4 ($SD=2.26$). For the high level of BMI ($n=30$) with the hamburger prompt the mean AUC for food was 3.35 ($SD=1.48$). Image split and AUC for food was not significant ($F(1,123)=.005, p=.095$). In addition, two independent t-tests with BMI split and image split were conducted. There was a significant interaction ($F(1,123)=4.59, p=.034$) (see figure 1). This relationship showed that differing levels of BMI did in fact have an effect on delay discounting rates; participants in the high level of BMI group had a significant increase of delay discounting over the low level of BMI group when shown the hamburger prompt. The level of BMI, however, did not affect the discounting rates for food when shown the salad prompt.

To assess the BMI split with monetary rewards, a 2x2 ANOVA was run. For the low level of BMI ($N=36$) with the salad prompt, the mean AUC for money was 4.56 ($SD=2.7$). For the high level of BMI ($n=32$) with the salad prompt the mean AUC for money was 3.88 ($SD=2.23$). For the low level of BMI ($n=25$) with the hamburger prompt the mean AUC for money was 4.92 ($SD=2.83$). For the high level of BMI ($n=29$) with the hamburger prompt the mean AUC for money was 4.0 ($SD=2.45$).

Overall, the relationship of the mean AUC for money with BMI split was not significant ($p=.090$) (see figure 2). Participants' differing levels of BMI with either the salad or hamburger image prompt did not have an effect on monetary discounting rates

Discussion

In this study, discounting rates for hypothetical monetary and food rewards were explored in relation to BMI and image priming. Consistent with current studies

Participants in the hamburger prompt condition who had a higher BMI were shown to have a much higher rate of delay discounting than those who had a lower BMI, whereas there were not any statistically significant difference between the delay discounting choices of those with higher BMI versus those with lower BMI in the salad condition. This suggests that perhaps individuals with a higher BMI can be influenced to make poor discounting decisions when primed with an unhealthy stimulus. This finding was consistent with the findings of Applehans et al. (2011), which found that women whose BMIs correlated with obesity had high levels of food discounting in regards to palatable foods, but comparatively low levels of food discounting with bland foods.

The study presented in this paper was inspired in part by the work of Rasmussen, Lawyer, and Reilly (2009). Instead of using the hyperbolic discounting function to find the indifference points, AUC was used. Additionally, to reduce the difficulty in gathering percent body fat, the current study used self-reported height and weight to calculate BMI so that the study could be presented in survey form online. Rasmussen, Lawyer, and Reilly (2009) study found that “percent body fat predicted increased discounting for hypothetical food, but not money” and that “none of the other dietary variables (including BMI) were related to discounting patterns.” Due to the current study focusing primarily on BMI, it could not support the first claim regarding percent body fat. However, the current study found, in accordance with Rasmussen, Lawyer, and Reilly (2009), that BMI does not affect discounting patterns insofar as Rasmussen et. al. had looked for correlations. As an extension of their study, effects of image priming were used as well

Odom, (2014) study in which the effects of priming photos on delay discounting were measured. Their study found that money discounting was reduced when scenes of nature were shown in comparison to pictures of man-made items or structures and shapes. This sparked an interest in seeing what the effects of food related photos as priming materials would be for participants’ discounting rates regarding food and money. Our results show that individuals of higher BMI are more affected by images of unhealthy foods in terms of their impulsivity with food choices. This information is uniquely important given the prevalence of advertising displaying unhealthy food choices in the daily lives of people in America and the trend of the American population towards obesity (Flegal, Carroll, Kuczmarski, & Johnson, 1997).

A similar study by Hendrickson and Rasmussen (2013) found that “high percent body fat (PBF) predicted more impulsive choice for food, but not small-value money” with the statement that other studies have found similar results (399). Our study did not find any supporting data, which could be due to the self reported measure of weight and height used to calculate BMI, or simply the limitations of using the body mass index. Due to BMI’s “relation to frame size, lean body mass, and fatness,” someone who reports as having a lower BMI may have more fat than expected or vice versa (Garn, Leonard, and Hawthorne, 1986). That is to say, frame size varies across individual persons, and height and weight that correlate to produce a healthy BMI in most frame sizes and shapes do not always correlate in the same percentages as suggested by the BMI scale for a healthy weight in more atypical frame sizes. Also, muscle, or lean body mass, may be more prevalent in someone than what is typically assumed, and

muscle, but their BMI remains fairly low even though their body fat percentage is too high.

The current study may also have been affected by allowing participants to choose their own hypothetical rewards in regards to food. Weatherly, Gudding, and Derenne (2010) study supports the notion that individuals prefer self-determined reinforcers over experimenter-determined ones, and are shown to delay the least when they get their choice of reinforcers. Due to our food discounting questionnaire asking the participants to imagine taking bites of their favorite food, rather than controlling for the hypothetical food by requesting that each participant imagine the bites to be of a specific example food, it may be that the participants were less willing to discount as highly as they would have otherwise.

The age of our participants must also be taken into account, as the findings of the study presented by this paper may not be applicable to all age groups, as adolescents have been shown to have higher rates of delay discounting than adults and older adults (Whelan and McHugh, 2009). While our participants were not as young as the adolescents in Whelan and McHugh (2009) (an average of fourteen years of age), it is likely that the rate of discounting was higher for our participants than for the average adult, which in Whelan and McHugh (2009) was an mean age of forty-six.

Despite higher delay discounting in certain individuals with high BMI, a number of studies show that human beings are not destined to make poor discounting decisions, and can be trained to discount more effectively in real time. An experiment performed by Schweighofer, Shishida, Han, Okamoto, Tanaka, Yamawaki, and Doya (2006), shows that people can be trained to make more efficient delay discounting

better decisions in real life environment given more time and research. Studies like the one done by Schweighofer et. al. (2006) may provide a means of treating people who tend to discount far more highly than is conducive to everyday life.

The study performed by Hendrickson and Rasmussen (2013) also featured a workshop on mindful eating that seemed to increase the amount of self control displayed by the study's participants in comparison to those in the control condition who watched an unspecified educational video. This provides support for a more applicable means of helping people make better discounting decisions, specifically in food.

Hendrickson and Rasmussen's study could be expanded to judge the effectiveness of these methods in other areas as well. The knowledge that photos of an unhealthy stimulus will increase rates of delay discounting and therefore impulsivity in those with a high BMI could help individuals who have a higher body mass index be aware of the need to avoid those stimuli and seek support in learning ways of improving their delay discounting decision making skills if they desire to improve their chances of reducing their BMI or otherwise become healthier.

In conclusion, this study was limited by a number of factors, including the limitations of BMI, the age group tested, and the ability of the participants to select their own preferred hypothetical reward.

However, the knowledge that images of an unhealthy stimulus will increase rates of delay discounting and therefore impulsivity in those with a high BMI could help individuals who have a higher body mass index be aware of the need to avoid those stimuli. This study may also help those individuals seek support to learn ways of improving their delay discounting decision-

Yale Review of Undergraduate Research in Psychology

Arkansas under the supervision of Shawn Charlton for a required Psychology course credit. Correspondence concerning this study should be addressed to snichols4@cub.uca.edu, cbrewer5@cub.uca.edu, or swroten1@cub.uca.edu.

References

- Appelhans, B., Woolf, K., Pagoto, S., Schneider, K., Whited, M., & Liebman, R. (2011). Inhibiting food reward: Delay discounting, food reward sensitivity, and palatable food intake in overweight and obese women. *Obesity, 19*(11), 2175-2182. doi:10.1038/oby.2011.57
- Berry, M., Sweeney, M., Morath, J., & Odom, A. (2014, May 19). The nature of impulsivity: Visual exposure to natural environments decreases impulsive decision-making in a delay discounting task. *PLoS ONE, 10*, 25-35. doi:10.1371/journal.pone.0097915
- Buono, F. D., Whiting, S. W., & Sprong, M. E. (2015). Comparison of temporal discounting among obese college students and obese adults. *Behavior Analysis: Research and Practice, 15*(2), 139-147. Retrieved from: <http://web.a.ebscohost.com.ucark.uca.edu/ehost/pdfviewer/pdfviewer?sid=bf883fb5-3ba5-458d-95e64a3a2314efc4%40sessionmgr4004&vid=18&hid=4109>
- Critchfield, T.S., Kollins, S.H., (2001). Temporal discounting: basic research and the analysis of socially important behavior. *Journal of Applied Behavior Analysis 34*, 101-122. doi: 10.1901/jaba.2001.34-101
- Davis, C., Levitan, R.D., Muglia, P., Bewell, C., Kennedy, J.L., (2004). Decision-making deficits and overeating: A risk model for obesity. *Obesity Research, 12*, 929-935. doi: 10.1038/oby.2004.113
- de Water, E., Cillessen, A. H., & Scheres, A. (2014). Distinct age-related differences in temporal discounting and risk taking in adolescents and young adults. *Child Development, 85*(5), 1881-1897. doi: 10.1111/cdev.12245.
- Epstein, L. H., Jankowiak, N., Fletcher, K. D., Carr, K. A., Nederkoorn, C., Raynor, H.A., & Finkelstein, E. (2014). Women who are motivated to eat and discount the future are more obese. *Obesity, 22*(6), 1394-1399. doi:10.1002/oby.20661
- Flegal, K., Carroll, M., Kuczmarski, R., & Johnson, C. (1997). Overweight and obesity in the United States: Prevalence and trends, 1960-1994. *International Journal of Obesity, 39*-47. doi:10.1038/sj.ijo.0800541
- Garn, S., Leonard, W., Hawthorne, V., (1986). Three web.a.ebscohost.com.ucark.uca.edu/ehost/pdfviewer/pdfviewer?sid=bf883fb5-3ba5-458d-95e64a3a2314efc4%40sessionmgr4004&vid=25&hid=4109.
- Guillaume, S., Sang, C. T., Jaussent, I., Raingeard, I., Bringer, J., Jollant, F., & Courtet, P. (2010). Is decision making really impaired in eating disorders?. *Neuropsychology, 24*(6), 808-812. doi:10.1037/a0019806
- Harris, J., Bargh, J., & Brownell, K. (2009). Priming effects of television advertising on eating behavior. *Health Psychology, 28*(4), 404-413. doi:10.1037/a0014399
- Hendrickson, K., & Rasmussen, E. (2013). Effects of mindful eating training on delay and probability discounting for food and money in obese and healthy-weight individuals. *Behaviour Research and Therapy, 51*(7), 399-409. doi:10.1016/j.brat.2013.04.002.
- Johnson, M., Bickel, W., (2002). Within-subject comparison of real and hypothetical money rewards in delay discounting. *Journal of the Experimental Analysis of Behavior 77*, 129-146. doi: 10.1901/jeab.2002.77-129.
- Manwaring, J., Green, L., Myerson, J., Strube, M., & Wilfley, D. (2011). Discounting of various types of rewards by women with and without binge eating disorder: Evidence for general rather than specific differences. *US National Library of Medicine, 61*(4), 561-582. Retrieved from: www.ncbi.nlm.nih.gov/pmc/articles/PMC3770473/
- Melanko, S., & Larkin, K. T. (2013). Preference for immediate reinforcement over delayed reinforcement: Relation between delay discounting and health behavior. *Journal of Behavioral Medicine, 36*, 34-43. doi: 10.1007/s10865-012-9399-z.
- Perry, J., & Carroll, M. (2008). The role of impulsive behavior in drug abuse. *Psychopharmacology, 200*(1), 1-26. doi: 10.1007/s00213-008-1173-0.
- Rasmussen, E., Lawyer, S., & Reilly, W. (2009). Percent body fat is related to delay and probability discounting for food in humans. *Behavioural Processes, 23*-30. doi:10.1016/j.beproc.2009.09.001.
- Reynolds, B., Ortengren, A., Richards, J., & Wit, H. (2006). Dimensions of impulsive behavior: Personality and behavioral measures. *Personality and Individual Differences, 40*(2), 305-315. doi:10.1016/j.paid.2005.03.024
- Schweighofer, N., Shishida, K., Han, C., Okamoto, Y., Tanaka, S., Yamawaki, S., & Doya, K. (2006). Humans can adopt optimal discounting strategy under real-time constraints. *PLoS Computational Biology, 2*. doi:10.1371/journal.pcbi.0020152.
- Weatherly, J.N., Gudding, J., & Derenne, A. (2010). Delay

Yale Review of Undergraduate Research in Psychology

Whelan, R., & McHugh, L. A. (2009). Temporal discounting of hypothetical monetary rewards by adolescents, adults, and older adults. *The Psychological Record, 59*, 247-258. Retrieved from: <http://web.a.ebscohost.com.ucark.uca.edu/ehost/pdfviewer/pdfviewer?sid=bf883fb5-3ba5-458d-95e6-4a3a2314efc4%40sessionmgr4004&vid=15&hid=4109>

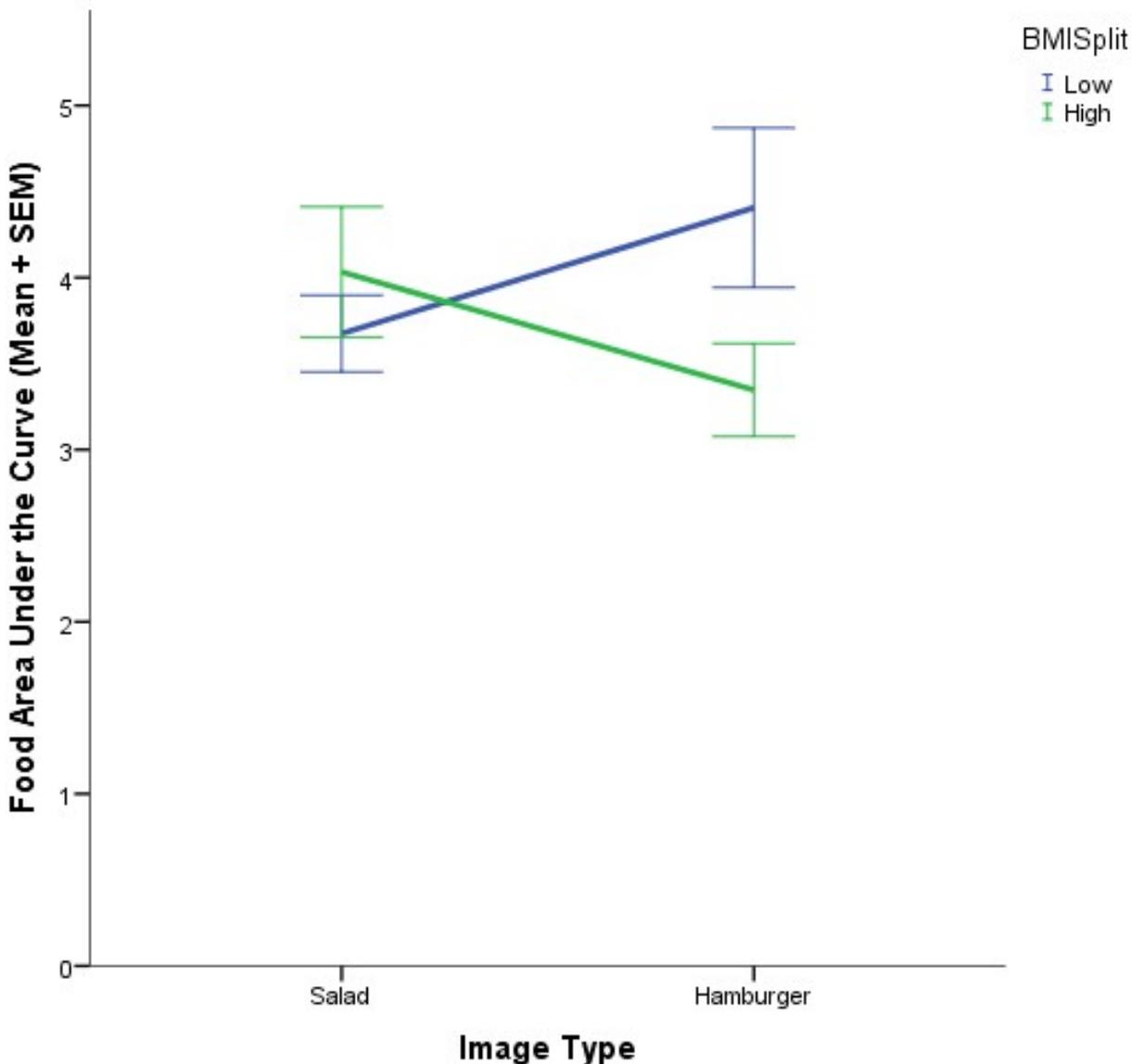


Figure 1. Illustrated in the graph above is the significant correlation between BMI split and image split found from the 2x2 ANOVA. When shown the hamburger prompt, the high BMI group had an increase of delay discounting for food (lower AUC) as compared to the low BMI group who had a decrease in delay discounting for food (higher AUC). Levels of BMI did not affect discounting rates for the salad prompt in the food delay discounting tasks.

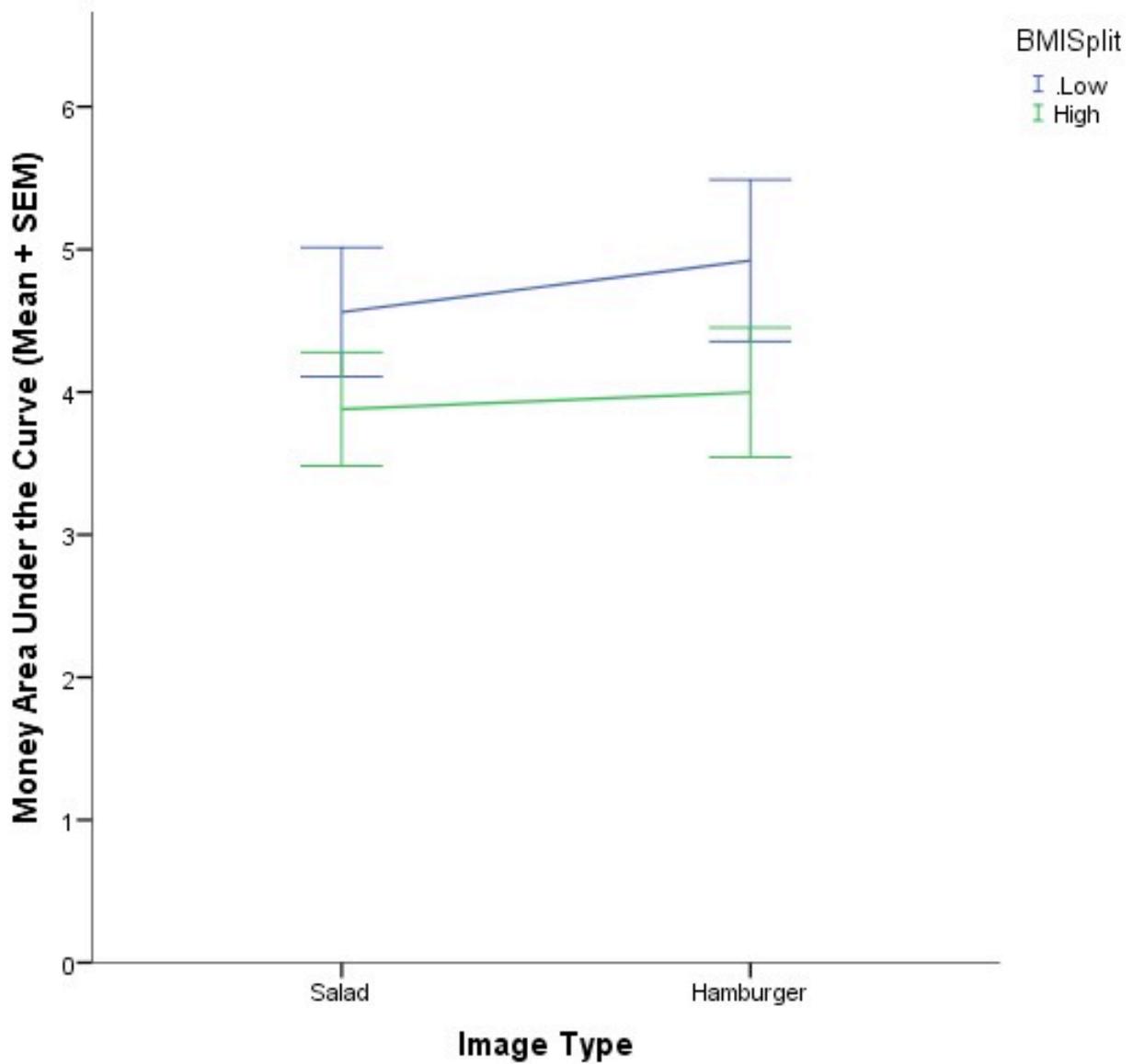


Figure 2. The graph above illustrates the results of the 2x2 ANOVA regarding money AUC and image type for both sections of high BMI and low BMI. There was no significance between levels of BMI and image prompt split in the money delay discounting tasks.

Music-Induced Chills

Will Halimou
Oberlin College

INTRODUCTION

Chills are rapidly spreading, tingling feelings that consist of goosebumps and shivers (Harrison & Loui, 2014; Mori & Iwanaga, 2014). These “aesthetic chills” are distinct from chills/goosebumps induced by cold temperatures (Craig, 2005). There are two broad categories of chills: “goosetingles” which are associated with positive feelings and approach-related constructs, and “coldshivers” which correspond to negative emotions and avoidance-related constructs (Maruskin et al., 2012). Music has been shown to be a stable and powerful inducer of chills (Goldstein, 1980) associated with the former type: goosetingles.

There is agreement in the literature that general reward sensitivity predicts chills (Harrison & Loui, 2014). This link is promising because there is already a plethora of knowledge on reward pathways. Several mysteries in music research could potentially be elucidated if viewed in the context of reward sensitivity, such as how sad music makes people feel pleasure (Sachs et al., 2015).

Not everyone experiences music-induced chills equally. Some researchers found that females experience more chills and hypothesized that this is because females use music to influence mood more than males do (Panksepp & Bernatzky, 2002). However, it is difficult to test whether females and males truly use music for different purposes. Contrary to Panksepp & Bernatzky (2002), Grewe et al. (2007) argue that personality factors rather than demographic factors (age, gender, music education) characterize chill responders and non-responders (Grewe et al., 2009). Indeed, more of the recent literature seems to agree with this perspective.

This review aims to clarify which individual-based personality and neurological traits predispose one to experiencing more chills

Chills in the context of social behavior

In their review paper, Panksepp & Bernatzky (2002) posit, “Chills are related to socio-emotional systems that generate separation-distress.”. The researchers primarily base this idea off of a PET imaging study that showed arousal of the ventral striatum and midbrain regions that include the periaqueductal gray areas that are thought to play a role in separation distress. According to their review paper, “...the perception of separation could provide motivational urgency for social-reunion responses.” Some time after this review paper was published, Grewe et al. (2007) found that among several different musical sections, the entry of a voice consistently elicited the most chills. Similarly, in their review paper, Harrison & Loui (2014) note that melodies occupying the human vocal register were major chill-inducers.

These observations about the human vocal register in music work together with the separation distress idea. The “voices” in the music could be reminiscent of a child calling out to his or her parent. Ultimately, this idea is difficult to properly verify and the cited PET study does not provide specific enough evidence to strongly back this claim. The stated brain regions have many functions and cannot be tied solely to separation distress. However, with more experiments and evidence to bolster it, this idea could provide an interesting framework for viewing the relationship between a social, communicative feature of music and chills.

Chills are linked to reward pathways

In one study, as the intensity of chills increased, there were increases in cerebral blood flow and decreases in the ventral striatum, midbrain, amygdala, orbitofrontal cortex, and ventral medial prefrontal cortex - brain regions thought to be involved in reward/motivation, emotion, and arousal (Blood & Zatorre, 2001).

when they have increased functional connectivity of the auditory cortices, amygdala, and ventromedial prefrontal regions with the nucleus accumbens. The wide brain connectivity with the nucleus accumbens implicates reward pathways with music listening and corollary experiences like chills.

Chills and their corresponding anticipation are highly pleasurable

One study observed that endogenous dopamine was released in the striatum at peak emotional arousal during music listening (Salimpoor et al., 2011). While this study did not use the term “chills”, “peak emotional arousal” seems to be an analogous phrase, as Harrison & Loui (2014) simply categorize these chills as “strong experiences with music.” Salimpoor et al.’s study also found that the anticipation of chills generated neurological activity linked to reward. Specifically, the caudate was more involved during the anticipation phase, while the nucleus accumbens was more involved during the peak emotional response (Salimpoor et al., 2011).

Furthermore, in their review, Panksepp & Bernatzky (2002) discuss a relationship between endogenous opioids and chills. Researchers established that naloxone, an opiate antagonist, can reduce the incidence of chills (Naloxone Injection: MedlinePlus Drug Information, 2016). This fact suggests that the chill response is caused by an abrupt increase in endogenous opioid activity or an endorphin rush. These results collectively suggest that both anticipating and experiencing music-induced chills is a highly pleasurable experience.

Higher openness and BAS scores correspond with more chills

Openness to experience, one of the “big five” personality traits (McCrae and Costa 1997) and high Behavioral Activation System (BAS) scores are also thought to be highly related to likelihood of experiencing chills from music (Silvia & Nusbaum, 2011; Mori & Iwanaga, 2015). The BAS is a neurobehavioral system thought to regulate positive affect and approach behavior in response to rewards (Livingstone, 2008). These two traits are often found hand-in-

could make these people more actively engage with external stimuli (Cherry, 2016; McCrae and Costa, 1997).

Nusbaum & Silvia (2011) found that degree of music engagement, rather than genre preference, directly related to amounts of chills. This finding makes sense when viewed in conjunction with Mori & Iwanaga’s (2015) observation that people experience more chills when the music is self-selected as opposed to experimenter-selected. Further support for the link between music engagement and chill experiences comes from the finding that skin conductance response (SCR) during chills was higher when people listened in solitude versus in the company of others (Egermann et al., 2011). This higher SCR suggests that music is more arousing when listened to alone, and the authors of the study suggest that this effect could be due to increased engagement and concentration on the music during solitude. These findings point to a link between the degree of engagement with music listening and the experience of chills.

Physical Arousal

Chills are associated with high emotional arousal. Salimpoor et al. (2009) observed a “...strong positive correlation between ratings of pleasure and emotional arousal.”. Researchers found that individuals who did not experience pleasure also showed no significant increases in emotional arousal. Not only are chills associated with high emotional arousal, but they are also associated with physical changes as well. One study found that people with high resting psychophysiological arousal experience chills more frequently than those with lower resting psychophysiological arousal (Mori & Iwanaga, 2015). Indeed there is a close relationship between chills and SCR/piloerection, two indicators of sympathetic nervous system arousal (Craig, 2005). In addition to galvanic skin response (GSR) and piloerection measurements, cardiac signatures of emotionality (EK) values, as well as heart rate, increased significantly during moments of peak positive emotion accompanied by piloerection (Sumpf et al., 2015).

of people that experience music-induced chills can reveal mechanisms behind not only the pleasurable emotions conjured by music, but also physical responses caused by music.

There has been much research about the types of acoustic qualities in music that induce chills. Grewe et al. (2007) observed that shivers were most reliably evoked by passages containing new or unexpected harmonies or sudden dynamic or textural changes. This finding is confirmed in a study that found peaks in loudness, moments of modulation, and melodies in the human vocal register to be common chill-inducers (Harrison & Loui, 2014). Future research could further explore the acoustic qualities that influence music-induced chills and also expand the scope to non-musical sounds that elicit chills. For instance, many people report a tingling effect similar to chills as part of a phenomenon called autonomous sensory meridian response (ASMR) which involves non-musical sounds (Barratt & Davis, 2015). Understanding the neurological and physical effects of musical and nonmusical sounds can eventually contribute to a better understanding of the power of music in our lives.

REFERENCES

- Barratt, E.L. and Davis, N.J. 2015. Autonomous Sensory Meridian Response (ASMR): a flow-like mental state. *PeerJ* 3, p. e851.
- Blood, A.J. and Zatorre, R.J. 2001. Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion. *Proceedings of the National Academy of Sciences of the United States of America* 98(20), pp. 11818–11823.
- Cherry, K. (2016). What Are The Big 5 Personality Traits? Retrieved February 28, 2016, from <http://psychology.about.com/od/personalitydevelopment/a/bigfive.htm>
- Craig, D.G. 2005. An Exploratory Study of Physiological Changes during “Chills” Induced by Music. *Musicae Scientiae* 9(2), pp. 273–287.
- Egermann, H., Sutherland, M.E., Grewe, O., Nagel, F., Kopiez, R. and Altenmuller, E. 2011. Does music listening in a social context alter experience? A physiological and psychological perspective on emotion. *Musicae Scientiae* 15(3), pp. 307–323.
- Goldstein, A. 1980. Thrills in response to music and other stimuli. *Physiological Psychology* 8(1), pp. 126–129.
- Psychoacoustical Correlates Of Chills And Strong Emotions. *Music Perception: An Interdisciplinary Journal* 24(3), pp. 297–314.
- Guhn, M., Hamm, A. and Zentner, M. 2007. Physiological and Musico-Acoustic Correlates of the Chill Response. *Music Perception: An Interdisciplinary Journal* 24(5), pp. 473–484.
- Harrison, L. and Loui, P. 2014. Thrills, chills, frissons, and skin orgasms: toward an integrative model of transcendent psychophysiological experiences in music. *Frontiers in psychology* 5, p. 790.
- Li, Y., Guan, Y., Wang, F., Zhou, X., Guo, K., Jiang, P., Mo, Z., Li, Y. and Fang, Z. 2015. Big-five personality and BIS/BAS traits as predictors of career exploration: The mediation role of career adaptability. *Journal of vocational behavior* 89, pp. 39–45.
- Livingstone, C. (2008). Behavioural activation system (BAS). Retrieved February 25, 2016, from [http://medical-dictionary.thefreedictionary.com/behavioural+activation+system+\(BAS\)](http://medical-dictionary.thefreedictionary.com/behavioural+activation+system+(BAS))
- Maruskin, L.A., Thrash, T.M. and Elliot, A.J. 2012. The chills as a psychological construct: content universe, factor structure, affective composition, elicitors, trait antecedents, and consequences. *Journal of personality and social psychology* 103(1), pp. 135–157.
- McCrae, R.R. and Costa, P.T. 1997. Conceptions and Correlates of Openness to Experience. In: *Handbook of Personality Psychology*. Elsevier, pp. 825–847.
- Mori, K. and Iwanaga, M. 2015. General Reward Sensitivity Predicts Intensity of Music-Evoked Chills. *Music Perception: An Interdisciplinary Journal* 32(5), pp. 484–492.
- Mori, K. and Iwanaga, M. 2014. Resting physiological arousal is associated with the experience of music-induced chills. *International Journal of Psychophysiology* 93(2), pp. 220–226. Naloxone Injection: MedlinePlus Drug Information. (2016, February 16). Retrieved February 27, 2016, from <https://nlm.nih.gov/medlineplus/druginfo/meds/a612022.html>
- Nusbaum, E.C. and Silvia, P.J. 2011. Shivers and Timbres: Personality and the Experience of Chills From Music. *Social psychological and personality science* 2(2), pp. 199–204.
- Panksepp, J. and Bernatzky, G. 2002. Emotional sounds and the brain: the neuro-affective foundations of musical appreciation. *Behavioural Processes* 60(2), pp. 133–155.
- Sachs, M.E., Damasio, A. and Habibi, A. 2015. The pleasures of sad music: a systematic review. *Frontiers in Human Neuroscience* 9, p. 404.
- Salimpoor, V.N., Benovoy, M., Larcher, K., Dagher, A. and Zatorre, R.J. 2011. Anatomically distinct dopamine release during anticipation and

Yale Review of Undergraduate Research in Psychology

2013. Interactions between the nucleus accumbens and auditory cortices predict music reward value. *Science (New York)* 340(6129), pp. 216–219.
- Silvia, P.J. and Nusbaum, E.C. 2011. On personality and piloerection: Individual differences in aesthetic chills and other unusual aesthetic experiences. *Psychology of aesthetics, creativity, and the arts* 5(3), pp. 208–214.
- Sumpf, M., Jentschke, S. and Koelsch, S. 2015. Effects of Aesthetic Chills on a Cardiac Signature of Emotionality. *Plos One* 10(6), p. e0130117.

Depressed People Need Not Apply: Mental Health Stigma Decreases Perceptions of Employability of Applicants with Depression

Arunima Kapoor
University of Toronto

ABSTRACT. The purpose of the current research was to examine whether individuals with depression are perceived as less desirable for employment and, if so, whether this decreased employability is related to potentially legitimate job-related concerns or simply to the stigma associated with mental illness. In Study 1, we compared the effect of different labels of illness on employability and found that individuals with a label of depression are less likely to be recommended for hiring than individuals labelled as physically ill. In Study 2, we aimed to rule out the possibility that this differential employability results from concerns about decreased productivity by adding a label of hypothyroidism, a physical illness with symptoms similar to depression, and comparing how that affects employability. We found that depressed applicants were less likely to be hired than applicants with hypothyroidism, despite being evaluated similarly overall. This confirms that decreased employability is a result of the stigma associated with mental illness rather than concerns about decreased productivity and elucidates the need for interventions to reduce this stigma.

Introduction

In 1792, Philippe Pinel first proposed that individuals with mental illnesses should be not be view as “mad” and restrained, but should instead be treated with kindness and care (Weiner, 1992). While he personally helped to significantly decrease stigma against the mentally ill during the 18th century, many of the constraints associated with mental illness remain prevalent. Even today, an explicit stigma attached to individuals with mental illnesses persists, hindering these individuals’ personal and professional achievements. Indeed, being labelled as mentally ill is still often considered a “mark of disgrace” and is associated with marked discrimination (Brohan et al., 2012). Individuals with mental disorders often have to cope

(Bodenhausen, & Newman, 2005). Of course, these social consequences can further exacerbate the original illness, resulting in a vicious and sometimes inescapable cycle. Unfortunately, the stigma attached to mental illness is particularly widespread in the environment where most individuals spend the majority of their day: the workplace. In the United States, mental disorders make up the second-most commonly cited basis for charges of discrimination and workplace harassment (Scheid, 1999). While recognition of mental illnesses may have increased in the twentieth century, many individuals living with mental illness report that they still would not disclose their illness to their manager due to the fear of negative consequences (Dewa, 2014).

examine whether the beliefs underlying such perceptions are related to concerns that the symptoms of the illness will interfere with work performance, or alternatively, if they are the product of the stigma associated with mental illness itself. We hypothesized that depressed individuals will continue to face discrimination and be perceived as less employable, despite contemporary efforts to eradicate the stigma surrounding mental illness. We also anticipated that the reduced perceived employability of individuals with depression is attributable to the stigma associated with mental illnesses rather than simply due to reservations about reduced productivity or other potentially relevant jobs-related factors.

Mental Illness Stereotypes & Beliefs

The stigmatization of mental illness is rooted in negative stereotypes, which precipitate prejudice and result in discrimination. Research on the stereotypes associated with mental health has revealed that these stereotypes often construe individuals with mental illnesses as violent and dangerous, dependent and incompetent, and irresponsible (Ottati, et al., 2005; Rusch, Angermeyer & Corrigan, 2005). Such negative stereotypes are demeaning and isolating, and they significantly influence how individuals with mental illnesses are perceived by themselves and others. This is particularly true in workplace settings, where competence, independence, and conscientiousness are valued (Mendel, Kissling, Reichhart, Buhner & Hamann, 2015).

Mental Health in the Workplace

Employment discrimination against individuals with mental illnesses seems to be driven by two main factors: general stigma and specific fears about loss of productivity. Individuals with mental illnesses are often held accountable for their illness in that

For example, one study has demonstrated that job applicants with a “hidden disability” such as a mental illness may be treated worse than individuals with a self-evident disability such as paraplegia (Bordieri & Drehmer, 1986). In this same study, when an applicant’s disability was attributed to an internal cause, they were evaluated more poorly because they were seen as being responsible for their disability.

Consequently, applicants with a physical disability are seven times more likely to be recommended for hiring than applicants with a mental illness (Koser, Matsuyama, & Kopelman, 1999). An individual with a mental illness may in fact be able to perform tasks more proficiently than an individual with a physical disability, yet stigmatization appears to put those with such disabilities at a disadvantage regardless of performance.

In addition to the stigma surrounding mental illness, loss of productivity is a common concern for employers (Diksa & Rogers, 1996) and may explain why individuals with mental illnesses are less likely to be hired. While it is a valid concern and a realistic possibility that mental illness negatively influence productivity, many individuals with mental illnesses are in remission and are able to successfully cope with their illness. Yet, even candidates who have learned to cope with their illnesses are at a disadvantage, as employment decisions are often made based on past episodes of mental illness or on the possibility of future episodes (Stier & Hinshaw, 2007). Indeed, most individuals with a mental illness are willing and able to work (Macias, DeCarlo, Wang, Frey, & Barreira, 2001), and even those with severe mental illnesses, such as schizophrenia, are able to live and work independently once treated (Harding, Brooks, Ashikaga, Strauss, & Breier, 1987).

Depression in the Workplace

In this paper we focus on depression, a mental illness that has been associated with job-related concerns including decreased work performance (Kessler et al., 2008) and absenteeism (Tsuchiya et al., 2012). Glozier (1998) conducted a survey of human resource officers in UK companies in order to determine whether negative attitudes about mental illness affected employment opportunities for those with depression. He found that, when employers were given a choice between two identical applicants whose only difference was either having depression or diabetes, the chances of employment significantly decreased for those with depression. This discrimination stemmed from perceptions that depression increases the potential for poor work performance and was more pronounced for jobs at the executive level. The present research project aims to update and extend these findings by examining whether lower employability ratings for applicants with depression is rooted in (potentially legitimate) concerns about productivity and absenteeism, or whether these concerns are more related to the stigmatization of depression.

Recognition of mental health issues has increased in the twentieth century (Stuart, 2004). This paper provides an update on the present state of stigmas related to mental health in North American workplaces, and examines whether employment discrimination against employees with mental illnesses still persists. Furthermore, we explore whether the apparent discrimination is related to concerns about productivity loss or to the stigma associated with the mental illness itself.

Overview of Studies

The current investigation consists of

participants to evaluate job applications that indicated if the candidate had taken time off to deal with depression or diabetes. There was also a third, control condition, which did not provide an explanation for the gap in employment. We compared the impact of the disease labels (depression vs. diabetes vs. none) on perceptions of employability and employers' overall evaluations of the applications. The study by Glozier (1998) employed a UK sample, did not include a control condition, and was conducted over 15 years ago. The current study updates and elucidates the present state of stigmas associated with mental health in North America, employs a much larger sample, and adds a control condition to the original study design in order to more comprehensively understand the study results.

As with Glozier (1998), we expected that reductions in employability would be most pronounced among those with depression, and that the label of depression would result in a worse evaluation on all assessment measures. While the study by Glozier (1998) found that reduced employability occurred only for jobs at the executive level, we predicted that this effect would occur for jobs on multiple levels (manual, administrative, and executive), given that our study was fully powered and employed a larger sample size.

The second study extended upon the findings of the first and explored the potential underlying reasons for the reduction in perceived employability. With the intention of determining whether decreased employability in the depression condition was related to concerns about decreased work performance or simply due to the stigma attached to it, we introduced another illness with symptoms that are extremely similar to those of depression itself—hyperthyroidism. We proposed that if

features of the illness itself that lower chances of employment.

We expected to find that the label of depression would result in a reduced chance of employment compared to the label of diabetes or hypothyroidism. While we explored general trends in employability, and thus predicted a widespread effect on all job types in Study 1, we were interested in the specific effect of symptomology on employability in Study 2, and thus held the specific job level constant at the executive level.

Study 1

Overview

This study was designed to examine whether employment discrimination against people with depression still persists in North America. In order to determine this, we compared the differences in the perceived employability and evaluation of the same individual when they were variously assigned the labels of depression, diabetes, or no illness.

Method

Participants. A total of 665 participants were recruited online through Amazon Mechanical Turk (40.2% women, 59.8% men). The average age of participants was 30.49 years ($SD=9.99$) with a range of 18 to 74 years. Participants were compensated \$1 for this ten-minute study. When asked about their employment title, the majority of participants described themselves as support staff (29.6%), with students (24.2%), middle and junior management (22.3%), and administrative staff (17.6%) rounding out the spectrum of responses. Additionally, a few participants indicated that they held upper management positions (5.9%). The ethnic composition of the sample was: European (72.0%), East and Southeast Asian (7.2%), African (5.4%), Latin Central and South American (4.5%)

consisted of 17 items on which participants appraised the job application. The items on the questionnaire investigated anticipated job commitment (e.g. “The applicant would be willing to make sacrifices for the job”), anticipated competence (e.g. “The applicant would think independently”), and likelihood of work dependability (e.g. “The applicant would take a lot of sick/personal days”). Participants were asked to respond to the items on a scale from 1 (e.g. Extremely Unlikely) to 7 (e.g. Extremely Likely). Questions regarding likelihood of work dependability were reverse coded, so higher scores on this scale correspond to a more positive evaluation while lower scores implied a more negative evaluation. The aggregated score on the scale was calculated by determining the mean of all items for each participant. The overall evaluation scale had excellent internal consistency ($\alpha = 0.92$).

The second measure was the participant’s recommendation about whether the applicant should be hired (“I think this applicant should be hired for this position”). Finally, the last measure was the participant’s recommendation about whether the applicant should be eliminated from consideration for the job (“I think this applicant should be eliminated from further consideration”). Hiring and elimination recommendations were assessed on a 7-point Likert scale, with higher scores indicating superior evaluation and employability.

The study was designed and executed using Qualtrics, an online survey software program.

Procedure. Participants who provided informed consent were invited to participate in a study examining their employee selection preferences. Participants were randomly assigned to one of nine conditions in a 3 (job type: executive, manual, administrative) x 3 (illness: control

and to (b) complete a questionnaire assessing the employability of the applicants.

A job description for either an executive, manual, or administrative position was provided to participants, and each description outlined the responsibilities, roles, and prior experience required for the position in question. Participants in the executive job condition viewed a job posting for a marketing manager, while those in the administrative job condition were presented with a job posting for an administrative assistant, and those in the manual condition saw a job posting for a warehouse worker.

After the participants had read the job description, they were shown an applicant's cover letter and resume. The manipulation for this study was included in the cover letter, which was tailored to indicate whether the applicant had depression or diabetes, or was in the control condition. In the depression and diabetes condition, the following sentences were included in the cover letter: "As you will notice on my resume, I took some time off between my current full-time position and my previous position. I had just been diagnosed with depression/diabetes and had to take some time off for this medical reason. Since that time, I have learned to manage my illness and am back at work full time". In the control cover letter, no statement of illness was made. Resumes for all three conditions were otherwise identical in order to ensure the equivalent competence of all applicants, and each application was designed such that the applicant was presented as being very well-suited for the position.

Once the participant had reviewed the cover letter and resume, they were provided with a list of symptoms associated with the illness manipulation in order to help them in their evaluation. No symptoms were mentioned in the control condition, while the

concentration, and depressed mood.

Participants were then asked to evaluate the applicant using the dependent measures described above. Following these measures, participants were asked to provide some demographic information. Finally, participants were given the debriefing form and were thanked for their participation.

Results

The dependent measures of interest were the scores on the overall evaluation scale, likelihood of elimination from consideration, and likelihood of being hired. We conducted two-way analyses of variance (ANOVA) for each dependent variable with illness type (diabetes, depression, control) and job type (manual, executive, administrative) entered as between-subject variables. Data were analyzed using IBM SPSS Statistics Data Editor Version 22, and alpha was set at 0.05. As our hypotheses were directional in nature, one-tailed significance values were used for post-hoc analyses, which were conducted with Bonferroni corrections.

Overall Evaluation Scale. As anticipated, we observed a significant main effect of illness type on the overall evaluation scale, $F(2, 656) = 8.31, p < 0.01, \eta^2_p = .025$, but no main effect of job type ($F(2, 656) = 1.88, p = 0.15, \eta^2_p = .006$) or interaction was observed ($F(4, 656) = 0.91, p = 0.46, \eta^2_p = .006$). Post-hoc analyses revealed that the depression resume ($M = 5.33, SD = 0.74$) was evaluated less positively than the control ($M = 5.58, SD = 0.66; p < 0.01$) and diabetes ($M = 5.54, SD = 0.65; p < 0.01$) resumes. There was no significant difference between the control and diabetes resumes ($p > 0.05, ns$). The mean score (with 95% confidence intervals) and standard deviation for each illness type in Table 1 indicates that control applicants were evaluated most positively, followed by

4.47, $p = 0.01$, $\eta^2_p = .014$) no significant difference was seen among job type ($F(2, 653) = 1.57$, $p = 0.21$, $\eta^2_p = .005$) and no interaction was observed ($F(4, 653) = 1.50$, $p = 0.20$, $\eta^2_p = .009$). Post-hoc analyses indicated that applicants with depression ($M = 2.34$, $SD = 1.60$) were recommended for elimination significantly more than applicants in the control condition ($M = 1.92$, $SD = 1.31$), $p < 0.01$. No significant difference was observed between diabetes and depression or diabetes and control ($p > 0.05$).

Hiring Recommendation. A

significant main effect of illness type ($F(2, 656) = 3.60$, $p = 0.03$, $\eta^2_p = .011$) and job type ($F(2, 656) = 4.68$, $p = 0.01$, $\eta^2_p = .014$) was observed on the hiring recommendation measure, but no interaction was observed ($F(4, 656) = 0.50$, $p = 0.74$, $\eta^2_p = .003$). Post-hoc analyses of illness type revealed that applicants with depression ($M = 5.32$, $SD = 1.23$) were rated as significantly less hireable than the control applicants ($M = 5.58$, $SD = 1.11$), $p < 0.04$, and marginally less hireable than diabetes applicants ($M = 5.54$, $SD = 1.07$, $p = 0.06$). Applicants with diabetes and control applicants did not differ on this measure ($p > 0.05$, *ns*). Post-hoc analyses of job type indicated that applicants are significantly less hireable for executive positions ($M = 5.29$, $SD = 1.23$) than administrative ($M = 5.60$, $SD = 1.08$) or manual positions ($M = 5.55$, $SD = 1.11$), all $ps < 0.05$. No significant difference was observed between administrative and manual positions ($p > 0.05$).

Discussion

This study drew upon an American sample to explore how the stigma surrounding mental illness influences employability. Specifically, we examined whether the label of depression resulted in reduced employability compared to the label

diminished employability more significantly than the label of diabetes or no illness at all.

When comparing applicants with depression to control applicants, we consistently found that applicants with depression were at a disadvantage. This suggests that if an employer knows that an applicant has suffered from mental illness, he or she may be less likely to choose that applicant over one with no previous illness. This effect occurred even though the individuals had identical resumes, which suggests that something beyond the competence of the individual was at play.

Moreover, it is essential to note that the manipulation for this study stated that the individual had recovered from their illness and was currently in good health.

Accordingly, the observed reduced perceptions of employability could not rationally be founded on the notion that the individual would be unable to perform well at present. Since participants were aware that the applicant had recovered, the reduced employability of applicants with depression is suggestive of the stigma associated with mental illness that underpins the baseless fear that future episodes may occur (Stier & Hinshaw, 2007). Furthermore, not only were applicants with depression less hireable than control applicants, but they were also more likely to be eliminated from consideration for the position. This trend is a compelling signification of the intensity of the stigma associated with mental illnesses. Likewise, the overall evaluation—which, in principle, should be based on an objective evaluation of the applicant's qualifications—was significantly worse for applicants with depression than for the control applicants.

In addition, a comparison of applicants with depression to those with diabetes further reinforces these findings. In keeping with Glozier's findings (1998)

received evaluations that were less positive overall. It is possible that there is no stigma associated with physical illnesses, which would explain why the label of a physical illness does not result in reduced employability. This notion has been validated by previous studies (e.g., Robinson et al., 1989) and could potentially explain our findings. Alternatively, it is possible that the symptoms of diabetes were not believed to be as debilitating as those of depression. That is, perhaps participants thought that applicants with diabetes would be able to manage their symptoms better than those with depression, and would consequently be able to perform the job at a higher level. In order to explore this possibility and rule out the alternative explanation that applicants with depression were less employable due to the symptoms associated with depression, we conducted Study 2 (see below). It is also noteworthy that applicants with depression were equally likely to be recommended for elimination as applicants with diabetes.

Thus, while applicants with depression are less hireable and evaluated less positively than applicants with diabetes, the difference between the two groups is not substantial enough to warrant significantly more recommendations for elimination for applicants with depression. Congruently, an interesting trend was observed on all assessment measures such that control applicants consistently had highest employability, followed by applicants with diabetes and applicants with depression, respectively.

As expected, no differences were found between the control applicants and the applicants with diabetes on any measure. This suggests that individuals with physical illnesses generally have the same chances of attaining employment as individuals with no illnesses. Additionally, we predicted that

observed. Unexpectedly, an effect of job type was observed when evaluating hireability. Specifically, all applicants were significantly less hireable for the executive positions compared to the manual and administrative positions. This may simply indicate that executive positions are more difficult to attain. Taken as a whole, the important findings of this study verify the existence of discrimination towards persons with mental illnesses in the North American workforce today.

Study 2

Overview

The purpose of this study was to examine whether the decreased employability of individuals with depression is related to the stigma associated with mental illness or to the concern that the symptoms of depression will interfere with work performance. In order to do this, we included a physical illness with symptoms similar to depression, namely hypothyroidism, and explored whether there would be a difference in employability between applicants who indicated that they had hypothyroidism and those who indicated that they had suffered from depression in the past.

Method

Participants. A total of 682 people recruited online through Amazon Mechanical Turk participated in this study (47.1% women, 52.9% men). The average age of participants was 32.55 years ($SD=11.31$) and they ranged from 18 to 72 years. Participants were compensated \$1 for completing this ten-minute study. When asked to describe their job title, most of the participants reported that they were support staff (29.3%), with students (20.8%), junior management (16.9%), administrative staff (15.4%), and middle management (11.7%) comprising the remainder of the responses

were African, 4.5% were Latin, Central, or South American, 1.9% South Asian, and 9.2% identified as “other”.

Materials. The same measures as Study 1 were employed, only in this study a hypothyroidism manipulation was added in which the applicant mentioned taking time off of work to adjust to living with hypothyroidism.

Procedure. Similar to Study 1, participants who provided informed consent were invited to participate in a study examining their employee selection preferences. A between-subjects design was employed and participants were randomly assigned to one of four conditions: control, diabetes, depression, or hypothyroidism. Participants were told that they would be asked to (a) read a job description and evaluate applications for the position, and (b) complete a questionnaire assessing the employability of the applicants.

Participants were first provided with a detailed job description outlining the responsibilities, roles, job specifications, and prior experience required for the executive position of marketing manager. This job description was identical to the one used in Study 1. After the participants had read the job description, they were shown an application for the position which included a cover letter and a resume. As in Study 1, the cover letter was used to introduce one of the following manipulations: control, diabetes, depression, or hypothyroidism. Similar to the diabetes and depression manipulation, the following sentence was included in the cover letter for the hypothyroidism condition: “As you will notice on my resume, I took some time off between my current full-time position and my previous position. I had just been diagnosed with hypothyroidism and had to take some time off for this medical reason. Since that time, I have learned to

symptoms to the depression condition, such as fatigue, excessive sleepiness, decreased concentration, and depressed mood. Next, participants were asked to evaluate the applicant, complete the assessment measures, and to provide some demographic information.

Results

A one-way analyses of variance (ANOVA) for each dependent variable with illness type (diabetes, depression, hypothyroidism, control) was conducted. Alpha was set at 0.05.

Overall Evaluation Scale. A significant effect of illness type was evident on the positive evaluation scale ($F(3, 678) = 9.39, p < 0.01, \eta^2_p = .040$). Depression resumes ($M = 5.40, SD = 0.69$) and hypothyroidism resumes ($M = 5.40, SD = 0.69$) were evaluated less positively than control resumes ($M = 5.69, SD = 0.61$) and diabetes resumes ($M = 5.65, SD = 0.70$), all $ps < 0.01$. There was no significant difference between the control and diabetes or depression and hypothyroidism ($ps > 0.05$). The mean score for each illness type is displayed in Table 2.

Elimination Recommendation. A significant difference among illness types was seen on the elimination measure ($F(3, 678) = 3.58, p = 0.01, \eta^2_p = .016$). Post-hoc analyses indicated that applicants with depression ($M = 2.47, SD = 1.60$) were recommended for elimination significantly more than control applicants ($M = 2.03, SD = 1.41$) and applicants with diabetes ($M = 2.05, SD = 1.38$), $ps < 0.05$. No significant difference was observed between other comparisons, including the depression and hypothyroidism conditions ($M = 2.32, SD = 1.50$), all $ps > 0.05$. Although not all comparisons were significant, the mean in Table 2 indicate that applicants with depression were most likely to be

was observed on the hiring recommendation measure ($F(3, 678) = 5.17, p < 0.01, \eta^2_p = .022$). Post-hoc analyses of illness type revealed that applicants with depression ($M = 5.06, SD = 1.29$) were significantly less hireable than applicants with hypothyroidism ($M = 5.85, SD = 3.16$), $p < 0.01$. No significant difference was observed between other comparisons, all $p > 0.05$. The mean score on the hiring recommendation measure for the diabetes resumes was 5.46 ($SD = 1.13$), while for the control resumes it was 5.46 ($SD = 1.01$).

Discussion

This study explored whether the decreased employability of individuals with mental illnesses is attributable to concerns about symptoms interfering with work or the stigma associated with mental illnesses. Specifically, we examined whether a label of depression had a more negative impact on employability than a label of hypothyroidism, diabetes, or no label. Since the symptoms of hypothyroidism are extremely similar to the symptoms of depression, the disparity in employability of applicants with depression and those with hypothyroidism suggests that the perception of persons with depression as being less employable is more related to stigma than to concerns about the associated symptoms. As with Study 1, we established that employability is influenced by illness labels across all assessment measures. In particular, we found that the label of depression resulted in a lower level of hireability than the label of hypothyroidism. However, there was no observable difference between the two groups on the overall evaluation scale or the elimination recommendation measure.

When examining the overall evaluation of applicants, we observed that depression and hypothyroidism resumes were evaluated less positively than the

with hypothyroidism and depression may have influenced the overall evaluation of the applicant; thus, applicants with depression and hypothyroidism received worse evaluations than the diabetes or control applicants. Applicants with hypothyroidism and depression did not differ from each other in regards to overall evaluation. Therefore, it is possible that the poorer overall evaluation of the applicant with depression illness could be at least in part attributed to their symptoms, and not only to stigma surrounding mental illness.

An interesting finding emerged when examining the scores on the elimination recommendation measure. Similar to Study 1, applicants with depression were recommended for elimination significantly more often than the control applications; however, unlike Study 1, applicants with depression were also recommended for elimination significantly more often than applicants with diabetes. The significant difference between depression and diabetes on this measure may have emerged in this study, but not Study 1 simply due to Study 2's larger sample size and thus increased statistical power. More importantly, applicants with hypothyroidism were equally likely to be recommended for elimination compared to all other conditions, including depression. Despite this finding, it is interesting to note that while applicants with depression differed significantly from the control applicants and the applicants with diabetes, the applicants with hypothyroidism did not exhibit significant differences compared to these groups. Although some comparisons did not reveal significant differences, the means for each condition reveal a general trend: the depression resumes were most often recommended for elimination, followed by the hypothyroidism condition, the diabetes condition, and then

depression, it appears to be a fairly subtle one.

The strongest support for our predictions came from the hiring recommendation measure. Applicants with hypothyroidism were viewed as being significantly more hireable than applicants with depression. Taken together, these findings suggest that applicants with depression and hypothyroidism were evaluated similarly overall and were equally likely to be recommended for elimination; however, applicants with depression were less likely to be hired than applicants with hypothyroidism. This suggests that factors apart from concerns about symptomology are responsible for the decreased employability of individuals with depression, towards an applicant with hypothyroidism while others were not. Given that hypothyroidism is a physical illness with debilitating symptoms, some people may be more compassionate towards such individuals than those with a mental illness.

Indeed, while individuals with depression may be denied sympathy due to being perceived as being culpable for their illness, it may be the opposite for persons with hypothyroidism: given its status as a physiological illness and its debilitating symptoms, prospective employers may be more inclined to be sympathetic to the plight of applicants living with this condition. This may have resulted in the higher likelihood of employment observed for applicants with hypothyroidism.

General Discussion

The studies presented in this paper establish that the stigma associated with mental illness continues to exist in North America. Study 1 demonstrated that individuals with depression are less likely to be hired than someone with no illnesses.

When the effects of a physical illness (i.e.

and that their decreased employability is attributable to the stigma associated with mental illness. Moreover, since overall evaluation and elimination recommendations did not differ between the hypothyroidism and depression applications, it is possible that stigma against mental illness only comes into play at the critical point when a decision regarding employability has to be made. Applicants may be evaluated equally in many respects, but, when it comes to actually choosing an employee, applicants with a mental illness are at a disadvantage.

Additionally, there was a large degree of variability in the hiring recommendation measure scores for hypothyroidism resumes. It is possible that some people were compassionate towards hypothyroidism, we found that applicants with depression and hypothyroidism were evaluated similarly and were equally likely to be recommended for elimination. Despite this, applicants with depression were less likely to be nominated for hiring than applicants with hypothyroidism, which suggests that decreased employability is attributable to the stigma associated with mental illness rather than concerns about symptomology. This study provides a better understanding of the stigma attached to mental illness in North America, and it illustrates how this stigma affects judgments about employees in the workplace.

A limitation of our study is that participants mainly held "support staff" positions and few held management positions. In reality, individuals in management positions are responsible for hiring decisions, limiting the generalizability of these findings. Therefore, it would be useful to replicate these studies on hiring managers who regularly evaluate resumes and make hiring decisions. Moreover, future research could explore the stigma of mental

education in order to reduce the stigma associated with mental illness and to make the workplace a safe and convivial environment for all individuals.

References

- Bordieri, J. E., & Drehmer, D. E. (1986). Hiring decisions for disabled workers: Looking at the cause. *Journal of Applied Social Psychology, 16*(3), 197–208. doi: 10.1111/j.1559-1816.1986.tb01135.x
- Brohan, E., Henderson, C., Wheat, K., Malcolm, E., Clement, S., Barley, E., ... Thornicroft, G. (2012). Systematic review of beliefs, behaviours and influencing factors associated with disclosure of a mental health problem in the workplace. *BMC Psychiatry, 12*(1), 11. <http://doi.org/10.1186/1471-244X-12-11>
- Dewa, C. S. (2014). Worker attitudes towards mental health problems and disclosure. *The International Journal of Occupational and Environmental Medicine, 5*(4), 175–86. Retrieved from <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=medl&NEWS=N&AN=25270007>
<http://www.ncbi.nlm.nih.gov/pubmed/25270007>
- Diksa, E., & Rogers, E. S. (1996). Employer concerns about hiring persons with psychiatric disability: Results of the Employer Attitude Questionnaire. *Rehabilitation Counseling Bulletin, 39*(4), 203–210. <http://doi.org/10.1017/CBO9781107415324.004>
- Glozier, N. (1998). Workplace effects of the stigmatization of depression. *Journal of Occupational and Environmental Medicine, 40*(9), 793–800.
- Harding, C. M., Brooks, G. W., Ashikaga, T., Strauss, J. S., & Breier, A. (1987). The Vermont longitudinal study of persons with severe mental illness, I. *American Journal of Psychiatry, 144*(6), 718–726.
- Koser, D. A., Matsuyama, M., & Kopelman, R. E. (1999). Comparison of a physical and a mental disability in employee selection: An experimental examination of direct and moderated effects. *North American Journal of Psychology, 1*(2), 213–222.
- Kessler, R. C., Heeringa, S., Lakoma, M. D., Petukhova, M., Rupp, A. E., Schoenbaum, M., ... & Zaslavsky, A. M. (2008). Individual and societal effects of mental disorders on earnings in the United States: results from the national comorbidity survey replication. *American Journal of Psychiatry, 165*(6), 703–711.
- Macias, C., DeCarlo, L. T., Wang, Q., Frey, J., & Barreira, P. (2001). Work interest as a predictor of competitive employment: Policy implications for psychiatric rehabilitation. *Administration and*
- Ottati, V., Bodenhausen, G. V., & Newman, L. S. (2005). Social psychological models of mental illness stigma. In P. W. Corrigan (Ed.), *On the stigma of mental illness: Practical strategies for research and social change* (pp. 99–128). Washington, DC: American Psychological Association.
- Rusch, N., Angermeyer, M. C., & Corrigan, P. W. (2005). Mental illness stigma: Concepts, consequences, and initiatives to reduce stigma. *European Psychiatry, 20*, 529–539. doi:10.1016/j.eurpsy.2005.04.004
- Scheid, T. L. (1999). Employment of individuals with mental disabilities: Business response to the ADA's challenge. *Behavioural Sciences & the Law, 17*(1), 73–91. doi: 10.1002/(SICI)1099-0798(199901/03)
- Stier, A., & Hinshaw, S. P. (2007). Explicit and implicit stigma against individuals with mental illness. *Australian Psychologists, 42*(2), 106–117. doi:10.1080/00050060701280599
- Stuart, H. (2004). Stigma and work. *Healthcare Papers, 5*(2), 100–111.
- Tsuchiya, M., Kawakami, N., Ono, Y., Nakane, Y., Nakamura, Y., Fukao, A., ... & Watanabe, M. (2012). Impact of mental disorders on work performance in a community sample of workers in Japan: The World Mental Health Japan Survey 2002–2005. *Psychiatry research, 198*(1), 140–145.
- Weiner, D. B. (1992). Philippe Pinel's "Memoir on Madness" of December 11, 1794: A fundamental text of modern psychiatry. *The American Journal of Psychiatry, 149*(6), 725–732

Table 1
Scores on Assessment Measures for Resumes in Study 1

Condition	Assessment Measures							
	Overall Evaluation			Elimination Recommendation			Hiring Recommendation	
	<i>M</i>	<i>95% CI</i>	<i>SD</i>	<i>M</i>	<i>95% CI</i>	<i>SD</i>	<i>M</i>	<i>95% CI</i>
Depression	5.33	[5.24, 5.42]	0.74	2.34	[2.15, 2.53]	1.60	5.32	[5.17, 5.46]
Control	5.58	[5.48, 5.67]	0.66	1.92	[1.73, 2.12]	1.31	5.58	[5.43, 5.74]
Diabetes	5.54	[5.44, 5.63]	0.65	2.12	[1.92, 2.31]	1.45	5.54	[5.39, 5.69]

Note. CI = confidence interval

Table 2
Scores on Assessment Measures for Resumes in Study 2

Condition	Assessment Measures							
	Overall Evaluation			Elimination Recommendation			Hiring Recommendation	
	<i>M</i>	<i>95% CI</i>	<i>SD</i>	<i>M</i>	<i>95% CI</i>	<i>SD</i>	<i>M</i>	<i>95% CI</i>
Depression	5.40	[5.30, 5.50]	0.69	2.47	[2.25, 2.69]	1.60	5.06	[4.78, 5.33]
Control	5.69	[5.59, 5.80]	0.61	2.03	[1.81, 2.26]	1.41	5.46	[5.17, 5.74]
Diabetes	5.65	[5.55, 5.75]	0.70	2.05	[1.83, 2.28]	1.38	5.46	[5.18, 5.74]
Hypothyroidism	5.40	[5.30, 5.50]	0.69	2.32	[2.10, 2.54]	1.50	5.85	[5.57, 6.13]

Note. CI = confidence interval