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Proximal mechanisms of externalizing behaviors: an intensive longitudinal design investigating the effects of temporally varying processes

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PROXIMAL MECHANISMS OF EXTERNALIZING BEHAVIORS:

AN INTENSIVE LONGITUDINAL DESIGN INVESTIGATING THE EFFECTS OF TEMPORALLY VARYING PROCESSES

by

Ke Anne Zhang

A thesis submitted in partial fulfillment
of the requirements for the Doctor of Philosophy
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The University of Iowa

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Thesis Supervisor: Associate Professor Kristian Markon

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CERTIFICATE OF APPROVAL

PH.D. THESIS

This is to certify that the Ph.D. thesis of

Ke Anne Zhang

has been approved by the Examining Committee for
the thesis requirement for the Doctor of Philosophy degree
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ABSTRACT

Externalizing behaviors have been shown to exhibit within-individual changes, increasing the need to identifying factors that influence such behavior to be more or less likely to occur in any given moment. The current study aimed to contribute to the understanding of mechanisms that influence externalizing behavior using an intensive longitudinal design. Demographic variables and personality traits were measured at baseline. Momentary personality states, situational context, affect, decision-making processes, and externalizing behaviors were measured three times per day for seven days in a university sample (N = 170). Results: A new measure of momentary externalizing—Momentary-Externalizing Spectrum Inventory—was created as a practically feasible measure to administer multiple times per day and its psychometric properties were investigated. Trait disinhibition-versus-constraint predicted mean levels of externalizing behaviors. Results supported the incremental utility of personality states, such that they appear to offer additional predictive power for momentary externalizing behavior over and above personality traits. Candidate proximal mechanisms such as situational factors, momentary affect, and delay discounting were shown have the ability to predict momentary externalizing behavior in an ongoing temporally varying manner. Personality traits moderated some of these relationships between candidate proximal mechanisms and momentary externalizing behavior. Implications for the understanding of externalizing behaviors were discussed while hypotheses for future research were generated.

PUBLIC ABSTRACT

Externalizing behaviors refer to a spectrum of psychological difficulties that include "acting out" behaviors such as substance use, aggression, lying, and theft. Understanding these behaviors is important in decreasing the personal, interpersonal, and societal costs associated with these behaviors. Levels of externalizing behaviors have been shown to change over time within individuals, increasing the need to identify factors that influence such behavior to be more or less likely to occur in any given moment. The current study aimed to contribute to the understanding of factors that influence externalizing behavior by repeatedly measuring such factors within individuals over short time intervals. Gender, age, and personality were measured once per participant. Ongoing moment-to-moment personality, situational context, mood, decision-making processes, and externalizing behaviors were measured three times per day for seven days in 170 university students.

A new measure of momentary externalizing behaviors—Momentary-Externalizing Spectrum Inventory—was created as a practically feasible measure to administer multiple times per day. One particular personality trait called disinhibition-versus-constraint predicted how much individuals engaged in externalizing behaviors on average. Measuring personality in ongoing moment-to-moment ways offered additional predictive power for momentary externalizing behavior over and above just measuring personality once. Momentary factors such as situational context, mood, and decision-making processes predicted externalizing behavior in an ongoing manner over time. However, exactly how situational context, mood, and decision-making predicted externalizing behaviors depends on a person's personality. Implications for the understanding of externalizing behaviors were discussed while hypotheses for future research were generated.

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PREFACE

This dissertation is original, unpublished, independent work by the author, Ke Anne Zhang. The data collection using human participants was approved by the University of Iowa Institutional Review Board, ID #201409757.

INTRODUCTION TO PROPOSED RESEARCH

Externalizing behaviors characterize a spectrum of psychopathology from substance use to antisocial behavior. The burden of this spectrum of psychopathology is exorbitantly high for externalizing individuals as well as society in general. Alcohol use disorders alone account for 3.8 percent of all global deaths and 4.6 percent of global disability-adjusted life years, as well as costing more than 1 percent of the gross national product in high-income and middle-income countries (Rehm et al., 2009). When individuals with antisocial personality disorder are compared with the general population, those with antisocial personality disorder show 7.9 to 20.7 times increase in odds for committing violent acts (Yu, Geddes, & Fazel, 2012). Similarly, antisocial personality disorder accounts for a proportionally higher percentage of criminal offenses than the general population (Moffitt, Caspi, Harrington, & Milne, 2002; Odgers et al. 2007). The current study aimed to contribute to the understanding of the mechanisms that cause externalizing spectrum behaviors and potentially mitigate some of these costs.

Mean levels of externalizing symptoms have been found to increase from ages 17 to 24 within individuals (Hicks et al., 2007). Additionally, externalizing behaviors have been shown to be related to a variety of temporally varying putative mechanisms. To my knowledge, no previous study has investigated the relative contributions of these putative mechanisms to externalizing behavior in one study, as well as how such relationships can change over short time scales using an intensive longitudinal design. Such an intensive longitudinal design would allow for stronger inferences about proximal mechanisms of externalizing behavior in the natural environment on a moment-to-moment basis.

Externalizing Behavior and its Relations to Personality

Modern accounts of externalizing psychopathology largely have their roots in the work of Achenbach (1966), who proposed employing the term "externalizing" to describe childhood and adolescent psychopathology characterized by "self-indulgence and turning against others" (p.28). Substance-related and conduct problems, aggressive and antisocial behavior, and personality traits such as disinhibition and impulsivity tend to co-occur at rates much higher than chance (Krueger & Markon, 2006). Applying quantitative models to these patterns of comorbidity gave rise to a liability-spectrum model of externalizing psychopathology (Krueger & Markon, 2006), so named for Achenbach's (1966) similar conceptualization of the structure of psychopathology.

In this model, externalizing liability is conceptualized as a set of underlying vulnerability factors shared across observed externalizing phenotypes (e.g., substance-related problems, aggressive behavior, antisocial behavior, conduct problems, disinhibition, impulsivity). The liability also has a spectrum (i.e., dimensional) nature, such that individuals can have varying levels of externalizing liability (Krueger, Markon, Patrick, & Iacono, 2005; Markon & Krueger, 2005). Structural analyses of comprehensive measures of externalizing behaviors provide evidence that externalizing behaviors can be modeled with a hierarchical structure (Krueger, Markon, Patrick, Benning, & Kramer, 2007). A general externalizing factor accounts for the common variance shared by all externalizing behaviors. After this general variance has been accounted for, the common variance found within the residual variances of each externalizing behavior can be accounted for by two specific factors (i.e., representing aggression and drug use), each of which are uncorrelated with each other and with general externalizing. Such a bottom-up empirically derived model uses observed externalizing behaviors to further the search for etiological mechanisms of externalizing liability, some of which may be general to all

externalizing behaviors and some specific to a subset of externalizing behaviors.

In addition to comorbidity data, behavioral genetics (Kendler, Prescott, Myers, & Neale, 2003; Krueger, 2005; Krueger et al., 2002; Stallings et al., 2005) and neurobiological (Aron, 2008; Hall, Bernat, & Patrick, 2007; Iacono, Malone, & McGue, 2008; Miller & Cohen, 2001; Patrick & Bernat, 2010; Patrick et al., 2006) research converge on the notion that externalizing behaviors are linked via common etiological mechanisms (see Krueger & South, 2009). Such substantive coherency of the externalizing spectrum of behaviors provides opportunities to study both general etiological mechanisms common to all externalizing behaviors as well as specific etiological mechanisms that affect some externalizing behaviors but not others. Personality traits have been identified as both specific and general indicators of externalizing liability.

Trait disinhibition—referred to in the present study as disinhibition-versus-constraint (DvC) to distinguish it from the Disinhibition scale of the Personality Inventory for DSM-5 (PID-5)—has been shown both cross-sectionally (Krueger, Caspi, Moffitt, Silva, & McGee, 1996; Nigg et al., 2002) and prospectively (Caspi et al., 2002; Caspi, Moffitt, Newman, & Silva, 1996; Chassin, Fora, & King, 2004; Elkins, King, McGue, & Iacono, 2006; Grekin, Sher, & Wood, 2006; Iacono, Carlson, Taylor, Elkins, & McGue, 1999; Krueger, 1999; Sher, Bartholow, & Wood, 2000) to be associated with a wide variety of externalizing behaviors. DvC represents a difficulty in prepotent response inhibition—lack of behavioral control (i.e., low Five Factor Model [FFM] conscientiousness)—combined with a tendency to be interpersonally disagreeable (i.e., low FFM agreeableness), which has been considered a general risk factor common across externalizing behaviors. [1] It has been argued that DvC may be the best candidate endophenotype for externalizing spectrum behavior due to its high heritability (Krueger et al., 2002; Young, Stallings, Corley, Krauter, & Hewitt, 2000) and the breadth of externalizing behavior with which

it is strongly associated. DvC may also represent the affect independent "core" of impulsive behavior that reflects the individual's inability to inhibit prepotent behavioral responses (Sharma, Markon, & Clark, 2014, p. 382). Because DvC appears to be the best candidate endophenotype for externalizing spectrum problems, the findings suggest that examining the mechanisms that underlie trait DvC may prove relevant to the etiology of externalizing behaviors as a whole.

Relatedly, externalizing behaviors consist of impulsive behaviors, but some impulsive behaviors (e.g., substance use) can involve other components (e.g., negative affect) in addition to DvC. Though trait impulsivity is similar to DvC, they are not always used synonymously. While DvC is a higher-order construct whose current usage has relatively clear boundaries (i.e., a combination of low conscientiousness and low agreeableness); impulsivity appears to be a non-unitary construct with historically fuzzy boundaries. In other words, impulsivity suffers from the "jingle and jangle" problem of multiple names referring to the same reference construct as well as a single name used to refer to multiple constructs (Kelly, 1972; Thorndike, 1904). Recently, Sharma, Kohl, Morgan, and Clark (2013) found that self-report measures of impulsivity separate into three "impulsigenic trait" factors—similar to those from Sharma and colleagues (2014)—that align with three well-accepted personality domains: DvC, neuroticism, and extraversion. This means that these three traits increase the risk of impulsive behaviors, with each trait influencing different sets of behaviors. Further, these impulsigenic traits are related to daily behaviors in meaningful but distinct ways. Thus, even though the term "impulsivity" is too imprecise to be very useful today, impulsigenic traits serve to connect the large body of literature on impulsivity to externalizing behaviors that are relevant to the current study. In order to avoid a variation of the "jingle and jangle" problem (Kelly, 1972; Thorndike, 1904), the current study refer to traits DvC, neuroticism, and extraversion instead of trait impulsivity.

While DvC may represent the affect independent core of the externalizing spectrum, it may interact with affectively laden traits. Trait neuroticism—also referred to as negative affectivity, negative emotionality, and sometimes emotional (in)stability—has been associated with externalizing spectrum as well as other (i.e., internalizing) phenomena, thereby acting as a general indicator for psychopathology (Clark, 2005; Kotov, Gamez, Schmidt, & Watson, 2010; Krueger & Markon, 2006; Lahey, 2009; Sher & Trull, 1994; Widiger, 2009). However, high neuroticism in the presence versus absence of high DvC functions to differentially increase the risk for externalizing versus internalizing behavior, respectively (Settles et al., 2012). Therefore, between-person variations in mean level negative emotionality, in the presence of DvC, predict between-person variations in externalizing behaviors.

Consistent with this notion of trait interaction, a trait called negative urgency—a combination of high neuroticism, low agreeableness, and low conscientiousness (Settles et al., 2012; Whiteside & Lynam, 2001)—shows close associations with many negative affectively driven externalizing behaviors (Cyders & Smith, 2007, 2008, 2010; Settles et al., 2012). Such evidence suggests that subjective distress combined with a tendency to act rashly when distressed may lead to behaviors such as smoking (Conner, Grogan, Fry, Gough, & Higgins, 2009; Doran & Trim, 2013; Settles et al., 2012; Spillane, Combs, Kahler, & Smith, 2013), substance abuse and dependence (Curcio & George, 2011; Cyders et al., 2014; Dir, Karyadi, & Cyders, 2013; Doran & Trim, 2013; Fischer, Smith, Annus, & Hendricks, 2007; Fischer, Settles, Collins, Gunn, & Smith, 2012; Kaiser, Milich, Lynam, & Charnigo, 2012; Karyadi & King, 2011; Settles et al., 2012; Sher & Trull, 1994; Shishido, Gaher, & Simons, 2013; Spillane, Cyders, & Maurelli, 2012; Stautz & Cooper, 2013; Verdejo-García, Bechara, Reckno, & Perez-Garcia, 2007), aggression (Derefinko, DeWall, Metze, Walsh, & Lynam, 2011; Moeller,

Robinson, & Bresin, 2010; Settles et al., 2012; Watkins, Maldonado, & DiLillo, 2014), risky sex (Deckman & DeWall, 2011; Settles et al., 2012; Trobst, Herbst, Masters, & Costa, 2002), reckless spending (Alemis & Yap, 2013), self-harm and suicidality (Anestis & Joiner, 2011; Bresin, Carter, & Gordon, 2013; Dir et al., 2013), and disordered eating (Anestis et al., 2009; Davis & Fischer, 2013; Davis-Becker, Peterson, & Fischer, 2014; Dir et al., 2013; Emery, King, Fischer, & Davis, 2013; Emery, King, & Levine, 2014; Fischer, Peterson, & McCarthy, 2013; Fischer et al., 2012; Racine et al., 2013). Although neuroticism and DvC interact to influence mean levels of externalizing behaviors at a between-individual level (Settles et al., 2012), within-individual associations in negative affect, momentary processes potentially underlying DvC, and momentary externalizing behavior are still unclear.

Positive urgency was introduced more recently to describe behaviors that are more likely to be performed when individuals are experiencing high levels of positive affect (Cyders & Smith, 2007, 2008, 2010). Such behaviors include smoking (Spillane et al., 2013), risky behaviors (Cyders et al., 2007, 2010), risky sex (Zapolski, Cyders, & Smith, 2009), substance abuse and dependence (Curcio & George, 2011; Cyders et al., 2007, 2010; Stautz & Cooper, 2013; Shishido et al., 2013), illegal drug use (Zapolski et al., 2009), and pathological gambling (Cyders et al., 2007). One might posit logically that trait positive urgency would be a mirror image of negative urgency, such that it is simply a combination of high extraversion (i.e., positive emotionality), low agreeableness, and low conscientiousness. Interestingly, positive urgency also seems to be associated with high neuroticism, low agreeableness, and low conscientiousness (Cyders & Smith, 2008). Thus, the urgency constructs appear to represent individual differences in affective dyscontrol (Cyders & Smith, 2008; Dir et al., 2013).

Note that some of the same externalizing behaviors have been associated with both

negative and positive urgency, which does not mean that they cannot be distinguished. Cyders & Smith (2007) empirically demonstrate their differential predictive utility, such that negative urgency only predicted externalizing behaviors in the presence of heightened negative mood while positive urgency only predicted externalizing in the presence of heightened positive mood. This is consistent with the literature regarding motives for drinking (Cooper, Frone, Russell, & Mudar, 1995; Cooper, Russell, & George, 1988; Cox & Klinger, 1988, 1990; Kuntsche, Weirs, Janssen, & Gmel, 2010; Piasecki et al., 2014) and gambling (Goldstein, Stewart, Hoaken, & Flett, 2014; Stewart & Zack, 2008; Stewart, Zack, Collins, & Klein, 2008). As discussed in the next section, research using momentary measures—instead of trait measures—can be used to study the functions of behaviors, revealing more about the role of mood in externalizing behaviors. Taken in combination, the urgency constructs' associations with externalizing behaviors strongly suggest that mood, in the presence of behavioral disinhibition, plays a crucial role in some externalizing behaviors.

In sum, externalizing behaviors share common personality correlates such as DvC. While the term "impulsivity" may be too imprecise to be useful in the current study, prior research using this term remains relevant in linking longer time scale traits with shorter time scale states. As detailed in the following sections, both externalizing behavior (Hicks et al., 2007) and personality traits (Ardelt, 2000; Fleeson & Gallagher, 2009; Fraley & Roberts, 2005; Vaidya, Gray, Haig, Mroczek, & Watson, 2008; Watson, 2004) show substantial within-person variability. Momentary constructs such as affective and decision-making processes have been hypothesized to underlie the time-varying manifestation of these traits (Hampson, 2012; Schutte, Malouff, Segrera, Wolf, & Rodgers, 2003). Therefore, it would be reasonable to examine proximal versions (i.e., temporally closer to actual externalizing behavior) of such traits as the

field moves toward more temporally relevant conceptualizations of etiological processes.

From Distal to Proximal Measures of Personality

Personality traits have been conceptualized as individual differences that are stable across situations and time. Certainly, there is a large body of literature that shows a substantial amount of consistency across time (Costa, Herbst, McCrae, & Siegler, 2000; Roberts & DelVecchio, 2000; Terracciano, McCrae, & Costa, 2010), raters (Funder & Colvin, 1997; Watson & Clark, 1991), and situations (Church et al., 2008; Epstein, 1979; Furr & Funder, 2004; Tett & Guterman, 2000). Further, personality traits capture much of the variation when predicting actual daily behaviors (Ching et al., 2014; Church et al., 2008; Fleeson & Gallagher, 2009; Grucza & Goldberg, 2007; Wu & Clark, 2003). More recently, personality researchers have begun to acknowledge two time-varying aspects of personality: (1) true change can occur in personality traits in an intra-individual manner (Ardelt, 2000; Fraley & Roberts, 2005; Watson, 2004), and (2) the degree to which people manifest personality traits in their emotional, cognitive, and behavioral states vary momentarily (Fleeson & Gallagher, 2009).

When true change does occur in personality traits over the life span, several findings are important to keep in mind. First, stability in personality traits do not decay to zero, even over very long test-retest intervals (Fraley & Roberts, 2005). Encouragingly, externalizing behavior as measured over the life span shows similar patterns of stability and change (see meta-analysis by Zhang & Markon, unpublished). Most importantly, even with true change, within-individual variation in personality traits still significantly predict within-individual variations in naturally occurring behaviors (Littlefield, Sher, & Wood, 2009, 2010; Turiano, Whiteman, Hampson, Roberts, & Mroczek, 2012). Therefore, it is important to acknowledge that personality is not entirely stable nor is it meaningless should change occur. True change does occur in personality

traits without diminishing its value as a psychological construct that allows us to predict behavior and other important outcomes.

Even though personality traits show utility in predicting behavior, there is room to improve. Personality traits may have temporally varying components (i.e., personality states) that influence behavior above and beyond stable components. Additionally, the magnitude and nature of the relationships between these temporally varying components to affective processes, decision-making processes, and momentary externalizing behaviors remain empirically open questions. Therefore, it may be useful to measure personality as a state rather than trait, allowing the temporally varying manifestation of personality traits to be measured at specific time points and correlated to externalizing behavior at and around those time points. It is an open empirical question whether personality states have incremental predictive utility over personality traits for externalizing behavior in particular.

There is evidence within the affective literature that trait and state measures have differential predictability, and that sole reliance on traits may yield less precise predictions than when both levels are considered (Merz & Roesch, 2011). Even though personality trait measures are correlated with aggregated momentary measures of personality, they are not the same constructs (r = 0.42-0.56: Fleeson & Gallagher, 2009; r = 0.21-0.59: Heller, Komar, & Lee, 2007; r = |0.20|-|0.39| when significant: Sharma et al., 2013; r = 0.17-0.55: Wu & Clark, 2003). The methodological difference between measuring momentary personality states with adjective markers (e.g., “bold” as a marker of extraversion) or with behaviors that are trait-relevant (e.g. “initiating conversation” because of its relevance to extraversion) further complicates the understanding of how traits are related to aggregated states. What is clear is that momentary measures of the degree to which people manifest personality traits (e.g., personality states, trait-

relevant behavior) show fairly high levels of variability (Augustine & Larsen, 2012; Fleeson & Gallagher, 2009). Therefore, personality states may present an opportunity to predict behaviors in a more proximal manner than traits.

Since measures of general personality traits (i.e., administered at one time point about general tendencies) are correlated but not equivalent to aggregated momentary personality states (i.e., administered at multiple time points about current state; Fleeson & Gallagher, 2009; Heller et al., 2007; Sharma et al., 2013; Wu & Clark, 2003), it may be useful to examine the numerous advantages to using momentary measurements of personality. First, the influence of retrospective memory biases are reduced with state measurements as compared to trait measurements. Retrospective memory biases include the overestimation of past emotion intensity and belief-consistent reporting of past experience (Robinson & Clore, 2002a). Robinson and Clore (2002b) posited that retrospective reports may be retrieved from semantic memory while online reports may be retrieved from episodic memory. This is consistent with evidence that ecological momentary assessment data is more accurate for behavioral reporting than daily reconstruction methods (Shiffman, 2009). Relevant findings from the clinical literature similarly suggest that when people are asked to report psychopathology symptoms, momentarily reported symptom levels and non-symptom correlates (e.g., the magnitude of correlation between symptoms and situational factors) are more accurate than recalled information (Gloster et al., 2008; Houtveen & Oei, 2007). To the extent that personality assessment items are meant to reflect actual lived experiences (i.e., the momentary manifestation of affective, cognitive, and behavioral content that corresponds to the trait construct), considerations of retrospective memory biases are relevant. This is because retrospective memory biases may influence self-reports about past experiences away from actual lived experiences (Christensen, Wood, & Barrett, 2003;

McFarland, Ross, & DeCourville, 1989; Robinson & Clore, 2002a, 2002b; Stone et al., 1998) toward information stored in semantic memory about the self. For these types of items that are meant to reflect actual lived experiences, personality state assessments should decrease the influence of retrospective biases as compared to personality trait assessments.

In addition to items that are meant to reflect actual lived experiences, personality measures also include items that are related to self-concept (e.g., "I am a people person."). I posit that intensive longitudinal assessment may also have advantages relevant to these items. Some social and personality psychologists posit that self-concept is dynamic (Markus & Wurf, 1987); indeed, it demonstrates temporal variation (Aron, Paris, & Aron, 1995; Markus & Kunda, 1986) as well as covariation with mood and life events (Aron et al., 1995; Mortimer & Lorence, 1981; Showers, Abramson, & Hogan, 1998). Further, people have self-enhancement motivations—motives to self-report personality traits in directions that exaggerated his/her talents and minimized his/her faults—that may differ within-individually depending on contextual factors (Paulhus & John, 1998; Vecchione & Alessandri, 2013). To the extent that personality assessment items are influenced by temporally varying self-concept and enhancement motivations, states are more able than global traits to capture this variation.

Combining the ability to reduce the influence of retrospective memory biases with the ability to capture changes in personality-relevant perceptions of the self, an ecological momentary design would provide greater temporal resolution with which to examine changes personality states and its relationships to other constructs. Therefore, it is worth examining empirically whether self-reported momentary personality has incremental utility in predicting externalizing behavior over and above personality traits. Even though traits and aggregated states are not equivalent (Fleeson & Gallagher, 2009; Heller et al., 2007; Sharma et al., 2013; Wu &

Clark, 2003), it is not assumed *a priori* that states are necessarily more *accurate* than traits in any objective sense. The current study explicitly chose to study states because substantial personality within-individual variation exists and its predictive utility for externalizing behaviors had not been studied.

The exact temporal relationships of momentary constructs that are relevant to externalizing behavior lack clarity. Even though temporal relationships between personality traits and externalizing behaviors have been investigated on longer time-scales (Eisenberg et al., 2009; Janson & Mathiesen, 2008; Olson, Schilling, & Bates, 1999; Prinzie, van der Sluis, de Haan, & Dekovic, 2010), momentary temporal relationships can yield different and equally important implications to the understanding of externalizing behavior. This is partially because causal factors exert their influence on behavior on different time scales, and shorter time scales are necessarily needed to examine those that exert their influence more proximally to the behavior. Translating research using traits to an intensive longitudinal design may further the understanding of proximal causal influences of externalizing behaviors.

Within-Individual Variation in Externalizing Behavior

Developmental change in externalizing behaviors has generally been described using a variety of methods. Methods that examine between-individual relationships have the potential to generate hypotheses about change in externalizing behaviors. First, cross-sectional epidemiological studies are able to assess the population prevalence of externalizing phenomena at different ages. The prevalence of most externalizing disorders peak in the late teens and experience a dramatic drop by young adulthood (Costello, Mustillo, Erkanli, Keller, & Angold, 2003; Kessler, Berglund, Demler, Kerikangas, & Walters, 2005). Second, methods such as latent growth curve analyses and semi-parametric group-based modeling have the potential to

characterize developmental trajectories over the life span and detect subtypes of trajectories. In general, existing research have found substantial heterogeneity in the development of externalizing psychopathology, such that subtypes have been identified in trajectories of substance use (Chassin et al., 2004; Chassin, Pitts, & Prost, 2002; Chassin, Presson, Pitts, & Sherman, 2000; Hill, White, Chung, Hawkins, & Catalano, 2000; Jackson, Sher, & Wood, 2000; Kandel & Chen, 2000; Li, Duncan, & Hops, 2001; Tucker, Orlando, & Ellickson, 2003) and antisocial behavior (Blokland, Nagin, & Nieuwbeerta, 2005; Brame, Mulvey, & Piquero, 2001; Connell & Frye, 2006; Ezell & Cohen, 2005; Fergusson, Horwood, & Nagin, 2000; Hamil-Luker, Land, & Blau, 2004; Laub & Sampson, 2003; Maughan, Pickles, Rowe, Costello, & Angold, 2000; Moffitt, 1993; Piquero, 2007; Reef, Diamantopoulou, van Meurs, Verhulst, & van der Ende, 2010, 2011; Reinecke, 2006; Sakai et al., 2010; Vaughn et al., 2011; Wu, Witkiewitz, McMahon, Dodge, & Conduct Problems Prevention Research Group, 2010). Taken in combination, one can infer that developmental change does occur in externalizing behavior but not everyone changes in the same ways.

Longitudinal analyses of patterns in stability and change over the life span provide stronger support for the previous findings. Hicks and colleagues (2007) found that individuals' symptom levels of antisocial behavior and substance dependence increase substantially from adolescence to young adulthood, with some individuals evincing more longitudinal change than others. Additionally, Zhang and Markon (unpublished) meta-analyzed 24 longitudinal studies and found that as assessment intervals increase, stability in externalizing behaviors decreased. However, stability never decreased to zero, instead reaching a horizontal asymptote slightly above a Pearson's correlation of 0.5. There also does not seem to be age effects on this stability; although the generalizability to ages past 26 is limited due to the dearth of longitudinal studies of

externalizing past that age. Such findings point to meaningful levels of within-individual stability, substantial amounts of change, as well as the potential of both stability and change to contribute to the understanding of the etiology of externalizing behaviors. It is important to note that these studies tend to examine change in externalizing behaviors as a whole construct without distinguishing between specific behaviors (e.g., substance abuse versus aggression). These studies also tend to examine younger samples, often with the practical goals of understanding changes in externalizing during childhood and adolescence in order to decrease criminal behavior and improve outcomes in adulthood. As such, these findings must be complemented by studies that investigate meaningful subsets of externalizing behaviors and older samples.

Ecological momentary assessment designs, with their own advantages and limitations, have also contributed to the understanding of longitudinal change in externalizing behavior. Fortunately, existing ecological momentary assessment studies do examine specific types of externalizing behaviors in older samples. However, the findings of studies of specific externalizing behaviors (e.g., drinking, smoking) are then not automatically generalizable to all externalizing behaviors. For example, Armeli, Todd, and Mohr (2005) found weekly within-individual patterns in drinking behaviors, such that college students drank more on Thursdays, Fridays, and Saturdays. It is not known whether this finding generalizes to other substances in the absence of data. Further, because many ecological momentary assessments studies' stated primary purposes are improving the prediction of externalizing behaviors, authors are less interested in describing the temporally varying patterns in the level of externalizing behaviors. A rare exception to this issue is Pearson, D'Lima, and Kelley's (2013) study, which decomposed variability in drinking into within-person and between-person variability. The authors found that the variation in alcohol use between individuals was roughly equivalent to the variation within

individuals. Finally, momentary designs have the advantage of measuring covariation between the externalizing behavior and its hypothesized mechanisms.

Momentary Constructs Relevant to Externalizing Behavior

Candidate proximal mechanisms for externalizing behavior come from very diverse literatures, with relationships to externalizing behavior and to each other that can differ depending on the literature consulted. A form of the "jingle and jangle" problem (Kelley, 1927; Thorndike, 1904) can occur, such that different terms share much conceptual and content overlap but are not exact equivalent to each other. In this section, I draw from the impulsivity, substance abuse, emotion-regulation, decision-making, and self-regulation literatures. Evidence from these disparate areas is integrated in the service of understanding externalizing behavior.

Additionally, it must be noted that when integration occurs over disparate areas of research, methodological differences may sometimes undermine the comparability of findings. Further, the lack of a gold-standard measure of momentary externalizing that is comprehensive and time-efficient may play a role in the dearth of intensive longitudinal research into externalizing behaviors. The act frequency approach has seen the creation of a variety of behavioral checklists to measure momentary manifestations of personality traits (e.g., impulsivity; Wu & Clark, 2003). Even though some of these behavioral checklists are psychometrically sound and can be feasibly administered in an intensive longitudinal design, none exist for the externalizing domain. It would be beneficial to create a momentary measure of externalizing behavior that comprehensively samples the behavioral domain, is psychometrically sound, is practically feasible, and allows for the comparison of findings across historically disparate bodies of research. Therefore, I discuss the creation of a new measure for this purpose in the subsequent section, drawing on the reviewed literature on externalizing behavior as well as

its candidate proximal mechanisms.

Impulsive behaviors. Because impulsivity is central to externalizing phenomena, its within-person variability should be central to explaining the within-person variability of externalizing behaviors. Several recent meta-analyses (Sharma et al., 2013; Sharma et al., 2014) examined impulsivity from a personality assessment perspective. Evidence shows that trait impulsivity is a multifaceted construct. It consists of what Sharma and colleagues (2013) call three "impulsigenic traits"—Distractibility/Urgency, Sensation-Seeking, and Behavioral (Dys)Control—implying multiple pathways to impulsive behavior. Other meta-analyses (Sharma et al., 2014; Carver, Johnson, Joorman, Kim, & Nam, 2011) of self-report impulsivity measures replicate similar three-factor structures, with factors centered on negative affectivity, positive affectivity, and behavioral DvC, respectively. Meta-analyses such as these bring some order to the messy impulsivity literature, allowing us to target mechanisms relevant to the three major impulsigenic traits. Specifically, I examine findings regarding the candidate mechanisms of momentary emotional experiences, momentary behavioral disinhibition, and how these candidate mechanisms may lead to externalizing behavior.

In addition to structurally analyzing self-reported impulsivity data, Sharma et al. (2014) also meta-analytically factor analyzed performance-based measures of impulsivity, resulting in four factors that did not align with those from the self-report measures: Inattention, Inhibition, Impulsive Decision-Making, and Shifting. The constructs tapped by the two methods appear to be distinct but marginally correlated, indicating that they may be related to different aspects or features of impulsivity, and may thus vary independently of each other. While self-report measures of impulsivity are better at capturing "macro-level patterns of responses involving emotionally salient stimuli," performance-based measures may be more suited to measure

"processes that are less affectively laden and occur on a more fine-grained micro-level timescale" (pp. 21). Like self-reported traits, momentary self-report state measures may tap into motivational or affective laden processes that may then interact with affective-free processes of externalizing behaviors. They may also serve as momentary indicators of the saliency or relevance of a trait to a specific situation that may vary with time. Taking into account well-documented strengths and limitations of both self-report (e.g., ability to measure internal experiences from unique perspective of the self; self-concept biasing report of current experience) and performance-based (e.g., less susceptible to social desirability and impression management biases; low external validity for many laboratory measures) measures, it would clearly be beneficial to use both methods when tracking externalizing behavior.

In conclusion, the body of literature on impulsivity has the potential to be very relevant to a subset of externalizing behaviors. It may be more beneficial to investigate the three impulsigenic traits separately, rather than investigating impulsivity as one construct. The next sections focus on how to translate the three impulsigenic traits into state measures. Finally, unique variance in externalizing behaviors may be captured by using both self-report and performance-based measures.

Affective processes. Two of the aforementioned impulsigenic traits (centered around negative and positive affectivity) are affect laden while one (centered around behavioral DvC) is affect independent. Neurobiological data support these distinctions, such that genetic and environmental risk factors associated with the serotonergic system are related to the two affect laden factors but not the affect independent factor (Carver, Johnson, & Joorman, 2008; Carver et al., 2011; Depue, 1995; Depue & Lenzenweger, 2005; Depue & Spoont, 1986; Spoont, 1992). This highlights the potential role of emotion in at least a subset of externalizing behaviors.

The motivational literature on specific externalizing behaviors yields findings consistent with the influence of affective mechanisms. Early research on the motives for substance use and pathological gambling used cross-sectional designs to assess individuals' general tendencies. This research found that people tend to use substances (Cooper et al., 1995; Cooper et al., 1988; Cox & Klinger, 1988, 1990; Kuntsche et al., 2010; Piasecki et al., 2014) and gamble (Goldstein et al., 2014; Stewart & Zack, 2008; Stewart et al., 2008) to reduce negative feelings (i.e., coping motive) or enhance positive feelings (i.e., enhancement motive). Although there are often other factors found in many motivational measures—often related to social motives or other instrumental motives—the boundaries of these factors are less clear (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007; Stewart, Zeitlin, & Samoluk, 1996) and are not consistently found in every sample (Kuntsche, Knibbe, Gmel, & Engels, 2005). Though this early research pointed to potential mechanisms for externalizing behaviors, such cross-sectional studies that treat motives as between-individual differences are not able to speak to momentary variation in motives. Individuals do not simply differ on how much they tend to drink to cope in general; the motivations from drink to drink seem to differ as well (Dvorak, Pearson, & Day, 2014). Further, people experience a wide range of affective experiences, each of which may lead to different behavioral consequences within the same individual. Incorporating within-individual data allow for stronger inferences to be made about mechanisms underlying externalizing behavior.

Indeed, within-individual analyses suggest that affective states are important antecedents for substance use (Bhushan, Blood, & Shrier, 2013; Chakroun, Johnson, & Swendsen, 2010; Doumas, 2012; Dvorak et al., 2014; Jahng et al., 2011; Minami, Yeh, Bold, Chapman, & McCarthy, 2014; Moore et al., 2014; Phillips et al., 2014; Rankin & Maggs, 2006; Shrier, Walls, Kendall, & Blood, 2012; Simons, Dvorak, Batien, & Wray, 2010; Thrul, Buhler, & Ferguson,

2014). Affective consequences were also associated with substance use, such that the use of substances does appear to be followed by reductions in negative affect or increases in positive affect (Cascella et al., 1994; Doran et al., 2006). Experimental data also support the distinctions between the two functions of externalizing behavior as affect regulators (i.e., to enhance positive affect versus reduce negative affect) for smoking (McKee, Wall, Hinson, Goldstein, & Bissonnette, 2003; Niaura, Shadel, Britt, & Abrams, 2002; Perkins, Karelitz, Giedgowd, & Conklin, 2013; Tiffany & Drobes, 1990), drinking (Birch et al., 2004; Colder, 2001; Cooney, Litt, Morse, Bauer, & Gaupp, 1997; Cyders et al., 2014; Rubonis et al., 1994; Willner, Field, Pitts, & Reeve, 1998), and gambling (Hills, Hill, Mamone, & Dickerson, 2001). Overall, the body of evidence supporting a main effect of mood on externalizing behaviors is very robust.

However, not everyone who feels heightened emotion is equally as likely to engage in externalizing behaviors. There is a growing body of evidence that between-individual differences in personality traits interact with momentary mood to predict who will externalize, given the same emotional stimulus (Cascella et al., 1994; Chakroun et al., 2010; Cyders & Smith, 2008; Cyders et al., 2014; Doran et al., 2006; Hirsh, Guindon, Morisano, & Peterson, 2010; Seibert, Miller, Pryor, Reidy, & Zeichner, 2010; Settles et al., 2012; Simons et al., 2010; Wardell, Read, & Colder, 2013). Given such between-individual differences in risk for externalizing behavior while experiencing heightened emotion, it is also quite possible that other momentary mechanisms underlie within-individual variation in the likelihood to externalize given emotional arousal. For example, findings that negative consequences from drinking decrease the likelihood of future drinking suggest a role for decision-making processes (Doumas, 2012). Additionally, findings that being under the influence of alcohol intensifies the motivational consequences of smoking suggest a role for cognitive processes that influence salience of previously learned

consequences (Piasecki et al., 2011). In other words, there may be temporal variation in the ability of an individual to take previously learned information into account when faced with the opportunity to externalize. For further elucidation of such processes, I turn to cognitive processes in the next section.

Cognitive processes. Sharma and colleagues (2014) posited that one of the three impulsigenic traits is affect independent, such that trait DvC may be the purest indicator of externalizing liability. Relevantly, how much DvC is manifested at any time may vary dramatically (Bocca, Marie, & Chavoix, 2013; de Wit, 2008; Hicks et al., 2007; Vaidya, Latzman, Markon, & Watson, 2010). In other words, cognitive processes may exist that vary independently from affect and can interact with affective processes. Therefore, research is needed regarding the proximal mechanisms that can influence the level of behavioral DvC individuals engage in from moment to moment.

Decision-making processes are relevant when discussing maladaptive externalizing behaviors, because individuals enact such behaviors despite negative consequences that are often known. In the decision-making literature, a two-mode model of self-regulation—adapted by Carver and colleagues (2008) from a variety of other literatures—has gained support as a transdiagnostic explanatory model for both internalizing and externalizing spectrum psychopathology (Johnson, Carver, & Joorman, 2013). The model posits two simultaneously operating and competing processes of self-regulation: an effortful/reflective mode and an automatic/reflexive mode (Dvorak & Simons, 2009). Automatic mode is for impulsive behaviors that occur under cognitive load, in the presence of heightened emotions, or out of habit. Effortful mode is for deliberative behaviors, in which individuals have plenty of time, cognitive resources, and the motivation to make decisions. This two-mode model may help explain how affective

processes interact with cognitive processes, such that decision-making may be more likely to proceed via automatic mode when there is emotional arousal.

A similar two-mode model of self-control has been discussed with regard to delay of gratification, another important cognitive process that has been associated with externalizing behaviors. An aspect of some externalizing behaviors is the selection of an immediate smaller reinforcer over a larger delayed reinforcer (Critchfield & Kollins, 2001; Dallery & Raiff, 2007; Heinz, Peters, Boden, & Bonn-Miller, 2013; Sheffer et al., 2012). In essence, some externalizing behaviors can then be conceptualized as a maladaptive intertemporal choice that services immediate desires at the cost of long-term goals (Bickel & Vuchinich, 2002; Critchfield & Kollins, 2001; Herrnstein & Prelec, 1992). This maladaptive choice may be associated with diminished sensitivity or lessened subjective value assigned to the larger delayed outcomes—a phenomenon known as delay discounting (Bobova, Finn, Rickert, & Lucas, 2009; Dixon, Marley, & Jacobs, 2003; Madden, Petry, Badger, & Bickel, 1997; Petry, 2005; Petry & Casarella, 1999). In the two-mode model of delay of gratification, individuals may employ "hot" or "cool" self-control strategies when thinking about an anticipated reward (Casey et al., 2011; Metcalfe & Mischel, 1999). Hot strategies focus on the emotionally arousing appetitive features of the reward (e.g., the taste of a marshmallow in the classic delay of gratification task) and cool strategies focus on reframing the reward in terms of its unarousing features (e.g., the shape and color of the marshmallow resemble a cloud). Combined with findings that different neurobiological substrates may underlie hot-automatic and cool-effortful systems (Casey et al., 2011; Reyna & Huettel, 2014), support clearly exists for a two-mode model of behavioral inhibition and control.

Certain researchers have proposed that the stability of delay discounting may support the

construct's ontological status as a personality trait, such that delay discounting can be conceptualized as an indicator of the latent trait impulsivity (Odum, 2011). Even though both delay of gratification and delay discounting show rank-order stability across time (Casey et al., 2011; Kirby, 2009), within-individual variation has also been shown to exist (Bickel et al., 2011; Cauffman et al., 2010; Figner, Mackinlay, Wilkening, & Weber, 2009; Somerville & Casey, 2010; Somerville, Hare, & Casey, 2011; Steinberg et al. 2009). Delay discounting function parameters have been shown to have one-week stability coefficients (i.e., Pearson correlations between test and retest) of between 0.744 and 0.906 (Simpson & Vuchinich, 2000) as well as three-month stability coefficients of between 0.45 and 0.75 (Ohmura, Takahashi, Kitamura, & Wehr, 2006). Situational factors such as positive or negative social cues (e.g., happy and fearful faces; Casey et al., 2011; Hare, Tottenham, Davidson, Glover, & Casey, 2005; Somerville et al., 2011), the extent to which externalizing behaviors are commonplace in the context (e.g., race track for pathological gamblers; Dixon, Jacobs, & Sanders, 2006), and the types of reinforcers an individual must choose between (e.g., drug versus money; Bickel et al., 2011) can influence the degree to which individuals employ these behavioral inhibition strategies.

Kurth-Nelson, Bickel, and Redish (2012) proposed a theoretical account of delay discounting that takes into account situational factors that can vary over time and within an individual. In this model, discounting emerges from a search process for potential rewards in the future, with the value assigned to the future outcome being proportional to how easy it is to find. Any factor that may influence the ease of an outcome being found during search, including temporal delay to the outcome, may influence its subjectively assigned value. It follows that making those outcomes more salient—for example, by tying future outcomes to episodic cues (e.g., "in 20 hours at my meeting at work" instead of "in 20 hours")—one can increase how easy

it is found during the search. While Kurth-Nelson and colleagues (2012) stated that this theoretical model is most likely to hold during deliberative decision-making, several studies have successfully applied it to impulsive behaviors (Daniel, Stanton, & Epstein, 2013a, 2013b; Peters, Miedl, & Buchel, 2012).

In sum, the evidence suggests that people do not always make maladaptive decisions under cognitive load or heightened emotion (Bickel, Yi, Landes, Hill, & Baxter, 2011; Kurth-Nelson et al., 2012; Lane, Cherek, Pietras, & Tcheremissine, 2003; Mueller et al., 2009), suggesting that sometimes the effortful mode is able to overcome automatic impulses. Measures of delay discounting operationalize momentary DvC using behavioral measures and statistical modeling, such that one can quantify a person's tendency to value immediate rewards over future consequences at any one time. Understanding how individuals are able to inhibit prepotent responses like this is crucial to understanding the dysfunctional processes underlying externalizing behaviors. Decision-making processes (e.g., the self-regulation mode that prevails regarding the behavior that is ultimately enacted) clearly can vary temporally (Baumeister, Vohs, & Tice, 2007; Muraven, Tice, & Baumeister, 1998). This is the rationale behind measuring the situation as carefully as an intensive longitudinal design allows (i.e., without undue participant burden). Such an intensive longitudinal design may allow us to identify important ways in which affective and cognitive processes interact to produce externalizing behaviors and conditions under which behavioral inhibition occurs.

The Present Study

The current study aimed to contribute to the understanding of the mechanisms that cause externalizing behavior using an intensive longitudinal design. Because externalizing behaviors have been shown to be related to a variety of temporally varying putative mechanisms, assessing

these candidate mechanisms together allow us to elucidate the relationships of these constructs with each other as well as externalizing behaviors.

New measure of momentary externalizing behavior. The current study aimed to develop the Momentary-Externalizing Spectrum Inventory (M-ESI) with the purpose of measuring time-varying externalizing behavior. The reliability and validity of this measure was examined toward contributing a comprehensive, psychometrically sound, and practically feasible self-report measure that could be administered multiple times per day. Factor analyses examined whether the M-ESI consist of multiple types of externalizing behavior. The current study investigated whether longitudinal findings differed by the type of externalizing behavior; specifically, whether predictors were significant for some behaviors but not for others. For example, perhaps some externalizing behaviors are more situationally specific whereas other behaviors tend to occur at similar levels regardless of contextual factors (e.g., interpersonal context, being at work versus at home, time of day). Perhaps some behaviors are less strictly policed during work hours (e.g., smoking cigarettes), while others are strictly prohibited (e.g., drinking alcohol). Such constraints on behavior may operate differentially on various types of externalizing behavior.

Personality traits. Personality traits have long been linked to externalizing behaviors. Specifically, I reviewed evidence that DvC (i.e., a combination of FFM's low conscientiousness and low agreeableness) and negative emotionality (i.e., FFM's neuroticism) are important personality predictors of person-specific mean level externalizing behaviors. I hypothesized that trait DvC and negative emotionality are positively associated with mean levels of externalizing behaviors with a significant interaction effect between the two traits.

Exploratory analyses investigated whether traits moderated the within-individual

associations between temporally varying constructs and externalizing behaviors. For example, because some people behave rashly under heightened emotion (i.e., negative and positive urgency), I hypothesized that individuals who are higher in trait DvC have stronger within-individual associations between mood and externalizing behavior. It is important to note that the current study may be underpowered to study small between-individual interaction effects. Thus, if traits are not found to be significant moderators, no inferences about moderations can be drawn. However, if individual difference moderators are found to be significant, one can be fairly confident in the finding.

Personality states. More recently, the level to which individuals manifest personality traits have been found to vary temporally (Fleeson & Gallagher, 2009), though the author is not aware of any existing research that has investigated fine-grained temporal covariation of personality states and a comprehensive sampling of externalizing behaviors. The current study aimed to replicate previous findings regarding the variation of personality states within individuals over time as well as evaluate the incremental validity of time-varying personality states over stable personality traits in predicting momentary externalizing behavior. In other words, does the costly process of measuring ever-changing personality states buy enough additional predictive power to make the cost worthwhile? I hypothesize that the incremental validity of states depends on the level of within-individual variation, such that momentary information for states that vary more widely may be more useful in predicting behavior over and above traits. According to Fleeson and Gallagher's (2009) "mega-analysis" of fifteen studies, state extraversion showed the greatest temporal variation while state intellect showed the least, though the difference in variance was modest. Whether these modest differences in within-individual variance translates into incremental validity in predicting externalizing behavior is an

open empirical question.

Candidate proximal processes. In addition to personality states, affective and cognitive processes vary momentarily and have been found to be associated with externalizing behaviors. Since emotion regulation seem to motivate some externalizing behaviors, I aimed to replicate previous research and show both positive and negative mood to be significant prospective predictors of externalizing behaviors. I also expect mood change to follow externalizing behaviors. Consistent with existing literature on coping motives, individuals may experience declines in negative mood. Similarly and consistent with enhancement motives, individuals may experience increases in positive mood after externalizing behaviors.

It is also important to attempt to disentangle momentary affect with non-affective processes. To this end, I operationalize the affective-free component of momentary DvC using a measure of delay discounting. I am not aware of previous research which shows delay discounting functions to change momentarily while also being able to predict momentary changes in behavior. I aimed to replicate previous research that delay discounting varies situationally—thus, momentarily—as well as show that the steepness of the delay discounting curve positively predicts momentary externalizing behavior. To the authors' knowledge, the current study would also represent the first intensive longitudinal study of delay discounting.

It is possible that affective and cognitive processes interact (Buelow, Okdie, & Blaine, 2013; Koff & Lucas, 2011), such that externalizing behavior is high when either mood or discounting rates are high but externalizing behavior is low only when both mood and discounting rates are low. For example, individuals may evaluate the values of compared outcomes differentially when they are in different mood states. Even though inferences about causality cannot be drawn based on these proposed analyses alone, results may function to

generate hypotheses and spur future research.

The primary contribution of the current study is to investigate such a wide range of candidate mechanisms—on both between-individual and within-individual levels—within one study. This allows for the comparison of the relative contributions from each candidate mechanism to externalizing behavior. Additionally, doing so with an intensive longitudinal design would allow us to investigate concurrent as well as time-lagged relationships between candidate mechanisms to reveal potential dynamic interplays between mechanisms as well as with the outcome of interest (i.e., externalizing behavior). Due to the increased temporal proximity of the predictors with the outcome variables, stronger inferences can be made about the causal nature of these relationships.

METHOD

Participants

Pilot study sample. The initial pilot sample (*N* = 192) was recruited via Amazon's Mechanical Turk (MTurk) Workplace. MTurk participants completed a screening questionnaire to be eligible to participate. If participants self-reported as: (1) over 18 years of age, (2) fluent in English, (3) residing in the U.S., and (4) consenting to the study, they were contacted by the principal investigator by email. Participants followed links provided to complete questions about demographics, personality states, mood, and externalizing behaviors online at two time points. The first time point (Time 1) could have been completed at any time, while the second time point (Time 2) must have been completed approximately four hours after the first. Thirty-three participants were excluded using validity variables for low effort or low comprehension, resulting in a final pilot sample of *N* = 159 at Time 1 and *N* = 99 at Time 2. Excluded individuals differed by age, race, income, and personality traits from included individuals (Tables 1 and 3).

Main study sample. A sample of 196 participants was recruited from the undergraduate research participant pool at the University of Iowa and compensated with course credit. Twenty-six participants were eliminated from the sample because they demonstrated clearly invalid responding (i.e., missing item responses, all responses have identical values) to the delay discounting measure on every occasion where they responded to this measure or because all of their delay discounting curves increase to the right instead of decreasing. This resulted in a remaining sample of *N* = 170 at baseline and *N* = 85 at the twenty-first time point. Excluded individuals differed by gender, race, and education from included individuals (Tables 1 and 3).

Table 1. Comparing the demographic composition of the participants that were included versus excluded from the pilot and main studies.

		Pilot Study		Main Study	
		Included	**Excluded**	**Included**	**Excluded**
Gender (Missing: Pilot Inc = 1)	Male	36.1%	45.5%	49.4%	26.9%
	Female	62.0%	54.5%	50.6%	73.1%
	Other (e.g., transgender, genderfluid)	1.9%	0%	0%	0%
Age (Missing: Pilot Inc = 1; Main Inc = 1)	Mean (SD)	34.4 (12.3)	28.2 (7.6)	19.2 (1.5)	19.4 (1.5)
	Range	19 to 72	20 to 57	18 to 28	18 to 24
Race	White	73.6%	45.5%	71.2%	42.3%
	Asian/Pacific-islander	12.6%	33.3%	21.5%	38.5%
	Black/African-American	4.4%	9.1%	5.0%	0%
	Hispanic/Latino/Latina	2.5%	0%	6.6%	3.8%
	Multi-racial	5.7%	12.1%	5.8%	11.5%
	Other	1.3%	0%	1.7%	3.8%
Education	Some high-school, no diploma	1.9%	0%	0.6%	3.8%
	High-school graduate or equivalent	8.2%	12.1%	0%	0%
	Some college, no degree	18.2%	18.2%	95.9%	80.8%
	Trade/technical/vocational training	1.9%	0%	0%	0%
	Associate's degree	10.7%	0%	2.4%	3.8%
	Bachelor's degree	40.9%	42.4%	1.2%	11.5%
	Master's degree	13.2%	18.2%	0%	0%
	Professional degree	3.1%	9.1%	0%	0%
	Doctoral degree	1.9%	0%	0%	0%
Marital (Missing: Pilot Inc = 2)	Single, never married	41.4%	63.6%	98.2%	92.3%
	Cohabitating, never married	8.9%	15.2%	1.2%	7.7%
	Married or domestic partnership	40.8%	18.2%	0.6%	0%
	Separated	1.9%	0%	0%	0%
	Divorced	5.1%	3.0%	0%	0%
	Widowed	1.9%	0%	0%	0%
Employ-ment	Employed for pay	57.2%	42.4%	24.7%	19.2%
	Self-employed	14.5%	18.2%	0%	0%
	Student	8.2%	24.2%	75.3%	76.9%
	Military	0.6%	3.0%	0%	3.8%
	Retired	2.5%	0%	0%	0%
	Homemaker	5.7%	0%	0%	0%
	Unemployed, looking for work	8.2%	9.1%	0%	0%
	Unemployed, not looking for work	1.9%	0%	0%	0%
	Unable to work	1.3%	3.0%	0%	0%
Income (Missing: Pilot Inc = 5, Exc = 1; Main Inc = 44, Exc = 10)	< $20,000 (1,2)	21.4%	46.9%	42.1%	68.8%
	$20,000 to $49,999 (3,4,5)	35.1%	40.6%	15.1%	6.3%
	$50,000 to $99,999 (6,7)	33.1%	9.4%	18.3%	6.3%
	> $100,000 (8,9)	10.4%	3.1%	24.6%	18.8%

Some percentages do not sum to 100% because of rounding. Significant ($\alpha = 0.05$) differences in demographic proportions (Fisher's exact tests) and means (*t*-test) were found between participants who were included versus excluded in both samples, highlighted here in yellow.

Table 2. Comparing the demographic composition of the participant sample at the beginning and end of the pilot and main studies.

		Pilot Study		Main Study	
		Time 1	**Time 2**	**Baseline**	**Time 21**
Gender (Missing: Pilot T1 = 1)	Male	36.1%	40.4%	49.4%	45.9%
	Female	62.0%	59.6%	50.6%	54.1%
	Other (e.g., transgender, genderfluid)	1.9%	0%	0%	0%
Age (Missing: Pilot T1 & T2 = 1; Main BL & T21 = 1)	Mean (SD)	34.4 (12.3)	36.6 (13.1)	19.2 (1.5)	19.2 (1.6)
	Range	19 to 72	20 to 67	18 to 28	18 to 28
Race	White	73.6%	72.7%	71.2%	70.6%
	Asian/Pacific-islander	12.6%	13.1%	21.5%	11.8%
	Black/African-American	4.4%	5.1%	5.0%	3.5%
	Hispanic/Latino/Latina	2.5%	2.0%	6.6%	7.1%
	Multi-racial	5.7%	6.1%	5.8%	5.9%
	Other	1.3%	1.0%	1.7%	1.2%
Education	Some high-school, no diploma	1.9%	2.0%	0.6%	1.2%
	High-school graduate or equivalent	8.2%	9.1%	0%	0%
	Some college, no degree	18.2%	15.2%	95.9%	95.3%
	Trade/technical/vocational training	1.9%	3.0%	0%	0%
	Associate's degree	10.7%	10.1%	2.4%	3.5%
	Bachelor's degree	40.9%	44.4%	1.2%	0%
	Master's degree	13.2%	11.1%	0%	0%
	Professional degree	3.1%	4.0%	0%	0%
	Doctoral degree	1.9%	1.0%	0%	0%
Marital (Missing: Pilot T1 = 2, T2 = 1)	Single, never married	41.4%	46.9%	98.2%	97.6%
	Cohabitating, never married	8.9%	7.1%	1.2%	1.2%
	Married or domestic partnership	40.8%	37.8%	0.6%	1.2%
	Separated	1.9%	2.0%	0%	0%
	Divorced	5.1%	5.3%	0%	0%
	Widowed	1.9%	1.0%	0%	0%
Employ-ment	Employed for pay	57.2%	52.5%	24.7%	20.0%
	Self-employed	14.5%	16.2%	0%	0%
	Student	8.2%	8.1%	75.3%	80.0%
	Military	0.6%	1.0%	0%	0%
	Retired	2.5%	3.0%	0%	0%
	Homemaker	5.7%	7.1%	0%	0%
	Unemployed, looking for work	8.2%	7.1%	0%	0%
	Unemployed, not looking for work	1.9%	3.0%	0%	0%
	Unable to work	1.3%	2.0%	0%	0%
Income (Missing: Pilot T1 = 5, T2 = 4; Main BL = 44, T21 = 21)	< $20,000 (1,2)	21.4%	23.2%	42.1%	39.1%
	$20,000 to $49,999 (3,4,5)	35.1%	36.8%	15.1%	18.8%
	$50,000 to $99,999 (6,7)	33.1%	31.6%	18.3%	20.3%
	> $100,000 (8,9)	10.4%	8.4%	24.6%	21.9%

Some percentages do not sum to 100% because of rounding. No significant ($\alpha = 0.05$) differences in demographic proportions (Fisher's exact tests) and means (*t*-test) were found between participants who completed the latter time point and those who did not in both samples.

Table 3. Comparing the personality trait distributions of different subsets of participants from the pilot and main studies.

		NEG	DET	PSY	ANT	DIS
Pilot	Included	2.05 (0.62)	1.85 (0.63)	1.82 (0.62)	1.70 (0.61)	1.59 (0.55)
	Excluded	2.32 (0.56)	2.03 (0.56)	2.17 (0.62)	2.07 (0.61)	1.89 (0.60)
Main	Included	1.13 (0.58)	0.73 (0.50)	0.75 (0.48)	0.90 (0.51)	0.83 (0.45)
	Excluded	1.05 (0.55)	0.67 (0.46)	0.79 (0.54)	0.86 (0.64)	0.75 (0.42)
Pilot	Time 1	2.05 (0.62)	1.85 (0.63)	1.82 (0.62)	1.70 (0.61)	1.59 (0.55)
	Time 2	2.01 (0.63)	1.89 (0.67)	1.81 (0.60)	1.68 (0.60)	1.56 (0.55)
Main	Baseline	1.13 (0.58)	0.73 (0.50)	0.75 (0.48)	0.90 (0.51)	0.83 (0.45)
	Time 21	1.21 (0.61)	0.74 (0.56)	0.79 (0.53)	0.93 (0.52)	0.86 (0.45)

Each cell consists of means with standard deviations in parentheses, where each trait score ranges between 0 to 4. Those included in each study was compared against those who were excluded. Those who completed the first time point were compared against those completed the later time point for each study. Significant ($\alpha = 0.05$) differences in personality trait means (*t*-test) were found, highlighted here in yellow.

Procedure

At baseline of the main study, participants were asked to complete questionnaires measuring demographic variables and personality traits. Researchers provided participants with instructions to fill out momentary behavioral records using the participants' mobile devices. Over the following week, participants completed three behavioral records per day (i.e., noon, 5pm, 10pm) that measured their situational context, mood, decision-making processes, personality states, and externalizing behaviors. These times were chosen in an attempt to oversample for externalizing behavior. Participants were reminded via email prior to each behavioral record in order to aid compliance. Within the email prompt, participants followed a link to the behavioral record. Participants must have completed the behavioral record within two hours of the prompt in order for the record to be included within the data analyses. At the end of the week, participants received course credit and a debriefing email, which offered additional in-person debriefing opportunities.

Measures

Five-Factor Model of personality traits. The Personality Inventory for DSM-5 (PID-5; Krueger, Derringer, Markon, Watson, & Skodol, 2012) assessed personality traits at baseline. The convergent validity of the PID-5 with well-validated measures of the Five Factor Model (FFM) of normal personality has repeatedly been demonstrated (De Fruyt et al., 2013; Gore & Widiger, 2013; Markon, Krueger, & Watson, 2005; Thomas et al., 2013; Watson, Stasik, Ro, & Clark, 2013). Thus, the PID-5 traits can be used as maladaptive equivalents to the FFM normal personality constructs. The PID-5 has 220 items scored on a 4-point Likert scale (i.e., "very false or often false," "sometimes or somewhat false," "sometimes or somewhat true," "very true or often true"). Items assess 25 maladaptive personality facets organized into five maladaptive personality domains (i.e., Neuroticism, Detachment, Antagonism, Disinhibition, Psychoticism). Each facet scale has between four and 14 items. Scale scores were derived by averaging items within the scale, resulting in scores between 0 and 3 that could be interpreted relative to observed norms (Krueger et al., 2012). Higher scores indicate greater personality dysfunction. Cronbach's alphas from the nationally-representative normative sample of the initial validation study (Krueger et al, 2012) ranged from 0.72 to 0.96 for facets and 0.84 to 0.96 for domains.

Situational factors. Three questions were administered to participants at each time point to measure type of setting ("Where are you right now?"), social context ("Who are you with right now?"), and activity ("What are you doing right now?"). In selecting items for this measure, I balanced the need for brevity with the need to measure aspects of the situation that may impact externalizing behavior as previous research suggested (Dunbar, Scharf, Kirchner, & Shiffman, 2010; Shiffman, 2000, 2009; Shiffman, Paty, Gnys, Kassel, & Hickcox, 1996; Tiffany, 1990; Vaidya et al., 2010; van Heck, Perugini, Caprara, & Fröger, 1994; Yang et al., 2014).

Personality states. With an emphasis on reducing participant burden (i.e., easy to comprehend item structure, short time to completion), Goldberg (1992) developed a set of 100 unipolar adjective markers for the FFM model of personality. This 100-item set of markers took 10 to 15 minutes of a subject's time, which would not be adequately brief for the purposes of the current study. Saucier (1994) created a shorter 40-item version of this measure by only retaining items that: (1) are easy to comprehend (i.e., include less difficult words such as "imperturbable" or negative descriptors such as "uncharitable"), (2) resulted in lower correlations between scales, (3) resulted in higher mean inter-item correlations within scales, and (4) loaded on the expected trait factor. In Saucier's (1994) original validation study, Cronbach's alphas for the five traits range between 0.74 and 0.83 for self-reports and between 0.74 and 0.84 for informant-reports.

Saucier (1994) acknowledged that creating a short-form requires creating more homogeneity among items within a scale in order to achieve an adequate internal consistency. Upon reviewing the 40 items within Saucier's (1994) Mini-Markers, I was concerned that not enough items measured facets of the traits that would be relevant to externalizing behaviors (did not include e.g., irritable). Further, I was concerned that some adjectives would be outdated for the college population (e.g., bashful). Finally, I was concerned about the number of negative adjectives that were retained by Saucier (1994) within the measure (e.g., uncreative, unenvious, unintellectual). Therefore, I modified the measure and examined the psychometric properties of this Modified Mini-Markers (M-MM) in both the pilot and main study samples.

Momentary mood. The Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) was used to measure momentary positive affect and negative affect. The PANAS is a 20-item self-report questionnaire that asks respondents to "indicate to what extent you feel this way right now, that is, at the present moment" (Watson et al., 1988, p. 1070).

Respondents use a 5-point Likert scale ranging from “very slightly or not at all” to “extremely” to describe their feelings using single word adjectives. In the initial validation study (Watson et al., 1988), the momentary version of the PANAS showed high internal consistencies (Cronbach’s alphas of 0.89 for positive affect and 0.85 for negative affect), excellent discriminant validity (positive affect- negative affect intercorrelation = -0.15), and adequate eight-week test-retest reliabilities (positive affect’s $r = 0.54$, negative affect’s $r = 0.45$). The PANAS has been exceptionally well-validated, translated into numerous languages (e.g., Galinha & Pais-Ribeiro, 2005; Gaudreau, Sanchez, & Blondin, 2006; Huang, Yang, & Li, 2003; Robles & Paez, 2003; Terracciano, McCrae, & Costa, 2003), and cited over 8,500 times.

Delay discounting. Beck and Triplett (2009) created a short group-administered paper-pencil measure of delay discounting. Participants could self-report on several items without the use of elaborate individually administered computer protocols, similar to any other self-report measure used in the current study. In Beck and Triplett’s (2009) measure, respondents are asked to imagine a scenario where they are paying money now in order to receive $1000 later. This measure contains six different items, each representing a different temporal delay until the respondent hypothetically receives $1000. For each item, respondents choose the amount they would hypothetically pay now, between $1 and $995. Using the responses, rate of discounting can be modeled using the hyperbolic function $V = A / (1 + kD)^s$, where V is the discounted value of a delayed reward A (e.g., $1,000), D is delay in standard units (e.g., weeks), and k is the slope of the delay curve (Mazur, 1987). The steeper the slope, the greater is the preference for an immediate smaller reward over a delayed larger reward. Thus, k—or rather, a log transformation of k, referred to as *log-k*—is the value of interest here. Beck and Triplett’s (2009) measure

validation obtained adequate six-week test-retest reliability (r = 0.65) for a momentary measure, comparable to the eight-week reliability of the momentary PANAS (r's = 0.45 and 0.54).

This measure is ideal for the current study's purposes for several reasons. Within-subject comparisons of real and hypothetical monetary rewards in delay discounting showed both to be equally valid measures (Johnson & Bickel, 2002; Matusiewicz, Carter, Landes, & Yi, 2013). Comparisons of multiple-choice (MC) and fill-in-the-blank (FIB) protocols for delay discounting showed that they predict differential rates of discounting, with FIB measures producing greater rates of discounting and more variable rates of discounting across different commodities (e.g., money, cigarettes, dating partners; Weatherly & Derenne, 2011). Since the present study is not interested how participants discount money, per se, and is instead interested in their momentary discounting in general, I selected MC so to introduce the least amount of method-specific variance. Smith & Hantula (2008) posited the reason for the greater rates of discounting using FIB protocols may be because they place greater cognitive demands on the respondent. It then stands to reason that temporal variance in cognitive resources may inflate within-individual variances of FIB measures of discounting. Choosing MC over FIB measures was a design choice for this specific study—instead of an empirically justified choice in all studies—in the interest of obtaining conservative estimates of within-individual variances of discounting, such that cognitive resources were not confounding our estimates of discounting. Finally, Beck and Triplett's (2009) measure can be administered in a few minutes at most. For these reasons, Beck and Triplett's (2009) MC measure of delay discounting was ideal for the current study.

Momentary externalizing. Momentary externalizing, for which a new questionnaire was created, was conceptualized as the severity of actual externalizing behavior a person is engaging in at any one point in time. Important considerations in the creation of this new measures were:

(1) comprehensively sampling the breadth of externalizing behaviors, (2) including both high and low base rate behaviors, (3) ease of item comprehension (e.g., items that require least amount of interpretation and are unambiguous), and (4) minimizing participant fatigue. I aimed to create a psychometrically sound measure of momentary externalizing behavior—hereby referred to as the Momentary-Externalizing Spectrum Inventory (M-ESI)—that could be administered multiple times per day.

Statistical Analysis

Power analysis. A preliminary power analysis was conducted in order to minimize the number of participants needed to detect the effects of interest. A procedure for estimating power for intensive longitudinal designs was adapted from Bolger, Stadler, and Laurenceau (2011). Where Bolger and colleagues (2011) simulated a pilot data set to estimate effect sizes, an actual pilot data set (N = 159) and previous intensive longitudinal studies were used to estimate effect sizes. In a series of power simulations using Mplus (see Appendix A for the code for one such simulation), effect sizes for key parameters and sample size were varied to examine the resulting changes in power. The parameter that was varied was the variance of the within-subject slopes due to the range of variances found in previous studies (Liu, Wang, Zhan, & Shi, 2009: 0.13; Segerstrom, 2014: 0.44). Thus, within-subject slope variances of 0.1 and 0.5 were tested in the power analyses. A sample size of N = 150 was gradually decreased to N = 100.

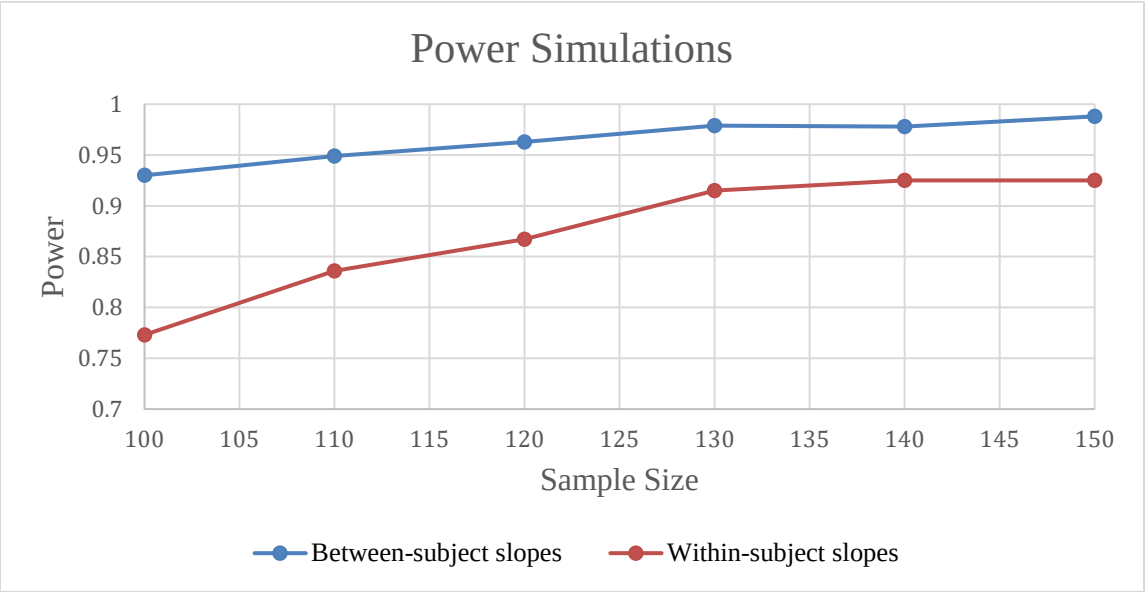
Per Bolger and colleagues (2011), predictors (i.e., momentary conscientiousness, momentary agreeableness, and the interaction of conscientiousness and agreeableness) were split into a between-subjects component (i.e., person-specific means) and a within-subjects component (i.e., the distribution of momentary predictors around the person-specific mean). Predictors were standardized z-scores; thus, all main effect variables had between-subject means

of 0 and variances of approximately 1 with some rounding error. The dependent variable used was momentary externalizing; that is, the total score of the M-ESI. Even though a three-scale structure was found for the M-ESI, the small number of observations in the pilot sample lead to floor effects. Thus, the total score of the M-ESI was more likely to realistically approximate the variation in externalizing found in the main study.

Assumed population effect sizes that were used in power simulations were calculated as follows. Because I measured momentary variables at two time points in the pilot study, I was able to calculate the variances of predictors' within-subject components using the sums of the squares of within-subject deviations from the person-specific means. Between-subject slopes were estimated by regressing momentary externalizing behavior onto the predictors using a simple linear regression of variables measured at baseline. The covariation between externalizing behavior and the within-subject slopes were calculated using Pearson's correlations. Since the average of all within-subject slopes was comparable to the between-subject slope, I calculated the means of within-subject slopes (i.e., "[s1-s3*0.211]" in Appendix) by averaging the between-subject slopes (i.e., 0.340, 0.247, and 0.047) that were already estimated.

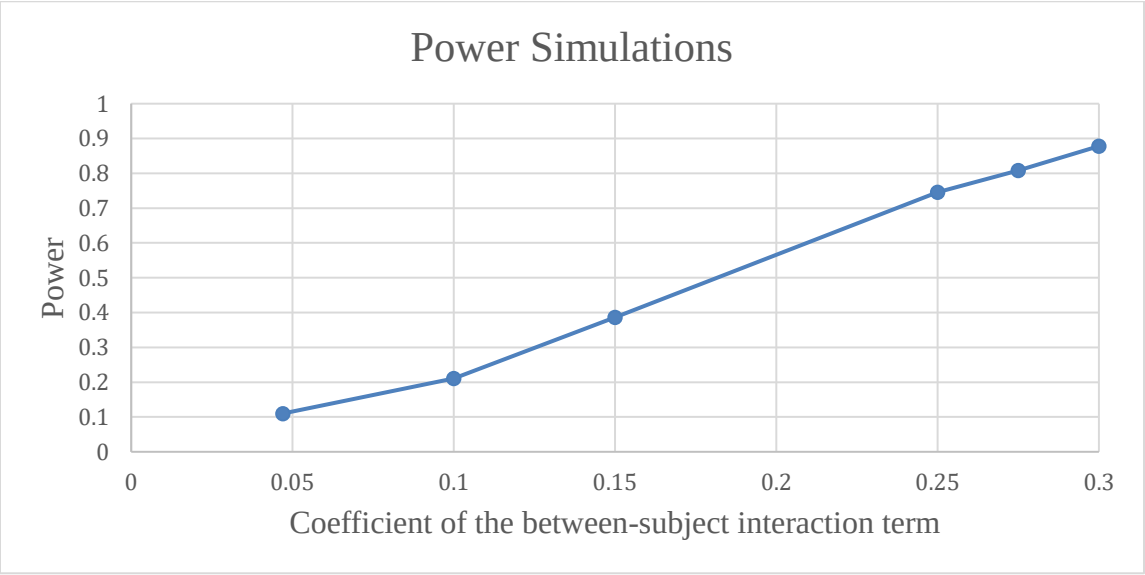
Results of conservative power simulations (i.e., using a within-subject slope variance of 0.5) are shown (Figure 1) for a prototypical predictor (i.e., conscientiousness). Power here was defined as the number of simulations in which effect sizes of interest are significant at $\alpha = 0.05$ level. Adequate power was defined as 0.80, according to guidelines by Cohen (1988). As sample size decreases, power to detect between-subject slopes remained adequate (at $N = 100$, power = 0.930) but power to detect within-subject slopes dropped precipitously (Fig. 1). To achieve a power of 0.80 to detect within-subject slopes, at least 110 participants would be needed to detect effects of most interest—within-subject and between-subject slopes. It is important to note that

Figure 1. The effect of varying sample sizes (x-axis) on power (y-axis).



though this may be due to the very small estimated slope (0.047) inputted into the simulation model. Figure 2 shows the effect of increasing the magnitude of this slope parameter from 0.047. Results show that a sample size of 110 has adequate power to detect between-subject interaction slope coefficients of at least |0.275| with a significance level of $\alpha = 0.05$.

Figure 2. The effect of varying the variance (x-axis) of the between-subject slope for the interaction term (i.e., conscientiousness x agreeableness) on power (y-axis).



Psychometric analyses. The psychometric analyses of the Modified Mini-Markers (M-MM) were less rigorous than that of the Momentary-Externalizing Spectrum Inventory (M-ESI). The former was modified from an existing measure wherein precedence existed for its use as a momentary personality state measure; the present study need only establish adequate factor structure. The latter was adapted from a much longer trait measure and is very different from that measure in many ways. Thus, psychometric analyses were more rigorous for the M-ESI.

In the pilot study, exploratory factor analyses of the M-MM extracted multiple possible solutions that varied by the number of factors extracted. Scree plots and substantive interpretations of factors were used to determine the optimal number of factors to use in the confirmatory factor analyses. Item-total correlations were calculated for each item and factor, wherein the deletion of items with low item-total correlations would result in higher Cronbach's alphas for the factor. In the interest of creating a short and feasible momentary measure, items that performed poorly (e.g., low factor loadings, many cross-loadings, low item-total correlations) were considered for elimination. Confirmatory factor analyses then compared a few plausible factor structures and that which best fit the data was used to structure the scales for the measure. The main study repeated exploratory factor analyses, used parallel analyses to determine the optimal number of factors, and repeated confirmatory factor analyses.

In the pilot study, exploratory factor analyses of the M-ESI extracted multiple possible solutions that varied by the number of factors extracted. Scree plots and substantive interpretations of factors were used to determine the optimal number of factors to use in the confirmatory factor analyses. In the interest of creating a short and feasible momentary measure, items that performed poorly (e.g., low factor loadings, many cross-loadings) were considered for elimination. Confirmatory factor analyses then compared a few plausible factor structures and

internal consistency, discriminant validity, and test-retest indicators were calculated for scales based on the most plausible factor structure. Informed by the results of the pilot study, the M-ESI underwent another round of item pool revision. The main study repeated exploratory factor analyses, used parallel analyses to determine the optimal number of factors, and repeated confirmatory factor analyses. Internal consistency and discriminative validity were investigated with scales based on the optimal structure from the main study.

With regard to selecting the optimal factor structure in the main study for both the M-MM and the M-ESI, it was decided that the structure chosen would have an equal number of within- and between-level factors. Calculating scale scores for use in the longitudinal analyses would require using only one set of factors, and would not allow for separate scale scores for within- and between-level factors. Because both the M-MM and M-ESI were temporally varying variables in longitudinal analyses, simple structure at the within-individual level was prioritized over simple structure at the between-individual level if they conflicted. Ultimately, optimal factor structure was chosen using a combination of empirically driven (e.g., fit indices, factor loadings) and construct validation approaches (e.g., item content, interpretability of factors).

Personality traits. Multiple linear regression models were conducted to investigate whether personality traits predict mean-level externalizing behaviors in a between-individual manner, controlling for the effects of gender and age. For the current study, PID-5 Antagonism and Disinhibition scale scores were added to yield a PID-5 DvC score. Full Models contained gender and age as covariates, four PID-5 traits (i.e., Negative Emotionality, Detachment, DvC, and Psychoticism), and a Negative Emotionality by DvC interaction term as independent variables, and Transgressive or Impulsive Behaviors as the dependent variable. In stepwise fashion, the least significant parameter was eliminated to form increasingly reduced models, until

only statistically significant parameters were left in the model. When the least significant main effect was involved in an interaction term that was not the second least significant parameter, the second least significant main effect was eliminated from the model.

Personality states. The current study sought to replicate findings (Fleeson & Gallagher, 2009) of the variation of personality states within individuals. The five M-MM scale scores (i.e., Neuroticism, Gregariousness, Sensation-Seeking, Agreeableness, and Conscientiousness) were transformed into percent-of-maximum-possible values such that scores range between 0 and 100, to control for the confounding influence of differing ranges of possible scores. Unconditional multilevel models were conducted and within-individual variance is divided by total variance to calculate the intraclass correlations (ICCs) for personality states.

Two-level models were conducted to evaluate the incremental utility of personality states over and above personality traits in predicting momentary externalizing behavior. In the Full and Fixed States Models, momentary externalizing was predicted by within-individual (Level 1) personality states and between-individual (Level 2) personality traits, the latter of which was in turn predicted by gender and age. The difference between the Full and Fixed States Model was that Level 1 predictors were random effects in the Full Model while they were fixed effects in the Fixed States Model. In the No States Model, momentary externalizing was only predicted by personality traits at Level 2, which was in turn predicted by gender and age. Note that the No States Model was still a two-level model, with momentary externalizing behavior having a random intercept. Since the series of three increasingly restrictive models (e.g., Full, Fixed States, No States) were nested within each other, likelihood ratio tests were conducted to test whether having additional sets of parameters increased the predictive utility of the model.

Table 4. Recoding categorical responses to situational factor variables into continuous and dichotomous variables for use in multilevel analyses.

Constraint Level		Social Context		Physical Exertion Level	
Nominal	Recode	Nominal	Recode	Nominal	Recode
Public social space	1	Stranger(s)	1	Inactivity	1
Bar/restaurant/dining	1	Coworker/customer	1	Work/school	2
Outside	2	Friend(s)	1	Phone	2
Car/bus/train	2	Roommate(s)	1	Commuting	2
Athletic space	2	Romantic partner	1	Leisure	3
Home	3	Family	1	Socializing	3
Someone else's home	3	Alone	0	Errands/chores	4
Work/school	4			Exercise	5
Public work space	4				
Place of worship	5				

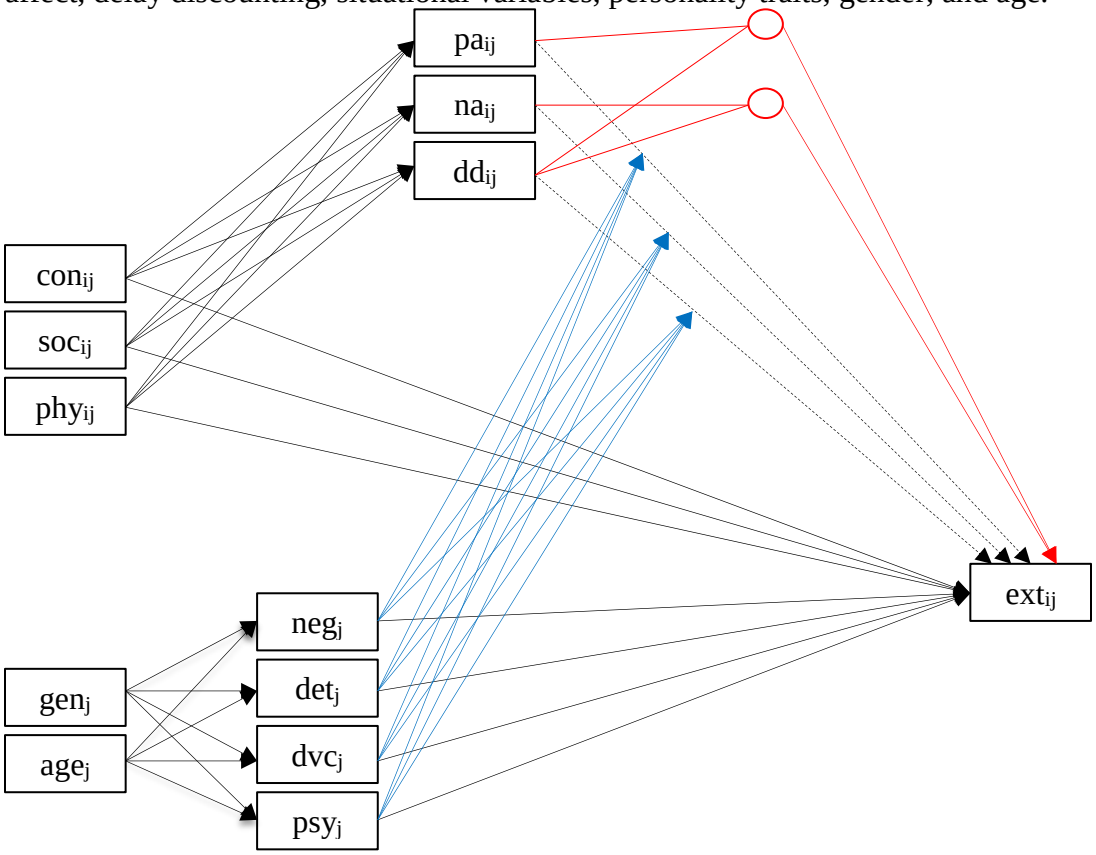
Candidate proximal processes. Nominal responses from participants to the three situational factors questions were recoded into continuous and dichotomous variables (Table 4) representing level of situational constraint, social context, and level of physical exertion to increase power to detect effects. The recoding of situational factor variables were rationally derived by the author of the current study, with the caveat that empirically derived criteria for situational constraint, social context, and level of physical exertion would be preferred. Delay discounting was represented by the log transformed delay discounting slope parameter, herein referred to as *log-k*. Please note that since *log-k* is calculated from a small number of observations (i.e., six items) at each occasion, measurement error may be an issue in the measure of delay discounting used in the current study. Unconditional multilevel models were conducted and within-individual variance is divided by total variance to calculate the ICCs for situational factors, momentary affect, and delay discounting. Changes in momentary affect were regressed onto momentary externalizing behaviors using time-lagged two-level models to investigate whether externalizing behaviors had affective consequences.

Time-dependent change in the candidate proximal mechanisms (i.e., situational context, mood, delay discounting) and the outcome variable (i.e., externalizing behavior) were described

and analyzed using multilevel modeling. These multilevel analyses modeled between-subject differences, within-individual variation over time, as well as cross-level interactions of individual differences and within-person change. Predictors and outcome variables are continuous, with the exception of gender and the situational variable of social context. Maximum likelihood estimation with robust standard errors was used. For each parameter estimate, effect sizes in the form of Cohen's *d* equivalents were calculated (Rosenthal & Rubin, 2003).

Predicting momentary externalizing behavior. The two-level models used in these analyses are graphically represented in Figure 3.

Figure 3. Predicting momentary externalizing behavior from positive and negative affect, delay discounting, situational variables, personality traits, gender, and age.



Graphical representation of two-level models used in predicting momentary externalizing behavior. Full Models include black and blue paths, with solid lines as fixed slopes and dashed lines as random slopes. In Fixed Slope Models, the dashed lines are fixed slopes and blue paths are excluded. Interaction Models include red paths and empty circles, which represent interaction terms between affect and delay discounting.

Full Models using random slopes. Two-level models were constructed to explore relationships between situational factors, delay discounting, momentary affect, personality traits, demographic variables, and momentary externalizing. These models were designed to be able to detect within-individual, between-individual, and cross-level relationships. Random slopes for within-individual predictors were used specifically to test for cross-level moderations of within-individual relationships by personality traits. Within-individual relationships in this model were represented by the following system of regression equations:

$$ext_{ij} = \beta_{0j} + \beta_{1j}\, pa_{ij} + \beta_{2j}\, na_{ij} + \beta_{3j}\, dd_{ij} + \beta_4\, con_{ij} + \beta_5\, soc_{ij} + \beta_6\, phy_{ij} + r_{ij} \quad (1)$$
$$pa_{ij} = \beta_{a1}\, con_{ij} + \beta_{a2}\, soc_{ij} + \beta_{a3}\, phy_{ij} + r_{aij} \quad (2)$$
$$na_{ij} = \beta_{b1}\, con_{ij} + \beta_{b2}\, soc_{ij} + \beta_{b3}\, phy_{ij} + r_{bij} \quad (3)$$
$$dd_{ij} = \beta_{c1}\, con_{ij} + \beta_{c2}\, soc_{ij} + \beta_{c3}\, phy_{ij} + r_{cij} \quad (4)$$

The dependent variable—Transgressive or Impulsive scale score—was represented by ext_{ij} and regressed onto momentary positive and negative affect as well as delay discounting. Random slopes of momentary affect (positive affect = pa_{ij} and negative affect = na_{ij}) and delay discounting (dd_{ij}) were specified by β_{1j}, β_{2j}, and β_{3j}, respectively. Fixed slopes of situational factors (constraint level = con_{ij}, social context = soc_{ij}, and physical exertion = phy_{ij}) were specified by β_4, β_5, and β_6. The random intercept was represented by β_{0j}. Within-individual level residual variances (r_{ij}, r_{aij}, r_{bij}, and r_{cij}) were assumed to be normally distributed. Momentary affect and delay discounting were additionally regressed onto situational factors, with fixed slopes represented by $\beta_{a1\text{-}a3}$, $\beta_{b1\text{-}b3}$, and $\beta_{c1\text{-}c3}$. Because within-individual level predictors were centered on the grand means of each predictor, the fixed intercepts in Equations 2 to 4 were zero.

Between-individual relationships were represented by the following system of equations:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}\, neg_j + \gamma_{02}\, det_j + \gamma_{03}\, dvc_j + \gamma_{04}\, psy_j + u_{0j} \quad (5)$$
$$\beta_{1j} = \gamma_{10} + \gamma_{11}\, neg_j + \gamma_{12}\, det_j + \gamma_{13}\, dvc_j + \gamma_{14}\, psy_j + u_{1j} \quad (6)$$
$$\beta_{2j} = \gamma_{20} + \gamma_{21}\, neg_j + \gamma_{22}\, det_j + \gamma_{23}\, dvc_j + \gamma_{24}\, psy_j + u_{2j} \quad (7)$$
$$\beta_{3j} = \gamma_{30} + \gamma_{31}\, neg_j + \gamma_{32}\, det_j + \gamma_{33}\, dvc_j + \gamma_{34}\, psy_j + u_{3j} \quad (8)$$

$$neg_j = \gamma_{a0} + \gamma_{a1}\, gen_j + \gamma_{a2}\, age_j + u_{aj} \quad (9)$$
$$det_j = \gamma_{b0} + \gamma_{b1}\, gen_j + \gamma_{b2}\, age_j + u_{bj} \quad (10)$$
$$dvc_j = \gamma_{c0} + \gamma_{c1}\, gen_j + \gamma_{c2}\, age_j + u_{cj} \quad (11)$$
$$psy_j = \gamma_{d0} + \gamma_{d1}\, gen_j + \gamma_{d2}\, age_j + u_{dj} \quad (12)$$

The random intercepts and slopes of Equation 1 were predicted by PID-5 traits (Negative Emotionality = neg_j, Detachment = det_j, DvC = dvc_j, and Psychoticism = psy_j) in Equations 5 through 8, with fixed slopes represented by $\gamma_{01\text{-}04}$, $\gamma_{11\text{-}14}$, $\gamma_{21\text{-}24}$, and $\gamma_{31\text{-}34}$. Fixed intercepts in Equations 5 through 8 were specified as γ_{00}, γ_{10}, γ_{20}, and γ_{30}. Between-individual level residual variances (u_{0j}-u_{3j} and u_{aj}- u_{dj}) were assumed to be normally distributed and u_{0j}-u_{3j} were allowed to correlate with each other. Personality traits were additionally regressed onto demographic variables gender (gen_j) and age (age_j), with fixed slopes represented by $\gamma_{a1\text{-}a2}$, $\gamma_{b1\text{-}b2}$, $\gamma_{c1\text{-}c2}$, and $\gamma_{d1\text{-}d2}$. Fixed intercepts in Equations 9 through 12 were specified as γ_{a0}, γ_{b0}, γ_{c0}, and γ_{d0}.

Fixed Slope Models. A second set of two-level models were constructed to test the necessity of using random slopes to predict momentary externalizing. The main difference between these models and the Full Models was β_{1j}, β_{2j}, and β_{3j} becoming fixed slopes β_1, β_2, and β_3. As a result, Equations 6 through 8 were not included in the Fixed Slope Models and no cross-level moderation effects were included.

Interaction Models. Two-level models were constructed to test the necessity of interaction effects between momentary affect and delay discounting. Two fixed slopes (β_7 and β_8) were added to Equation 1, representing the interaction between negative affect and *log-k* and positive affect and *log-k*, respectively. In interpreting the results from contrasting the Fixed Slope and Interaction models, predictors should be considered conditionally dependent if interaction effects are found. This would still be true if, for example, delay discounting was not a significant predictor when interaction effects were excluded, but became significant when interaction effects were included. This is because the presence of the interaction term

fundamentally changes the definition of each predictor's effect, such that the effect at some value of one predictor depends on the value of the other predictor. Since not including the interaction term would be misspecifying the model, one can infer moderation whenever an interaction term is significant regardless of whether or not the "main effect" is significant.

RESULTS

Psychometrics of the Modified Mini-Markers (M-MM)

Pilot item pool development and exploratory analyses. The initial item pool consisted of 40 Mini-Markers, 19 externalizing-relevant items selected from the original set of Goldberg (1992) markers, and 13 new externalizing-relevant items. Qualitative feedback from pilot respondents revealed many interpreted “warm” and “cold” as temperatures; thus, I eliminated these items. Exploratory factor analyses (EFAs) were performed on the remaining 70 items, the scree plot of which showed that a three-factor solution would be best (eigenvalues of one, two, three, four, five, and six factor solutions = 17.45, 8.54, 4.53, 3.34, 2.85, and 2.53, respectively). I extracted one-, two-, three-, four-, and five-factor solutions using promax rotation. Items were eliminated if they showed: (1) factor loadings below |0.40| across multiple solutions, (2) cross-loadings across multiple solutions, or (3) loadings onto semantically different or semantically unexpected factors across solutions. Items were considered especially problematic if these issues occurred within the three- or five-factor solutions. This resulted in the deletion of 20 items (see Table 5), leaving 50 items. These 50 items were grouped into five scales based on the five-factor solution and their item-total correlations were computed. Those with low item-total correlations were considered for elimination; however, this was balanced with comprehensive coverage of the construct. This resulted in the elimination of nine more items (see Table 5), leaving 41 items.

Pilot study confirmatory analyses. Since only the three- and five-factor EFA solutions had clear interpretations, confirmatory factor analyses (CFAs) were conducted with the final 41-item pool using three- and five-factor models. The five-factor model resembling the FFM of personality showed the best model fit (three-factor model: RMSEA = 0.093, AIC = 25666.112, BIC = 26052.794; five-factor model: RMSEA = 0.077, AIC = 25309.159, BIC = 25717.324).

Table 5. Items eliminated from the initial pilot item pool for the Modified Mini-Markers, with reasons for the elimination of items.

#	Adjective	Reason for elimination
1	Bashful	Low loadings (1F, 2F); cross loadings (3F, 5F)
6	Philosophical	Semantic
7	Cold	Feedback
8	Practical	Semantic
9	Complex	Semantic
12	Relaxed	Low loadings (3F, 4F)
15	Deep	Semantic
16	Shy	Low loadings (1F, 2F); cross loadings (5F)
17	Disorganized	Low IT correlation (conscientiousness)
30	Uncreative	Low IT correlation (openness/sensation-seeking)
32	Unenvious	Low loadings (1F, 2F, 3F, 4F)
33	Inefficient	Low IT correlation (conscientiousness)
34	Unintellectual	Low loadings (2F, 3F)
35	Intellectual	Cross loadings (3F)
36	Unsympathetic	Low IT correlation (agreeableness)
38	Warm	Feedback
40	Withdrawn	Semantic
42	Unrestrained	Semantic
44	Inhibited	Low IT correlation (neuroticism)
45	Unadventurous	Low IT correlation (openness/sensation-seeking)
50	Distrustful	Low loadings (3F, 4F)
51	Selfish	Semantic
55	Careful	Cross loadings (2F, 4F, 5F)
56	Undependable	Low IT correlation (conscientiousness)
57	Negligent	Cross loadings (3F)
58	Haphazard	Low IT correlation (conscientiousness)
60	Cautious	Semantic
64	Dependable	Cross loadings (5F)
67	Distractible	Low IT correlation (conscientiousness)
68	Rash	Cross loadings (3F)
71	Indulging	Low loadings (1F, 2F, 3F, 4F, 5F)

The initial item pool consisted of: Items 1 to 40 from Saucier's (1994) Mini-Markers, Items 41 to 59 from Goldberg's (1992) original set of 100 markers, and Items 60 through 72 that were added by the current author. Feedback = negative participant feedback. Low or cross loadings = low or cross-loadings (solutions in which this problem was encountered are presented in brackets; for example, "1F" indicates the one-factor solution). Semantic = loaded on semantically different or unexpected factors across solutions. Low IT correlation = low correlation between the item and its scale as determined by the five-factor solution (presented in brackets).

Table 6. Confirmatory factor analysis of the Modified Mini-Markers showing factor loadings of the pilot study's best-fitting five-factor solution.

#	Item	Estimate (S.E.)	#	Item	Estimate (S.E)
	Neuroticism			*Conscientiousness*	
2	Moody	.693 (.058)	4	Organized	.741 (.055)
14	Rude	.652 (.058)	5	Careless	-.549 (.073)
23	Envious	.515 (.082)	18	Sloppy	-.649 (.067)
26	Temperamental	.837 (.032)	19	Efficient	.766 (.043)
27	Fretful	.655 (.055)	22	Systematic	.597 (.070)
28	Touchy	.809 (.039)	53	Prompt	.589 (.061)
29	Harsh	.673 (.051)	54	Thorough	.708 (.060)
37	Jealous	.448 (.080)	61	Persevering	.535 (.064)
52	Demanding	.667 (.055)	62	Distracted	-.515 (.083)
59	Irritable	.629 (.064)	63	Productive	.713 (.062)
70	Regretful	.491 (.078)	65	Planful	.622 (.071)
	Extraversion		69	Purposeful	.677 (.078)
10	Quiet	-.653 (.076)		*Openness/Sensation-Seeking*	
24	Talkative	.842 (.050)	3	Bold	.618 (.076)
25	Extraverted	.835 (.049)	13	Creative	.680 (.059)
46	Reserved	-.488 (.093)	21	Energetic	.783 (.055)
	Agreeableness		31	Imaginative	.686 (.063)
11	Cooperative	.707 (.064)	41	Daring	.631 (.070)
20	Sympathetic	.763 (.041)	43	Active	.755 (.056)
39	Kind	.845 (.041)	66	Adventurous	.718 (.055)
47	Considerate	.854 (.056)	72	Impulsive	.396 (.104)
48	Helpful	.825 (.042)			
49	Trustful	.610 (.059)			

Numbers (#) represent item number from initial item pool. All loadings are significant at $p \leq 0.05$.

Notably, sensation-seeking items (e.g., bold, adventurous) loaded onto the same factor as openness-to-experience items (e.g., creative, imaginative) in this five-factor model. The five scale structure (see Tables 6 and 7) was chosen for the M-MM to maintain consistency with past personality literatures (i.e., the FFM of personality traits). Further, narrower constructs provided more precision to detect specific associations with other constructs.

Table 7. Confirmatory factor analysis of the Modified Mini-Markers showing bivariate factor correlations of the pilot study's best-fitting five-factor solution.

	2	3	4	5
1. N	-.303 *	-.336 *	.234 *	.057
2. C		.616 *	.244 *	.434 *
3. A			.318 *	.534 *
4. E				.630 *
5. O/SS				

N = Neuroticism, C = Conscientiousness, A= Agreeableness, E = Extraversion, and O/SS = Openness-to-Experience/Sensation-Seeking. * denotes $p \leq 0.05$.

Table 8. Comparison of empirical and simulated eigenvalues for the Modified Mini-Markers.

Empirical Eigenvalues from Exploratory Factor Analysis		Simulated Eigenvalues from Parallel Analysis	
Within-Level	Between-Level	Within-Level	Between-Level
8.322	**19.260**	1.332	3.030
4.267	**9.543**	1.276	2.526
2.328	**2.370**	1.243	2.205
1.486	1.241	1.220	2.016
1.227	0.935	1.199	1.869
1.123	0.803	1.181	1.753
1.039	0.738	1.165	1.655
0.989	0.603	1.149	1.570
0.945	0.550	1.136	1.492
0.917	0.497	1.123	1.426

Eigenvalues on the left were estimated from exploratory factor analysis of the dataset. Ninety-five percentile eigenvalues on the right were derived from 1000 Monte Carlo simulation iterations of the dataset. Bolded eigenvalues indicate the empirical eigenvalues are higher than the simulated eigenvalues.

Main study exploratory analyses. A parallel analysis was conducted using R 3.2.3 and 1000 Monte Carlo simulation iterations (Table 8). Ninety-five percentile eigenvalues from the parallel analysis indicated that a five-factor solution would be optimal at the within-individual level and a three-factor solution would be optimal at the between-individual level. Two-level EFAs were conducted using Mplus 6.1, MLR estimator, and geomin rotation. Four factor structures (three- to six-factor models) were investigated, whose fit indices are shown in Table 9. Root mean square error of approximations (RMSEAs; MacCallum, Browne, & Sugawara, 1996) from all EFAs indicated good fit. Comparative fit indices (AIC, BIC, CFI, and TLI) indicated that models that extracted increased number of factors had better fit to the data. In addition to these fit indices, it is important to include substantive considerations about items content and interpretability of factors when choosing between three- through six-factor models.

Table 9. Fit indices for exploratory factor analyses of Modified Mini-Markers.

# of Factors		# of Parameters	RMSEA	CFI	TLI	AIC	BIC	LL
Within	Between							
3	3	363	0.031	0.863	0.839	484597	486791	-241936
4	4	439	0.027	0.899	0.875	483015	485668	-241068
5	5	513	0.024	0.923	0.900	482109	485210	-240542
6	6	585	0.023	**0.937**	**0.912**	**481501**	**485037**	-240165

Bolded fit indices represent best-fitting models according to that particular incremental fit index. Absolute fit indices are never bolded because they cannot be compared to each other in the same way as incremental fit indices. # = number. RMSEA = root mean square error of approximation. CFI = comparative fit index. TLI = Tucker-Lewis index. AIC = Akaike information criterion. BIC = Bayesian information criterion. LL = log-likelihood.

Main study item pool refinement. Tables 10 through 13 show factor loadings for the three- through six-factor EFAs. Loadings denoted with superscript "a" represented those that are clearly secondary to the highest cross-loading in the same model and level, indicating subsequent analyses should place the item on the factor that is consistent with the primary loading. However, it was more unclear where items should be placed when loadings are denoted with superscripts "b" and "c," because they indicate items exhibiting similar magnitude cross-loadings or failing to load at a |0.35| magnitude. Thus, items denoted by numerous "b" and "c" superscripts at the within-individual level (i.e., "sympathetic," "careless," "distracted," "bold," "imaginative," and "impulsive") were eliminated from subsequent CFAs.

Other items were retained or eliminated due to construct validity considerations. Even though "quiet" and "reserved" showed cross-loadings at the between-individual level, it was retained because it showed clear and consistent loadings on the same within-level factor as other items of similar semantic content (e.g., "talkative," "extraverted"). "Energetic" was eliminated because it showed unstable loadings, loading with items measuring sensation-seeking (e.g., "active," "daring," "adventurous") in some EFAs but with items measuring gregariousness (e.g. "quiet," "talkative," "extraverted") in other EFAs. Though "sloppy" did not show cross-loadings

Table 10. Modified Mini-Markers' three-factor exploratory factor analysis loadings.

	Within-Level Loadings			Between-Level Loadings		
	DvC	E	N	PSE	NSE	A
cooperative	0.60		[a]-0.10	0.82		[a] 0.34
sympathetic	0.40			0.69	[a] 0.19	[a] 0.37
kind	0.50	[a] 0.16	[a]-0.12	0.74		[a] 0.53
considerate	0.56		[a]-0.09	0.73		[a] 0.58
helpful	0.60		[a]-0.10	0.79		[a] 0.45
trustful	0.53		[a]-0.11	0.74		[a] 0.45
organized	0.66	[a]-0.08		0.78		
productive	0.67		[a]-0.07	0.95	[a]-0.14	
planful	0.66	[a]-0.12		0.90		
purposeful	0.61			0.93		
careless	[a]-0.14		[c] 0.28		0.73	
sloppy	[a]-0.12		0.43		0.85	
efficient	0.67			0.95	[a]-0.15	
systematic	0.60		[a] 0.07	0.84		
prompt	0.52		[a] 0.06	0.71	[a] 0.19	
thorough	0.68	[a]-0.08		0.83		[a] 0.12
persevering	0.51		[a] 0.13	0.81		
distracted			[c] 0.24		0.85	[a] 0.34
quiet	[a] 0.42	-0.67			[b] 0.32	0.40
talkative		0.73		0.66	[a] 0.29	
extraverted		0.64	0.09 [a]	0.67	[a] 0.26	
reserved	[a] 0.37	-0.50	[a] 0.17	[b] 0.38	0.45	[a] 0.33
moody		[a]-0.23	0.49	[a]-0.16	0.81	
irritable		[a]-0.21	0.57	[a]-0.17	0.93	
regretful		[a]-0.11	0.46		0.92	
rude	[a]-0.11		0.56		0.87	[a]-0.24
envious			0.45		0.83	
temperamental			0.61		0.79	
fretful			0.52		0.92	
touchy			0.45		0.80	
harsh	[a]-0.11		0.64		0.83	[a]-0.26
jealous			0.48		0.88	
demanding	[a] 0.09	[a] 0.12	0.42	[a] 0.27	0.64	[a]-0.23
bold	[b] 0.25	[c] 0.29	[a] 0.16	0.78	[a] 0.18	[a]-0.22
creative	0.39	[a] 0.26		0.84		
energetic	[a] 0.28	0.52		0.95		
imaginative	[b] 0.30	[c] 0.30	[a] 0.07	0.72	[a] 0.25	
daring	[a] 0.09	0.41	[a] 0.25	0.63	[a] 0.40	[a]-0.28
active	[b] 0.33	0.42		0.89		[a]-0.30
adventurous	[a] 0.16	0.46	[a] 0.15	0.76	[a] 0.19	[a]-0.27
impulsive		[c] 0.34	[b] 0.33	[a] 0.22	0.75	

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses (e.g., confirmatory factor analyses). DvC = Disinhibition-versus-Constraint. E = Extraversion. N = Neuroticism. PSE = Positive Self Evaluation. NSE = Negative Self Evaluation. A = Agreeableness.

[a] |secondary loading| differing by > 0.1 from the |highest cross-loading| within same model and level.

[b] |secondary loading| differing by ≤ 0.1 from the |highest cross-loading| within same model and level.

[c] highest or only |factor loading| within model and level that is < |0.35|, even if statistically significant.

Table 11. Modified Mini-Markers' four-factor exploratory factor analysis loadings.

	Within-Level Loadings				Between-Level Loadings			
	E	N	C	A	PSE	NSE	O	A
cooperative		[a]-0.06	[c] 0.34	[b] 0.33	0.84			[a] 0.33
sympathetic	[a] 0.07	[a] 0.08	[a] 0.12	[c] 0.34	0.75			[a] 0.29
kind	[a] 0.13	[a]-0.06		0.57	0.77			[a] 0.53
considerate				0.68	0.77			[a] 0.54
helpful	[a] 0.06	[a]-0.04	[a] 0.15	0.57	0.83			[a] 0.42
trustful		[a]-0.05		0.64	0.76	[a]-0.10		[a] 0.42
organized			0.59	[a] 0.09	0.81			
productive		[a]-0.07	0.76		0.96	[a]-0.16		
planful	[a]-0.08		0.60		0.92			
purposeful	[a] 0.07		0.56		0.94			
careless		[c] 0.29	[b]-0.25	[a] 0.12		0.71	[a] 0.18	
sloppy		0.44	[a]-0.18			0.83	[a] 0.17	
efficient	[a] 0.06	[a]-0.04	0.69		0.97	[a]-0.19		
systematic		[a] 0.09	0.58		0.87			
prompt		[a] 0.09	0.36	[a] 0.20	0.78			
thorough			0.54	[a] 0.17	0.90			
persevering		[a] 0.16	0.37	[a] 0.17	0.86			
distracted		[c] 0.27	[a]-0.15	[b] 0.23		0.85		[a] 0.34
quiet	-0.64	[a] 0.15	[a] 0.11	[a] 0.28		[c] 0.33		
talkative	0.69				0.61	[a] 0.27	[a] 0.28	
extraverted	0.61	[a] 0.07	[a] 0.10		0.68	[a] 0.22		
reserved	-0.49	[a] 0.24		[a] 0.34	0.49	[b] 0.41		
moody	[a]-0.20	0.50		[a]-0.09		0.81		
irritable	[a]-0.19	0.58				0.93		
regretful	[a]-0.11	0.48		[a] 0.07		0.92		
rude		0.55	[a] 0.06	[a]-0.25		0.85		[a]-0.25
envious		0.45				0.83		
temperamental		0.61				0.77		
fretful	[a]-0.06	0.53				0.91		
touchy	[a] 0.09	0.45	[a]-0.07	[a] 0.09		0.79		
harsh	[a] 0.06	0.62		[a]-0.22		0.80		[a]-0.29
jealous		0.48				0.88		
demanding	[a] 0.14	0.41	[a] 0.12		[a] 0.28	0.61		[a]-0.27
bold	[c] 0.29	[a] 0.15	[b] 0.29		0.80			[a]-0.28
creative	[a] 0.24		0.35		0.78		[a] 0.52	
energetic	0.52		[a] 0.37		0.91			
imaginative	[c] 0.28	[a] 0.08	[b] 0.23	[a] 0.14	0.65		[b] 0.57	
daring	0.39	[a] 0.24		[a] 0.09	0.63	[a] 0.33		[a]-0.31
active	0.42		[b] 0.36		0.85			
adventurous	0.44	[a] 0.14	[a] 0.14	[a] 0.08	0.72			
impulsive	[c] 0.32	[c] 0.32			[a] 0.21	0.72	[a] 0.14	

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts (see Table 10's caption) denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses. E = Extraversion. N = Neuroticism. C = Conscientiousness. A = Agreeableness. PSE = Positive Self Evaluation. NSE = Negative Self Evaluation. O = Openness-to-Experience.

Table 12. Modified Mini-Markers' five-factor exploratory factor analysis loadings.

	Within-Level Loadings					Between-Level Loadings				
	M/C	N	E	A	C	PSE	NSE	M/C	M/C	J
cooperative	0.48			[a] 0.26		0.85			[a] 0.33	
sympathetic	[b] 0.22	[a] 0.09		[c] 0.30		0.75	[a] 0.19		[a] 0.29	
kind		[a]-0.06		0.53		0.79			[a] 0.53	
considerate				0.66		0.79			[a] 0.54	
helpful			[a] 0.06	0.57	[a] 0.19	0.84			[a] 0.41	
trustful		[a]-0.04		0.63	[a] 0.09	0.78			[a] 0.42	
organized	0.45				[a] 0.30	0.81				
productive	[a] 0.22	[a]-0.07			0.61	0.95	[a]-0.13			
planful				[a] 0.13	0.58	0.91				
purposeful			[a] 0.09	[a] 0.12	0.52	0.93				
careless		[c] 0.29			[b]-0.29		0.68			
sloppy		0.44			[a]-0.18		0.82	[a] 0.18		
efficient	0.49	[a]-0.04			[a] 0.37	0.97				
systematic	[a] 0.27	[a] 0.09			0.39	0.86				
prompt		[a] 0.09		[a] 0.23	0.40	0.77				
thorough				[a] 0.22	0.56	0.88		[a]-0.19		
persevering		[a] 0.16		[a] 0.20	0.37	0.84				
distracted		[c] 0.28		[b] 0.22			0.82		[a] 0.31	
quiet		[a] 0.18	-0.68	[a] 0.21			[c] 0.34			
talkative			0.64			0.62	[a] 0.25	[a] 0.29		
extraverted			0.55			0.67	[a] 0.23			
reserved		[a] 0.25	-0.49	[a] 0.28		0.47	[b] 0.44			
moody		0.50	[a]-0.19	[a]-0.10			0.80			
irritable		0.58					0.93			
regretful		0.48					0.93			[a] 0.29
rude		0.54		[a]-0.24			0.86		[a]-0.26	
envious		0.45					0.91			[a] 0.55
temperamental		0.61		[a]-0.09			0.77			
fretful		0.53					0.91			
touchy		0.45	[a] 0.08				0.79			
harsh		0.62	[a] 0.07	[a]-0.21			0.80		[a]-0.31	
jealous		0.48					0.96			[a] 0.52
demanding		0.41	[a] 0.17		[a] 0.19	[a] 0.26	0.60		[a]-0.30	
bold	0.37	[a] 0.15				0.78			[a]-0.28	
creative	0.57					0.78		[a] 0.54		
energetic	[b] 0.40		0.44		[a] 0.12	0.90				
imaginative	0.40	[a] 0.08				0.65		[b] 0.60		
daring		[a] 0.23	0.35	[a] 0.08		0.60	[a] 0.33		[a]-0.33	
active			0.36		[a] 0.17	0.85			[a]-0.26	
adventurous		[a] 0.13	0.42	[a] 0.11		0.71			[a]-0.26	
impulsive		[b] 0.31	[c] 0.32	0.07		[a] 0.20	0.70	[a] 0.18		

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts (see Table 10's caption) denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses. Factors were considered strong factors if they consisted of significant primary loadings from items that were retained and showed replicability across multiple factor solutions. If a factor did not meet these expectations, they are labeled in these tables with "M/C" for Mixed Content. N = Neuroticism. E = Extraversion. A = Agreeableness. C = Conscientiousness. PSE = Positive Self Evaluation. NSE = Negative Self Evaluation. J = Jealousy.

Table 13. Modified Mini-Markers' six-factor exploratory factor analysis loadings.

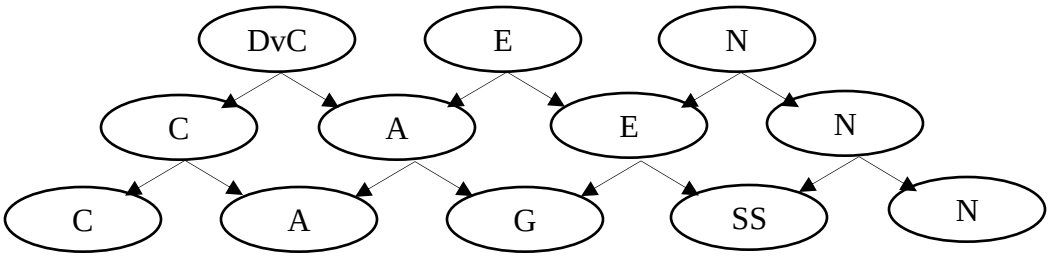
	Within-Level Loadings						Between-Level Loadings					
	M/C	N	G	A	C	SS	PSE	NSE	J	M/C	M/C	A
cooperative	0.47			[a] 0.25			0.74					[a] 0.36
sympathetic	[b] 0.21	[a] 0.07		[c] 0.31			0.66					[a] 0.30
kind	[a] 0.14	[a]-0.07		0.55			[b]0.60					0.62
considerate				0.67			0.61			[a] 0.15		[b] 0.59
helpful			[a] 0.08	0.63	[a] 0.20		0.68					[a] 0.51
trustful		[a]-0.06		0.62	[a] 0.09		[b]0.59					0.59
organized	0.44		[a]-0.08		[a] 0.31		0.71					
productive	[a] 0.20				0.62		0.91					
planful			[a]-0.12		0.59	[a] 0.14	0.88					
purposeful					0.53	[a] 0.22	0.92					
careless		[b] 0.22	[a]-0.10		[c]-0.29	[a] 0.17						
sloppy		0.38	[a]-0.09		[a]-0.18	[a] 0.12			0.48			
efficient	0.48				[b] 0.39		0.92					
systematic	[a] 0.27	[a] 0.15			0.40		0.89					
prompt		[a] 0.09		[a] 0.22	0.39		0.76					
thorough				[a] 0.18	0.55		0.88					
persevering		[a] 0.12		[a] 0.15	0.37	[a] 0.16	0.89					
distracted		[c] 0.22	[a]-0.09	[b] 0.19						0.49		
quiet	[a] 0.26		-0.66									
talkative		[a] 0.09	0.64	[a] 0.29			0.53					[a] 0.26
extraverted		[a] 0.09	0.49	[a] 0.20			0.64					
reserved		[a] 0.16	-0.52	[a] 0.13						0.62		
moody		0.53						0.91				
irritable	[a]-0.10	0.60	[a]-0.10					0.73		[a] 0.32		
regretful		0.43	[a]-0.15						0.71			
rude		0.55		[a]-0.21				0.52	[b]0.43			[a]-0.18
envious		0.47							1.01			
temperamental		0.67				[a]-0.15		0.85				
fretful		0.53							0.39	[a] 0.24		
touchy		0.43		[a] 0.10				0.65				
harsh		0.61		[a]-0.17				0.66	[a]0.30			
jealous		0.46							1.00			
demanding	[a]-0.10	0.37			[a] 0.18	[a] 0.18	[a]0.25	0.67				
bold	[c] 0.32	[a] 0.08		[a]-0.07		[b] 0.32	0.77	[a]0.33				
creative	0.53					[a] 0.26	0.80				[a]0.52	
energetic	[b] 0.31		[c] 0.34		[a] 0.14	[a] 0.21	0.88					
imaginative	0.36					[b] 0.29	0.66				[b]0.60	
daring		[a] 0.11				0.46	0.60	[a]0.49				
active	[c] 0.24		[b] 0.24		[b] 0.18	[b] 0.22	0.83			[a]-0.27		
adventurous					[a] 0.12	0.63	0.69					
impulsive	[a]-0.10	[a] 0.20				0.40		0.57				

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts (see Table 10's caption) denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses. Factors were considered strong factors if they consisted of significant primary loadings from items that were retained and showed replicability across multiple factor solutions. If a factor did not meet these expectations, they are labeled in these tables with "M/C" for Mixed Content. N = Neuroticism. G = Gregariousness. A = Agreeableness. C = Conscientiousness. SS = Sensation-Seeking. PSE = Positive Self Evaluation. NSE = Negative Self Evaluation. J = Jealousy.

or fail to load, it was eliminated because it consistently loaded with items that typically measure negative emotionality. The remaining items were examined in the interpretation of factors.

Interpretation of main study factor analyses. On the within-individual level, interpretation of most factors are consistent with well-known personality constructs. Within-level factors in the three-factor model can be interpreted as DvC, Extraversion, and Neuroticism. In the four-factor model, DvC seems to split into Conscientiousness and Agreeableness. In the five-factor model, Factors 2 to 5 correspond to the four-factor model, but Factor 1 seems to consist of positive self-descriptors that lack coherence as personality constructs. In the six-factor model, Extraversion breaks into Gregariousness and Sensation-Seeking. It should be noted that primary loadings of "creative" in both the five- and six-factor models are on Factor 1, which contained very mixed content. Taking this finding in combination with the typical conceptualization of "creative" as an indicator of Intellect, it was eliminated from subsequent analyses because of a lack of items with similar semantic content. Figure 4 graphically shows the within-level factor structure of the M-MM at different levels of abstraction.

Figure 4. Within-level EFA factor structure of the Modified Mini-Markers.



DvC = Disinhibition-versus-Constraint. E = Extraversion. N = Neuroticism. C = Conscientiousness. A = Agreeableness. G = Gregariousness. SS = Sensation-Seeking.

On the between-individual level, two factors consistently appeared across EFAs: Positive and Negative Self Evaluation. As the number of between-level factors increased past two factors, additional factors seem to demonstrate a combination of undesirable characteristics. All of these additional factors contain none or few primary loadings amidst many secondary or similar magnitude cross-loadings. This characteristic on its own would not be undesirable, as it may simply indicate specific variance in certain items over and above the first two factors. However, the items that comprise these factors tend to be unstable (i.e., loading on different factors as additional factors are extracted). The item content of these factors also fail to correspond to previously studied personality constructs or tend to correspond to very narrowband constructs (e.g., Jealousy). These results suggest that the way that personality states covary within individuals over time may differ from the way that person-specific mean levels of states vary between individuals, and that the latter shows a two-factor structure.

Table 14. Fit indices for confirmatory factor analyses of Modified Mini-Markers.

# of Factors		# of Parameters	RMSEA	CFI	TLI	AIC	BIC	LL
Within	Between							
3	2	164	0.041	0.788	0.772	379989	380980	-189831
4	2	167	0.037	0.822	0.809	378870	379879	-189268
5	2	171	0.036	**0.840**	**0.827**	**378328**	**379361**	-188993

Bolded fit indices represent best-fitting models according to that particular incremental fit index. Absolute fit indices are never bolded because they cannot be compared to each other in the same way as incremental fit indices. # = number. RMSEA = root mean square error of approximation. CFI = comparative fit index. TLI = Tucker-Lewis index. AIC = Akaike information criterion. BIC = Bayesian information criterion. LL = log-likelihood.

Main study confirmatory analyses. Three CFAs were compared: three-, four, and five-factor models (see Table 14 for fit indices). Item content of factors were determined using a combination of parallel analysis results, EFA results, and previous research about personality constructs. Within-level factor content varied by model, but the same two between-level factors

(e.g., Positive and Negative Self Evaluation) remained consistent across models. The best-fitting model consisted of five within-level factors: Conscientiousness, Agreeableness, Gregariousness, Sensation-Seeking, and Neuroticism (see Table 15 for item loadings). Scale scores for subsequent analyses were created by summing the items on each of these five scales.

Table 15. Confirmatory factor analysis of the Modified Mini-Markers showing factor loadings of the main study's optimal factor structure.

Within-Level Factor Loadings (S.E.)				Between-Level Factor Loadings (S.E.)			
N		C		PSE		NSE	
moody	.515 (.029)	organized	.597 (.024)	cooperative	.914 (.025)	moody	.719 (.047)
irritable	.595 (.027)	productive	.687 (.021)	kind	.894 (.029)	irritable	.832 (.034)
regretful	.461 (.027)	planful	.642 (.025)	considerate	.915 (.026)	regretful	.884 (.026)
rude	.551 (.028)	purposeful	.660 (.023)	helpful	.934 (.020)	rude	.913 (.020)
envious	.444 (.031)	efficient	.674 (.021)	trustful	.862 (.041)	envious	.879 (.033)
temperamental	.629 (.026)	systematic	.600 (.022)	organized	.802 (.049)	temperamental	.813 (.041)
fretful	.528 (.025)	prompt	.540 (.029)	productive	.926 (.017)	fretful	.896 (.020)
touchy	.435 (.050)	thorough	.667 (.021)	planful	.913 (.020)	touchy	.811 (.035)
harsh	.630 (.026)	persevering	.548 (.032)	purposeful	.899 (.021)	harsh	.906 (.021)
jealous	.478 (.032)	G		efficient	.923 (.020)	jealous	.904 (.029)
demanding	.397 (.028)	talkative	.821 (.022)	systematic	.847 (.032)	demanding	.762 (.049)
A		extraverted	.701 (.041)	prompt	.786 (.050)	quiet	.315 (.081)
cooperative	.582 (.031)	quiet	-.418 (.043)	thorough	.884 (.032)	reserved	.499 (.072)
kind	.667 (.024)	reserved	-.268 (.046)	persevering	.823 (.034)		
considerate	.704 (.022)	SS		talkative	.762 (.090)		
helpful	.737 (.021)	daring	.551 (.028)	extraverted	.735 (.053)		
trustful	.660 (.028)	active	.684 (.019)	daring	.616 (.062)		
		adventurous	.587 (.028)	active	.792 (.039)		
				adventurous	.694 (.050)		

All factor loadings were statistically significant at $p \leq 0.05$. N = Neuroticism. A = Agreeableness. C = Conscientiousness. G = Gregariousness. SS = Sensation-Seeking. PSE = Positive Self Evaluation. NSE = Negative Self Evaluation. Within-level factor correlations (* denotes $p \leq 0.05$): $r_{N\text{-}A}$ = -.088, $r_{N\text{-}C}$ = .099*, $r_{N\text{-}G}$ = -.053, $r_{N\text{-}SS}$ = .102*, $r_{A\text{-}C}$ = .855*, $r_{A\text{-}G}$ = .808*, $r_{A\text{-}SS}$ = .582*, $r_{C\text{-}G}$ = .714*, $r_{C\text{-}SS}$ = .663*. Between-level factor correlations (* denotes $p \leq 0.05$): $r_{PSE\text{-}NSE}$ = .238*.

Table 16. Pilot item pool development for the Momentary-Externalizing Spectrum Inventory.

#	Item Name	Item Content
1a	Alcohol use	I drank alcohol.
1b	*Alcohol problems*	… Even though it will lead to problems in my life.
2a	Marijuana use	I used marijuana.
2b	*Marijuana problems*	… Even though it will lead to problems in my life.
3a	Drug use	I used drugs for non-medical purposes.
3b	*Drug problems*	… Even though it will lead to problems in my life.
4	Dependability	I was late to or failed to keep a commitment (e.g., appointment, project deadline, promise, work).
5	Destructive aggression	I destroyed (vandalized, set fire to, or ~~otherwise~~ broke) some~~one else's~~ thing~~s~~ intentionally.
6	Excitement seeking	I did something risky just for the thrill.
7	Honesty	I lied.
8	Fraud	I took advantaged of somebody or misrepresented myself to get something I wanted (e.g., money, things, sex, favors).
9	Impatient urgency A	I acted on an urge I couldn't control.
10	Irresponsibility A	I did something I shouldn't have (e.g., spent more money than I meant to, drove too fast or dangerously).
11	*Irresponsibility B*	I neglected to do something I should have (e.g., forgetting to pay bills, stood somebody up, missed an assignment or exam at school).
12	Physical aggression	I got into a physical fight.
13	*Planful control A*	I thought carefully about a decision before I acted.
14	*Planful control B*	I thought things over before I did them.
15	*Problematic impulsivity A*	I jumped into something without thinking.
16	Problematic impulsivity B	I made a "spur of the moment" decision.
17	Rebelliousness	I broke rules or disobeyed authority.
18	Relational aggression	I insulted, spread rumors about, or excluded someone ~~I dislike~~.
19	Theft	I stole something.
20	*Alienation*	I felt mistrustful of other people.
21	*Boredom proneness*	I felt bored.
22	*Blame externalization*	I was unfairly blamed.
23	*Empathy*	I cared about someone else's feelings.
24	*Impatient urgency B*	Nothing else seems important except for what I want to do right now.
25	Hit	I hit something in anger.
26	Lost temper	I lost my temper.
27	Argument	I got into an argument with someone.
28	Threaten	I threatened someone.
29	Acted on whim	I did something (e.g., went out, skipped class, bought something) on a whim.
30	Leisure over work	I spent time on leisure activities (e.g., playing video games, watching TV) longer than I meant to.
31	Clean	I picked up my work or living space.
32	Work over leisure	I did work instead of hanging out.
33	Blew off work	I blew off my homework.
34	Waited to confront	I waited to talk to someone I was mad at.
35	Unprotected sex	I had unprotected sex.
36	Hook up	I hooked up with someone I didn't know well.

The initial item pool development yielded items 1 through 24, adapted from the Externalizing Spectrum Inventory (Krueger et al., 2007). Items 1a + 1b, 2a + 2b, and 3a + 3b were summed into Items 1, 2, and 3. Italicized items were eliminated from the item set for the M-ESI. Item refinement at the end of the pilot study resulted in changes in red, including the addition of items 25 through 36.

Psychometrics of the Momentary-Externalizing Spectrum Inventory (M-ESI)

Pilot item pool development. The initial item pool was created by adapting facets of the Externalizing Spectrum Inventory (ESI; Krueger et al., 2007), such that each facet was translated into an item measuring prototypical behaviors (Table 16). For example, the Alcohol Use facet yielded momentary item, "I drank alcohol." The Destructive Aggression facet yielded the item, "I destroyed (vandalized, set fire to, or otherwise broke) someone else's things intentionally." Multiple items were created from certain facets to enable selection of the best functioning item. For example, it was not immediately obvious how to optimally represent ESI's Problematic Impulsivity facet. The two items created for it were, "I jumped into something without thinking," and "I made a 'spur of the moment' decision." Substance use problems were initially created as dependent items that would appear if participants answered the "use" items affirmatively.

Results from the pilot study showed that some items had more desirable psychometric properties, while other items needed revisions supported by the pilot analyses. Due to limited variance of all substance use or substance use problems in the pilot dataset, Items 1a and 1b were summed into a single Alcohol Use item, 2a and 2b were summed into a single Marijuana Use item, and 3a and 3b were summed into a single Drug Use item. Further, because some items sampled severe externalizing behaviors (e.g., drug use, destructive aggression) and were rarely endorsed, these items showed extreme floor effects. In order to mitigate this problem, M-ESI data from the pilot study were analyzed using multilevel modeling, using participant identification number as the clustering variable to account for similarities within-individuals.

Pilot study exploratory analyses. EFAs were performed on the resulting M-ESI items using promax rotation, extracting one- to five-factor solutions. The scree plot showed that a one-factor solution would be best (eigenvalues for one, two, three, four, five, and six factor solutions

= 6.354, 2.047, 1.864, 1.590, 1.291, and 1.179, and respectively). However, it was difficult to interpret factors with the inclusion of problematic items. Planful Control A, Planful Control B, Alienation, Boredom Proneness, Empathy, and Impatient Urgency B showed factor loadings less than |0.30| across more than one EFA solution; thereby, they were eliminated. Marijuana Use also evinced low factor loadings, but was kept in order to allow for the possibility of a substance use factor to emerge. Additionally, in the interest of increasing the discriminant validity between the M-ESI—the outcome variable of interest in the multilevel models—and predictors such as mood and personality state, I eliminated any remaining items that were internal experiences (e.g., feelings, thoughts). This resulted in the elimination of Blame Externalization. Finally, in the interest of reducing participant burden, Irresponsibility B and Problematic Impulsivity B were eliminated because the content they tapped into were better covered by Irresponsibility A and Problematic Impulsivity A, respectively. The former items showed lower factor loadings than the latter items across the majority of EFA solutions.

Pilot study confirmatory analyses. Because the three- and four-factor EFA solutions contained trivial factors (i.e., factors with only two significantly loading items) and the five-factor EFA solution failed to converge, CFAs were conducted with the final 15 items using one- and two-factor models. The one-factor solution demonstrated poorer model fit (RMSEA = 0.121, AIC = 1662.261, BIC = 1821.969). In the two-factor solution, Factor 1 consists of a substance use item (1), an excitement-seeking item (6), and several callous-aggressive items (Items 5, 7, 8, 12, 18, and 19); thus, it was interpreted as primarily a Callous-Aggressive factor. Factor 2 consisted of a substance use item (3) and several disinhibited-impulsive items (Items 4, 9, 10, 16, and 17); thus, it was interpreted as primarily a Disinhibited-Impulsive factor. However, it was unclear where Item 2 (Marijuana Use) belonged. Three variations of the two-factor solution were

tested: (1) a solution in which Item 2 loads on Factor 1 (RMSEA = 0.108, AIC = 1514.926, BIC = 1678.184), (2) a solution in which Item 2 loads on Factor 2 (RMSEA = 0.102, AIC = 1531.118, BIC = 1694.375), and (3) a solution in which Item 2 was excluded (RMSEA = 0.077, AIC = 1252.406, BIC = 1405.017). Since it was unclear where Marijuana Use belongs in a two-factor structure, a three-factor solution was tested in which Factor 1 was Callous-Aggression, Factor 2 was Disinhibited-Impulsivity, and Factor 3 was Substance Use.

The three-factor structure demonstrated better model fit (RMSEA = 0.106, AIC = 1501.102, BIC = 1667.908) than the two-factor structures that included Item 2. The three-factor structure and the two-factor structure excluding Item 2 were not directly comparable, because different numbers of items were involved. However, upon examination of the three-factor structure, the high correlation between the Callous-Aggression and Substance Use factors (r = 0.82, $p < 0.001$) raised concerns about discriminant validity between the scales. Therefore, the pilot results showed mixed support for two- versus three-factor structures of the M-ESI and for inclusion versus exclusion of Item 2. Since substance use items suffered from floor effects in this pilot sample, Item 2 was retained in order to investigate its inclusion using a different dataset.

Psychometric properties of M-ESI scales derived from the pilot study. In sum, revision of the initial M-ESI item pool dropped items that performed poorly psychometrically or loaded onto semantically unexpected factors. The remaining 15 items of the M-ESI (see Table 16) could most optimally be organized into two scales excluding Item 2 or three scales including Item 2. When organized into the three scale structure, the seven-item Callous-Aggression (Cronbach's α = 0.86), five-item Disinhibited-Impulsivity (Cronbach's α = 0.74), and three-item Substance Use (Cronbach's α = 0.62) scales showed adequate internal consistencies. They also showed adequate discriminant validity with momentary mood and personality state, with

correlations ranging between: |0.002| and |0.317| at Time 1, |0.004| and |0.370| at Time 2. Finally, they showed sizable test-retest correlations for a momentary measure of behavior (*r*'s of Callous-Aggression, Disinhibited-Impulsivity, and Substance Use scales = 0.66, 0.40, and 0.64, respectively, $p < 0.0001$). A floor effect was observed for some severe externalizing behaviors (e.g., drug use, destructive aggression) in the pilot sample.

Pilot item pool refinement. In the interest of sampling less severe externalizing behaviors, a subset of daily impulsive behaviors from Sharma and colleagues' (2013) behavioral checklist were added to the M-ESI. Items were chosen for inclusion in the M-ESI based on which items were likely to sample ranges of severity or frequency of externalizing behaviors not already sampled by the M-ESI. Two additional items representing risky sexual behavior were also added. The wording of several M-ESI items from the initial item pool were revised for simplicity and ease of comprehension. Resulting changes to the M-ESI are presented in Table 16.

Table 17. Comparison of empirical and simulated eigenvalues for the Momentary-Externalizing Spectrum Inventory.

Empirical Eigenvalues from Exploratory Factor Analysis		Simulated Eigenvalues from Parallel Analysis	
Within-Level	Between-Level	Within-Level	Between-Level
5.997	**13.946**	1.184	2.965
1.937	**3.014**	1.153	2.152
1.567	1.792	1.133	1.872
1.361	1.445	1.117	1.706
1.227	1.090	1.103	1.593
1.148	0.732	1.090	1.493
1.045	0.677	1.078	1.407
0.920	0.571	1.068	1.335
0.869	0.506	1.057	1.264
0.815	0.490	1.048	1.208

Eigenvalues on the left are estimated from exploratory factor analysis of the dataset. Ninety-five percentile eigenvalues on the right are derived from 1000 Monte Carlo simulation iterations of the dataset. Bolded eigenvalues indicate the empirical eigenvalues are higher than the simulated eigenvalues.

Main study exploratory analyses. A parallel analysis was conducted using R 3.2.3 and 1000 Monte Carlo simulation iterations (Table 17). Ninety-five percentile eigenvalues from the parallel analysis indicated an optimal six-factor solution at the within-individual level and an optimal two-factor solution at the between-individual level. Two-level EFAs were conducted using Mplus 6.1, the MLR estimator, and geomin rotation. Six factor structures (two- to seven-factor models) were investigated, whose fit indices are shown in Table 18. RMSEAs from all EFAs indicated good fit (MacCallum et al., 1996). Comparative fit indices (AIC, BIC, CFI, and TLI) indicated that models that extracted increased number of factors had better fit to the data. Tables 19 through 25 show EFA factor loadings for the two- through seven-factor models.

Table 18. Fit indices for exploratory factor analyses of Momentary-Externalizing Spectrum Inventory.

# of Factors		# of Parameters	RMSEA	CFI	TLI	AIC	BIC	LL
Within	Between							
2	2	187	0.035	0.776	0.736	172062	173192	-85844
3	3	237	0.032	0.821	0.770	170971	172404	-85249
4	4	285	0.029	0.871	0.818	170283	172005	-84856
5	5	331	0.027	0.896	0.839	169689	171689	-84513
6	6	375	0.022	**0.936**	**0.890**	**169132**	**171398**	-84191

Bolded fit indices represent best-fitting models according to that particular incremental fit index. Absolute fit indices are never bolded because they cannot be compared to each other in the same way as incremental fit indices. # = number. RMSEA = root mean square error of approximation. CFI = comparative fit index. TLI = Tucker-Lewis index. AIC = Akaike information criterion. BIC = Bayesian information criterion. LL = log-likelihood.

Main study item pool refinement. As described previously in this manuscript, factor loadings denoted with superscripts “a” did not indicate the need to eliminate the item, while those denoted with numerous “b” and “c” subscripts were considered for elimination. Superscript “d” denotes a primary factor loading above an absolute value of 1, which also does not indicate a need to eliminate the item. Examining items denoted by numerous “b” and “c” superscripts at the within-individual level, Items 2 (“marijuana use”), 6, (“risky behavior for thrill”), 21 (“leisure

Table 19. Momentary-Externalizing Spectrum Inventory's two-factor exploratory factor analysis loadings.

	Within-Level Loadings		Between-Level Loadings	
	TR	IM	TR	IM
alcohol use		0.39	0.39	
marijuana use	[c] 0.22		[c] 0.33	
drug use	[c] 0.33		0.51	
dependability		[c] 0.32		0.67
destructive aggression	0.57		[d] 1.02	
excitement seeking	[a] 0.18	0.50	0.64	0.38 [a]
honesty	[a] 0.12	[c] 0.34	[a] 0.27	0.53
fraud	0.40	[a] 0.26	0.86	
impatient urgency		0.50		0.65
irresponsibility		0.64		0.92
physical aggression	0.70		1.05 [d]	
problematic impulsivity	[a]-0.07	0.63		0.91
rebelliousness	[a] 0.17	0.45	0.43 [a]	0.57
relational aggression	[c] 0.34	[a] 0.15	0.50	0.38 [a]
theft	0.70		0.94	
hit	0.66		0.91	
lost temper	0.45		0.55	0.45 [b]
argument	[c] 0.28	[a] 0.16	0.39 [a]	0.61
threaten	0.62		0.99	
acted on a whim	[a]-0.06	0.55		0.81
leisure over work		0.35	-0.35 [a]	0.74
clean	[c] 0.12		-0.22 [a]	0.50
work over leisure	[c] 0.14			0.28 [c]
blew off work		[c] 0.34		0.62
waited to confront	[c] 0.28		0.25 [c]	0.25 [b]
unprotected sex	0.36		0.59	
hook-up	0.54		0.70	

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses (e.g., confirmatory factor analyses). TR = Transgressive Behaviors. IM = Impulsive Behaviors.

[a] |secondary loading| differing by > 0.1 from the |highest cross-loading| within same model and level.
[b] |secondary loading| differing by ≤ 0.1 from the |highest cross-loading| within same model and level.
[c] highest or only |factor loading| within model and level that is < |0.35|, even if statistically significant.
[d] factor loading that is > |1.00|.

Table 20. Momentary-Externalizing Spectrum Inventory's three-factor exploratory factor analysis loadings.

	Within-Level Loadings			Between-Level Loadings		
	IM	IA	EA	SU	TR	IM
alcohol use	0.38	[a] 0.18	[a] -0.15	0.59		
marijuana use		0.35				
drug use		0.43		0.85		
dependability	[c] 0.31					0.66
destructive aggression		0.48	[a] 0.23		0.84	
excitement seeking	0.49	[a] 0.28			[b] 0.42	0.42
honesty	[c] 0.34		[a] 0.16			0.55
fraud	[c] 0.27	[b] 0.26	[b] 0.25		0.79	
impatient urgency	0.50		[a] 0.12			0.64
irresponsibility	0.63					0.90
physical aggression		0.57	[a] 0.30		0.94	
problematic impulsivity	0.61					0.89
rebelliousness	0.45	[a] 0.15			[a] 0.31	0.57
relational aggression	[a] 0.17		0.35		0.52	[a] 0.40
theft		0.47	[b] 0.39		0.89	
hit		[a] 0.30	0.54		0.95	
lost temper			0.63		0.60	[a] 0.45
argument	[a] 0.18		0.42		[a] 0.40	0.61
threaten		[a] 0.33	0.44		0.97	
acted on a whim	0.54					0.83
leisure over work	[c] 0.34				[a] -0.26	0.73
clean			[c] 0.14			0.51
work over leisure			[c] 0.15			[c] 0.30
blew off work	[c] 0.33					0.61
waited to confront	[a] 0.11		[c] 0.26			[c] 0.26
unprotected sex		0.44				
hook-up		0.64				

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses. IM = Impulsive Behaviors. IA = Instrumental Aggression. EA = Emotional Aggression. SU = Substance Use. TR = Transgressive Behaviors.

[a] |secondary loading| differing by > 0.1 from the |highest cross-loading| within same model and level.
[b] |secondary loading| differing by ≤ 0.1 from the |highest cross-loading| within same model and level.
[c] highest or only |factor loading| within model and level that is < |0.35|, even if statistically significant.
[d] factor loading that is > |1.00|.

Table 21. Momentary-Externalizing Spectrum Inventory's four-factor exploratory factor analysis loadings.

	Within-Level Loadings				Between-Level Loadings			
	IM	EA	IA	M/C	TR	IM	HR	M/C
alcohol use	0.38	[a]-0.12	[a] 0.21	[a]-0.09		0.38		[b]-0.28
marijuana use			0.37					
drug use			0.44				0.49	
dependability	[c] 0.30					0.68		
destructive aggression			0.46		0.83			
excitement seeking	0.48		[a] 0.29		[b] 0.41	0.46		
honesty	[c] 0.33	[a] 0.17			[a] 0.30	0.53		
fraud	[b] 0.26	[c] 0.28	[b] 0.24		0.79			
impatient urgency	0.48	[a] 0.15				0.68		
irresponsibility	0.61					0.98		
physical aggression			0.54		0.94			
problematic impulsivity	0.59			[a] 0.06		0.91		
rebelliousness	0.43		[a] 0.16		[a] 0.32	0.63		
relational aggression	[a] 0.15	0.38			0.53	[a] 0.36		
theft		[b] 0.40	0.43		0.91			
hit		0.56			0.97			
lost temper		0.68			0.59	[a] 0.44		
argument	[a] 0.15	0.44			[a] 0.42	0.58		
threaten		0.46			0.96			
acted on a whim	0.52			[a] 0.14		0.79		
leisure over work	[c] 0.33			[a] 0.21	[a] -0.25	0.52		[b] 0.49
clean		[a]-0.04		0.74				0.89
work over leisure	[a]-0.13			0.45				0.72
blew off work	[c] 0.32		[a]-0.07			0.52		
waited to confront	[a] 0.08	[b] 0.21		[c] 0.22			[b] 0.32	0.38
unprotected sex			0.45				0.86	
hook-up			0.64				0.90	

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses. Factors were considered strong factors if they consisted of significant primary loadings from items that were retained and showed replicability across multiple factor solutions. If a factor did not meet these expectations, they are labeled in these tables with "M/C" for Mixed Content. IM = Impulsive Behaviors. EA = Emotional Aggression. IA = Instrumental Aggression. TR = Transgressive Behaviors. HR = High-Risk Behaviors.

[a] |secondary loading| differing by > 0.1 from the |highest cross-loading| within same model and level.
[b] |secondary loading| differing by ≤ 0.1 from the |highest cross-loading| within same model and level.
[c] highest or only |factor loading| within model and level that is < |0.35|, even if statistically significant.
[d] factor loading that is > |1.00|.

Table 22. Momentary-Externalizing Spectrum Inventory's five-factor exploratory factor analysis loadings.

	Within-Level Loadings					Between-Level Loadings				
	M/C	IM	TR	M/C	M/C	SU	TR	IM	M/C	SX
alcohol use	[a] 0.23	0.36			[a]-0.10	0.55				
marijuana use	0.64					0.83				
drug use	0.65					0.72				
dependability		[c] 0.29						0.66		
destructive aggression			0.54				0.84			
excitement seeking		0.47	[a] 0.19				0.42			
honesty		[c] 0.31		[a] 0.18			[a] 0.32	0.50		
fraud		[b] 0.26	[c] 0.32				0.82			
impatient urgency		0.49		[a] 0.13				0.68		
irresponsibility		0.61						0.95		
physical aggression			0.76				0.95			
problematic impulsivity		0.61						0.84		
rebelliousness		0.42					[a] 0.34	0.54		
relational aggression		[a] 0.14		[c] 0.31			0.57	[a] 0.34		
theft			0.58				0.94			
hit			0.43	[b] 0.38			1.00			
lost temper				0.68			0.63	[a] 0.43		
argument		[a] 0.11		0.48			[b] 0.46	0.55		
threaten			0.47	[a] 0.25			1.00			
acted on a whim	[a]-0.12	0.56			[a] 0.13			0.81		
leisure over work		[c] 0.34			[a] 0.20		[a]-0.27	0.54	[b] 0.44	
clean					0.74				0.98	
work over leisure		[a]-0.14			0.45				0.71	
blew off work		[c] 0.33						0.56		
waited to confront		[a] 0.08	[b] 0.14	[b] 0.17	[c] 0.23				[b] 0.29	0.37
unprotected sex			0.45							0.79
hook-up			0.66							0.93

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses due to its factor loadings across all models. Factors were considered strong factors if they consisted of significant primary loadings from items that were retained and showed replicability across multiple factor solutions. If a factor did not meet these expectations, they are labeled in these tables with "M/C" for Mixed Content. IM = Impulsive Behaviors. TR = Transgressive Behaviors. SU = Substance Use. SX= High-Risk Sexual Behaviors.

[a] |secondary loading| differing by > 0.1 from the |highest cross-loading| within same model and level.
[b] |secondary loading| differing by ≤ 0.1 from the |highest cross-loading| within same model and level.
[c] highest or only |factor loading| within model and level that is < |0.35|, even if statistically significant.
[d] factor loading that is > |1.00|.

Table 23. Momentary-Externalizing Spectrum Inventory's six-factor exploratory factor analysis loadings.

	Within-Level Loadings						Between-Level Loadings				
	M/C	IM	TR	M/C	M/C	M/C	SU	TR	IM	M/C	SX
alcohol use	[a] 0.21	0.38				[a]-0.12	0.55				
marijuana use	0.66						0.90				
drug use	0.63						0.65				
dependability		[c]0.21			[b] 0.16				0.60		
destructive aggression			0.53					0.87			
excitement seeking		0.54	[a]0.16					[b] 0.45	0.45		
honesty		[c]0.28		[b]0.19	[a] 0.07			[a] 0.32	0.46		
fraud		[b]0.27	[c]0.31					0.84			
impatient urgency	[a]-0.06	0.53		[a]0.12					0.51		
irresponsibility		0.56			[a] 0.11				1.00	[a]-0.11	
physical aggression			0.76					0.98			
problematic impulsivity		0.64				[a] 0.07			0.80		
rebelliousness		0.45						[b] 0.35	0.45		
relational aggression		[a]0.16		[c]0.30				0.58			
theft			0.60					0.97			
hit			0.45	[b]0.36				[d] 1.04			
lost temper				0.64				0.60			
argument		[a]0.12		0.46		[a] 0.07		0.46			
threaten			0.48					[d] 1.03			
acted on a whim	[a]-0.11	0.46			[a] 0.20	[a] 0.09			0.97		
leisure over work					0.72			[a]-0.28	0.61	[a] 0.45	
clean						0.59				0.95	
work over leisure					[a]-0.25	0.65				0.74	
blew off work					0.52	[a]-0.12			0.54		
waited to confront			[b]0.15	[b]0.15		[c] 0.23				[b] 0.32	0.37
unprotected sex			0.47								0.82
hook-up			0.69								0.92

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses due to its factor loadings across all models. Factors were considered strong factors if they consisted of significant primary loadings from items that were retained and showed replicability across multiple factor solutions. If a factor did not meet these expectations, they are labeled in these tables with "M/C" for Mixed Content. IM = Impulsive Behaviors. TR = Transgressive Behaviors. SU = Substance Use. SX= High-Risk Sexual Behaviors. The sixth between-level factor is not shown because it contains no significant loadings.

[a] |secondary loading| differing by > 0.1 from the |highest cross-loading| within same model and level.
[b] |secondary loading| differing by ≤ 0.1 from the |highest cross-loading| within same model and level.
[c] highest or only |factor loading| within model and level that is < |0.35|, even if statistically significant.
[d] factor loading that is > |1.00|.

Table 24. Momentary-Externalizing Spectrum Inventory's seven-factor exploratory factor analysis loadings at the within-individual level.

	Within-Level Loadings						
	M/C	IM	TR	M/C	M/C	M/C	SX
alcohol use	0.20 [a]	0.37	-0.16 [a]			-0.13 [a]	
marijuana use	0.67						
drug use	0.63						
dependability		0.24 [c]			0.16 [b]		
destructive aggression			0.48				
excitement seeking	0.13 [a]	0.55			-0.05 [a]		
honesty		0.29 [c]			0.07 [a]		
fraud		0.29 [b]	0.35				
impatient urgency	-0.07 [a]	0.54					
irresponsibility		0.58			0.11 [a]		
physical aggression			0.63				
problematic impulsivity		0.65				0.07 [a]	
rebelliousness		0.46					
relational aggression		0.16 [b]	0.26 [c]	0.21 [b]			
theft			0.58				
hit			0.51	0.26 [a]			
lost temper				0.64			
argument				0.52			
threaten			0.61				
acted on a whim	-0.11 [a]	0.47			0.20 [a]	0.09 [a]	
leisure over work					0.72		
clean						0.59	
work over leisure					-0.24 [a]	0.63	
blew off work				0.13 [a]	0.52	-0.13 [a]	0.10 [a]
waited to confront				0.20 [b]		0.23 [c]	0.13 [b]
unprotected sex							0.54
hook-up							0.67

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses due to its factor loadings across all models. Factors were considered strong factors if they consisted of significant primary loadings from items that were retained and showed replicability across multiple factor solutions. If a factor did not meet these expectations, they are labeled in these tables with "M/C" for Mixed Content. IM = Impulsive Behaviors. TR = Transgressive Behaviors. SX= High-Risk Sexual Behaviors.

[a] |secondary loading| differing by > 0.1 from the |highest cross-loading| within same model and level.
[b] |secondary loading| differing by ≤ 0.1 from the |highest cross-loading| within same model and level.
[c] highest or only |factor loading| within model and level that is < |0.35|, even if statistically significant.
[d] factor loading that is > |1.00|.

Table 25. Momentary-Externalizing Spectrum Inventory's seven-factor exploratory factor analysis loadings at the between-individual level.

	Between-Level Loadings						
	SU	TR	IM	M/C	SX	M/C	M/C
alcohol use	0.56						
marijuana use	0.88						
drug use	0.68						
dependability			0.58				0.30 [a]
destructive aggression		0.88					
excitement seeking		0.47	0.40 [b]				
honesty							
fraud		0.89					
impatient urgency			0.34 [c]				
irresponsibility			0.94				
physical aggression		0.99					
problematic impulsivity			0.74				
rebelliousness		0.39					
relational aggression		0.65				0.39 [a]	
theft		0.98					
hit		1.02 [d]					
lost temper							0.64
argument		0.52					
threaten		1.00					
acted on a whim			1.04 [d]				
leisure over work		-0.25 [a]	0.55	0.44 [a]			
clean				0.93			
work over leisure				0.75			
blew off work					0.26 [c]		
waited to confront		0.19 [a]		0.30 [b]	0.36		
unprotected sex					0.80		
hook-up					0.92		

Notes: All loadings that appear in the table are statistically significant at $p \leq 0.05$. Superscripts denote special remarks about factor loadings. Italicized script indicates that the item has been eliminated from subsequent analyses due to its factor loadings across all models. Factors were considered strong factors if they consisted of significant primary loadings from items that were retained and showed replicability across multiple factor solutions. If a factor did not meet these expectations, they are labeled in these tables with "M/C" for Mixed Content. SU = Substance Use. TR = Transgressive Behaviors. IM = Impulsive Behaviors. SX= High-Risk Sexual Behaviors.

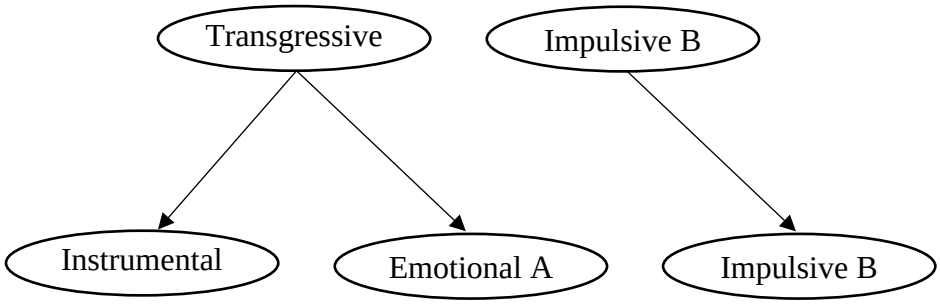
[a] |secondary loading| differing by > 0.1 from the |highest cross-loading| within same model and level.
[b] |secondary loading| differing by ≤ 0.1 from the |highest cross-loading| within same model and level.
[c] highest or only |factor loading| within model and level that is < |0.35|, even if statistically significant.
[d] factor loading that is > |1.00|.

over responsibility"), 23 ("work over leisure"), and 25 ("waited to confront someone") were eliminated from subsequent CFAs.

Other items were retained or eliminated due to construct validity considerations. Even though Items 4 ("late or missed appointment"), 7 ("dishonesty"), and 24 ("blew off work") showed low magnitude loadings across multiple factor solutions, they were retained because they consistently loaded onto the same within-level factor as a cluster of other items (e.g., Items 1, 9, 10, 12, 13, 20). Even though Item 8 ("fraud") showed similar magnitude cross-loadings at the within-individual level, it was retained because the highest loadings were fairly consistently clustered onto the same within-level factor as several other items (e.g., Items 5, 11, 15, 16, 19) across the vast majority of factor solutions. Similarly, Item 14 ("relational aggression") was retained because it clustered together with Items 16, 17, and 19. Item 18 ("argument with someone") was eliminated because it showed unstable loadings, loading with items measuring callous-aggression (e.g., "property destruction," "fraud," "physical" and "relational aggression," "theft") in some EFAs but with items measuring impulsivity (e.g. "blew off work") in other EFAs. Item 22 ("clean or tidy") was eliminated because it failed to load onto the one-factor EFA solution, suggesting that it may not measure the same underlying phenomenon as other items in the M-ESI measure. The remaining items were examined in the interpretation of factors.

Interpretation of main study factor analyses. On the within-individual level, factors were considered strong factors if they consisted of significant primary loadings from retained items and showed replicability across multiple solutions. Figure 5 shows a graphical representation of the hierarchical organization of strong factors across multiple factor solutions. Given the elimination of items (i.e., Items 2, 6, 18, 21, 22, 23, and 25) and the focus on simple structure (i.e., no hierarchical structures were investigated), factors were interpreted with the

Figure 5. Within-level EFA factor structure of the Momentary-Externalizing Spectrum Inventory at different levels of abstraction.



B = Behaviors. A = Aggression.

primary loadings of retained items only. Within-level factors in the two-factor model were interpreted as Transgressive and Impulsive Behaviors. In the three-factor model, Transgressive Behaviors split into Instrumental and Emotional Aggression. Factor 4 in the four-factor model did not contain any primary loading items. In the five-factor model, Instrumental and Emotional Aggression seemed to recombine into a Transgressive Behaviors factor, while the other three factors contained too few primary loading items or none at all. The newly extracted Factor 6 in the six-factor model was not considered a strong factor for the same reason. While the newly extracted Factor 7 in the seven-factor model was interpretable as High-Risk Sexual Behaviors, it was a very narrowband factor and not considered a standalone scale in subsequent analyses.

On the between-individual level, two factors consistently appeared across EFAs: Transgressive and Impulsive Behaviors. Substance Use emerged in the three-factor model, consisting of two items (i.e., alcohol and drug use). In addition to Transgressive and Impulsive Behaviors in the four-factor model, drug use loaded with high-risk sexual behaviors (i.e., unprotected sex and unknown hook-ups) to form a High-Risk Behaviors factor. The newly extracted Factor 4 in the four-factor model was not considered a strong factor. In addition to Transgressive and Impulsive Behaviors in the five-factor model, Substance Use and a High-Risk

Sexual Behaviors emerged as narrowband factors, along with a weak Factor 5. Factor 6 in the six-factor model and Factor 7 in the seven-factor model are weak factors, while other factors remained similar to the five-factor model. Remarkably, the most stable factors at both the within- and between-individual levels are Transgressive Behaviors and Impulsive Behaviors.

Table 26. Fit indices for confirmatory factor analyses of Momentary-Externalizing Spectrum Inventory.

# of Factors		# of Parameters	RMSEA	CFI	TLI	AIC	BIC	LL
Within	Between							
2	2	102	0.029	0.856	0.838	113134	113751	-56465
3	2	104	0.028	**0.868**	**0.851**	**112957**	**113585**	-56374

Bolded fit indices represent best-fitting models according to that particular incremental fit index. Absolute fit indices are never bolded because they cannot be compared to each other in the same way as incremental fit indices. # = number. RMSEA = root mean square error of approximation. CFI = comparative fit index. TLI = Tucker-Lewis index. AIC = Akaike information criterion. BIC = Bayesian information criterion. LL = log-likelihood.

Main study confirmatory analyses. Two- and three-factor CFAs were compared (see Table 26 for fit indices). Within-level factor content varied by model, but the same two between-level factors (e.g., Transgressive and Impulsive Behaviors) remained consistent across models. Even though the three-factor model showed the best fit to the data according to fit indices, other issues were taken into consideration in choosing the optimal factor structure for the M-ESI. First, the replicability of Transgressive and Impulsive Behaviors were clearly shown at both the within- and between-individual levels across multiple EFA solutions. Second, Instrumental and Emotional Aggression recombined into Transgressive Behaviors only served to bolster the replicability of the Transgressive Behaviors factor. Finally, the high correlation (r = 0.837) between the Instrumental and Emotional Aggression factors questions the disparate nature of the two factors. Therefore, the optimal factor structure of the M-ESI consisted of two factors: Transgressive Behaviors and Impulsive Behaviors (see Table 27). Scale scores for subsequent

analyses were created by summing the items on each of these two scales.

Table 27. Confirmatory factor analysis of the Momentary-Externalizing Spectrum Inventory showing factor loadings of the main study's optimal factor structure.

	Within-Level Loadings (S.E.)		Between-Level Loadings (S.E.)	
	TR	IM	TR	IM
alcohol use		.373 (.031)		.458 (.102)
drug use	.391 (.053)		.542 (.131)	
dependability		.337 (.036)		.807 (.051)
destructive aggression	.588 (.069)		.924 (.047)	
honesty		.398 (.040)		.700 (.068)
fraud	.560 (.046)		.929 (.032)	
impatient urgency		.541 (.034)		.764 (.086)
irresponsibility		.646 (.025)		.948 (.024)
physical aggression	.706 (.046)		.998 (.010)	
problematic impulsivity		.583 (.027)		.889 (.041)
rebelliousness		.502 (.029)		.842 (.050)
relational aggression	.431 (.044)		.720 (.095)	
theft	.661 (.053)		.970 (.030)	
hit	.634 (.043)		.956 (.018)	
lost temper	.474 (.039)		.820 (.065)	
threaten	.605 (.052)		.999 (.012)	
acted on whim		.502 (.029)		.842 (.047)
blew off work		.293 (.028)		.560 (.064)
unprotected sex	.422 (.053)		.564 (.136)	
hook-up	.540 (.065)		.627 (.145)	

All factor loadings were statistically significant at $p \leq 0.05$. TR = Transgressive Behaviors. IM = Impulsive Behaviors. Within-level factor correlations (* denotes $p \leq 0.05$): $r_{TR\text{-}IM} = .593$ *. Between-level factor correlations (* denotes $p \leq 0.05$): $r_{TR\text{-}IM} = .671$*.

Psychometric properties of M-ESI scales derived from the main study. The Transgressive (Cronbach's $\alpha = 0.82$) and Impulsive (Cronbach's $\alpha = 0.78$) Behaviors scales showed adequate internal consistencies. They also showed adequate discriminant validity with mood and personality state, with within-individual level correlations (i.e., temporal covariation) ranging between: |0.011| and |0.295|.

Summary. The pilot study began with an initial pool of 24 items. Elimination of items with the weakest psychometric properties (e.g., low factor loadings) or semantically related concerns (i.e., with potential to reduce discriminant validity between predictors and outcomes)

during the pilot study resulted in a measure with 15 items. Twelve items were added between the pilot and main studies in order to comprehensively sample different severity and types of externalizing behaviors. The 27-item measure underwent an additional round of refinement during the main study, during which seven items were eliminated. The final M-ESI measure consisted of 20 items with desirable psychometric properties. Factor analyses showed mixed support for a two- versus a three-factor structure for the M-ESI in the pilot study, while the main study showed the optimal structure to be a two-factor model. Overall, the findings of the current study support the validity of the M-ESI as a measure of momentary externalizing behavior.

Personality Traits

Stepwise multiple linear regression was used to investigate whether personality traits predict mean-level externalizing behaviors in a between-individual manner. As shown in Tables 28 and 29, trait DvC was the only significant predictor of mean-levels of both types of externalizing behaviors.

Personality States

Table 30 shows the descriptive statistics for how these personality states were distributed in the current sample as well as how they covaried within and across individuals. Person-specific mean levels of state Neuroticism was the lowest of the five personality states, centered around 34.50 percent (i.e., percent of maximum possible on the scale). In increasing order, Sensation-Seeking, Gregariousness, and Conscientiousness's person-specific means ranged between 47.88 to 56.05 percent. Person-specific mean levels of Agreeableness was 63.56 percent, the highest of the five personality states. The spread of mean levels of states are indicated by two statistics in Table 30—the standard deviations of the mean and the between-individual variance ($\sigma^2_{between}$).

Table 28. Stepwise regression to predict person-specific mean levels of Transgressive Behaviors.

Model	Parameter	Estimate	S.E.	P (Estimate)	Multiple R^2	R^2 Change	F Change	P (Change)
Full DF = 161	Intercept	4.919	3.661	0.1810	0.095	-	-	-
	Gender	0.118	0.553	0.8314				
	Age	0.254	0.166	0.1282				
	NEG	0.856	1.043	0.4129				
	DET	-0.555	0.545	0.3101				
	DvC	1.656	0.686	0.0168				
	PSY	1.104	0.768	0.1522				
	NEG*DvC	-0.711	0.463	0.1265				
Reduced 1 DF = 162	Intercept	4.936	3.662	0.1796	0.089	0.006	1.037	0.3101
	Gender	0.118	0.553	0.8308				
	Age	0.249	0.166	0.1361				
	NEG	0.672	1.027	0.5136				
	DvC	1.641	0.686	0.0178				
	PSY	0.909	0.743	0.2231				
	NEG*DvC	-0.682	0.462	0.1417				
Reduced 2 DF = 163	Intercept	5.475	3.641	0.1346	0.080	0.009	1.496	0.2231
	Gender	-0.013	0.543	0.9808				
	Age	0.225	0.165	0.1743				
	NEG	0.817	1.022	0.4254				
	DvC	1.866	0.661	0.0054				
	NEG*DvC	-0.634	0.461	0.1708				
Reduced 3 DF = 164	Intercept	7.321	3.393	0.0324	0.070	0.010	1.893	0.1708
	Gender	-0.012	0.545	0.9818				
	Age	0.198	0.164	0.2306				
	NEG	-0.410	0.501	0.4144				
	DvC	1.111	0.371	0.0032				
Reduced 4 DF = 165	Intercept	7.230	3.388	0.0343	0.066	0.004	0.670	0.4144
	Gender	-0.182	0.503	0.7182				
	Age	0.197	0.164	0.2307				
	DvC	0.948	0.312	0.0028				

Mean levels of Transgressive Behaviors were regressed onto personality traits, controlling for the effects of gender and age. In stepwise fashion, the least significant parameter (not involved in a significant interaction) was eliminated to form increasingly reduced models. Predictors are untransformed. NEG = Negative Emotionality. DET = Detachment. DvC = Disinhibition-versus-Constraint. PSY = Psychoticism.

Gregariousness showed the lowest spread at 11.21 percent ($\sigma^2_{between}$ = 70.50) while Sensation-Seeking showed the highest at 16.97 percent ($\sigma^2_{between}$ = 237.50). In increasing order, the spread

Table 29. Stepwise regression to predict person-specific mean levels of Impulsive Behaviors.

Model	Parameter	Estimate	S.E.	P (Estimate)	Multiple R^2	R^2 Change	F Change	P (Change)
Full DF = 161	Intercept	8.325	5.257	0.1152	0.129	-	-	-
	Gender	0.634	0.794	0.4332				
	Age	-0.023	0.238	0.9245				
	NEG	2.133	1.497	0.1561				
	DET	-0.378	0.782	0.6293				
	DvC	3.025	0.985	0.0025				
	PSY	0.724	1.102	0.5125				
	NEG*DvC	-1.085	0.665	0.1047				
Reduced 1 DF = 162	Intercept	8.336	5.244	0.1139	0.128	0.001	0.234	0.6293
	Gender	0.624	0.792	0.4319				
	Age	-0.026	0.238	0.9123				
	NEG	2.008	1.471	0.1742				
	DvC	3.014	0.982	0.0025				
	PSY	0.591	1.065	0.5799				
	NEG*DvC	-1.065	0.662	0.1095				
Reduced 2 DF = 163	Intercept	8.686	5.195	0.0965	0.126	0.002	0.308	0.5800
	Gender	0.539	0.775	0.4882				
	Age	-0.041	0.236	0.8609				
	NEG	2.101	1.458	0.1515				
	DvC	3.160	0.944	0.0010				
	NEG*DvC	-1.034	0.658	0.1181				
Reduced 3 DF = 164	Intercept	11.695	4.851	0.0170	0.113	0.013	2.468	0.1181
	Gender	0.540	0.779	0.4892				
	Age	-0.086	0.235	0.7140				
	NEG	0.103	0.716	0.8859				
	DvC	1.931	0.530	0.0004				
Reduced 4 DF = 165	Intercept	11.718	4.834	0.0164	0.113	0.000	0.021	0.8859
	Gender	0.582	0.718	0.4186				
	Age	-0.086	0.234	0.7134				
	DvC	1.972	0.445	0.0000				

Mean levels of Impulsive Behaviors were regressed onto personality traits, controlling for the effects of gender and age. In stepwise fashion, the least significant parameter (not involved in a significant interaction) was eliminated to form increasingly reduced models. Predictors are untransformed. NEG = Negative Emotionality. DET = Detachment. DvC = Disinhibition-versus-Constraint. PSY = Psychoticism.

of Conscientiousness, Neuroticism, and Agreeableness ranged between 14.26 ($\sigma^2_{between}$ = 172.90) to 16.10 percent ($\sigma^2_{between}$ = 217.50).

Table 30. Descriptive statistics of personality states.

	Neuroticism	Gregariousness	Sensation-Seeking	Agreeableness	Conscien-tiousness
M of M	34.50	53.50	47.88	63.56	56.05
SD of M	14.34	11.21	16.97	16.10	14.26
Range of M	11.11 - 64.90	13.89 - 100	11.11 - 100	16.37 - 100	13.06 - 100
M of SD	8.73	14.58	14.05	12.37	12.03
SD of SD	4.38	6.85	7.07	7.10	6.80
Range of SD	0 - 20.04	1.39 - 39.03	0 - 52.38	2.03 - 42.07	1.75 - 42.78
Between Var	192.25	70.54	237.50	217.50	172.90
Within Var	97.85	252.65	230.00	198.70	183.40
ICC	0.337	0.782	0.492	0.477	0.515

Personality state scale scores have been percent-of-maximum-possible transformed. M = mean. SD = standard deviation. Var = variance. ICC = intraclass correlation.

Temporal variation of personality traits are described by three statistics in Table 30—the mean of the standard deviation, standard deviation of the standard deviation, and within-individual variation (σ^2_{within}). State Neuroticism showed the lowest average standard deviation of individuals' data points around person-specific means at 8.73 percent (σ^2_{within} = 97.85). Neuroticism was followed in increasing order by Conscientiousness, Agreeableness, Sensation-Seeking, and Gregariousness ranging between 12.03 (σ^2_{within} = 183.40) and 14.58 percent (σ^2_{within} = 252.65). Neuroticism's temporal variation showed the lowest spread at 4.38 percent while Agreeableness showed the highest at 7.10 percent. ICCs took into account between- and within-individual variation, reflecting the proportion of total variance accounted for by temporal variation. Once both sources of variation (i.e., between- and within-individual) are taken into account, Conscientiousness (ICC = 51.5 percent of total variance) outranked those of Agreeableness (ICC = 47.7 percent) and Sensation-Seeking (ICC = 49.2 percent). Neuroticism's ICC is lowest at 33.7 percent while Gregariousness is highest at 78.2 percent.

Central tendency and spread statistics of personality states were correlated with all five personality traits as measured by the PID-5 (Table 31), with many findings worth highlighting.

Figure 6. Histograms of descriptive statistics of personality states.

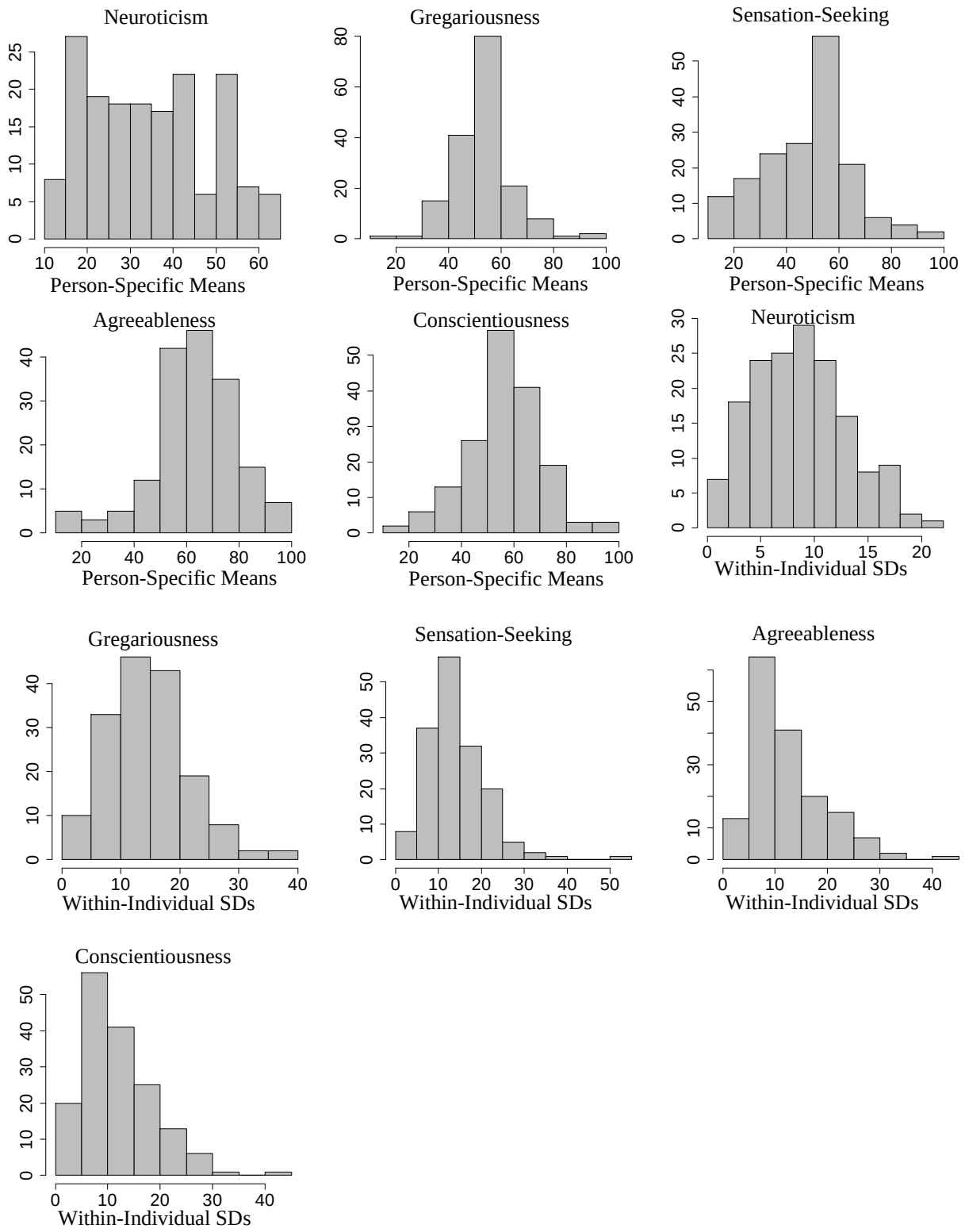


Table 31. Correlations between the measures of central tendency and spread of personality states and personality traits.

Neuroticism	NEG	DET	PSY	ANT	DIS
Mean	***0.370	**0.219	***0.384	***0.337	***0.399
Median	***0.361	**0.219	***0.394	***0.325	***0.393
Max	***0.303	*0.156	***0.302	***0.326	***0.319
Min	**0.232	**0.201	***0.313	**0.239	***0.323
Variability (SD)	^0.146	-0.076	0.009	^0.132	0.076
Gregariousness	NEG	DET	PSY	ANT	DIS
Mean	**-0.203	***-0.422	^-0.130	0.017	-0.086
Median	^-0.145	***-0.352	-0.085	0.069	-0.029
Max	*-0.191	***-0.387	^-0.145	0.024	*-0.163
Min	-0.089	*-0.166	-0.059	-0.067	-0.005
Variability (SD)	-0.026	*-0.178	-0.060	0.063	-0.095
Sensation-Seeking	NEG	DET	PSY	ANT	DIS
Mean	-0.078	^-0.140	^0.143	^0.143	0.079
Median	-0.105	^-0.132	0.118	^0.135	0.057
Max	-0.118	**-0.248	^0.129	*0.184	0.085
Min	-0.015	-0.040	0.113	0.048	0.073
Variability (SD)	-0.087	**-0.218	-0.013	0.087	0.004
Agreeableness	NEG	DET	PSY	ANT	DIS
Mean	-0.085	*-0.154	-0.084	^-0.136	*-0.190
Median	-0.089	-0.124	-0.106	-0.120	**-0.212
Max	*-0.159	*-0.195	^-0.150	*-0.179	**-0.227
Min	-0.013	-0.097	0.025	-0.121	-0.065
Variability (SD)	-0.111	-0.028	^-0.132	-0.036	-0.078
Conscientiousness	NEG	DET	PSY	ANT	DIS
Mean	^-0.128	^-0.131	0.029	0.037	*-0.160
Median	^-0.132	-0.114	0.032	0.034	*-0.152
Max	**-0.237	-0.122	-0.041	-0.000	*-0.187
Min	-0.023	-0.086	0.043	-0.008	-0.080
Variability (SD)	-0.119	-0.038	-0.073	-0.033	-0.027

States and traits have been percent-of-maximum-possible transformed. NEG = Negative Emotionality. DET = Detachment. DvC = Disinhibition-versus-Constraint. PSY = Psychoticism. *** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$; ^ $p \leq 0.1$.

Neuroticism appeared to be most broadly associated with personality traits, with significant correlations between most measures of central and extreme tendencies and all five personality traits. Gregariousness and Conscientiousness appeared to be most precisely associated with their corresponding PID-5 traits Detachment and Disinhibition, respectively. Gregariousness was additionally associated with Negative Emotionality and Disinhibition, while Conscientiousness

was additionally associated with Negative Emotionality. Person-specific maximums of Agreeableness were significantly correlated with multiple traits including PID-5 Antagonism, while the central tendency of Agreeableness was associated with PID-5 traits Disinhibition and Detachment. Participants' maximum ratings of Sensation-Seeking were significantly correlated with PID-5 traits Detachment and Antagonism, while Sensation-Seeking's variability was associated with PID-5 Detachment. Overall, it is worth noting that trait standings seemed not to be isomorphically (i.e., in a one-to-one correspondence) related to mean levels of states. Instead, each trait showed associations with multiple distribution descriptors of multiple states.

Incremental utility. Two-level models were conducted to evaluate the incremental utility of personality states over and above personality traits in predicting momentary externalizing behavior (see Table 32 for model comparisons). Likelihood ratio tests compared Full versus Fixed States models to determine whether personality state random slopes—as opposed to fixed slopes—added predictive value. Results indicated that random slopes were useful in predicting momentary Impulsive but not Transgressive behavior from personality states. Likelihood ratio tests compared Fixed States versus No States models to determine whether including personality states as predictors added predictive value. Results supported the incremental utility of personality states over and above personality traits for both Transgressive and Impulsive Behaviors.

The current study also hypothesized that the amount of within-individual variation for each state would be related to its incremental utility. In decreasing order, the within-individual variance of states in the current study was found to be Gregariousness, Sensation-Seeking, Agreeableness, Conscientiousness, and Neuroticism. When predicting Transgressive Behaviors, personality states' slope effect sizes ranked from Neuroticism, Sensation-Seeking,

Table 32. Model comparisons toward determining incremental utility of personality states.

Model	**# of Free Parameters**	**LL**	**Scaling Factor**	**χ^2**	**df**	**P**
Outcome: Transgressive Behaviors; 4 Traits: NEG, DET, DvC, PSY						
Full	68	-8331.190	67.510	-	-	-
Fixed States	28	-8510.501	2.664	3.176	40	1.000
No States	23	-8552.318	2.986	70.708	5	0.000
Outcome: Impulsive Behaviors; 4 Traits: NEG, DET, DvC, PSY						
Full	68	-9657.475	1.461	-	-	-
Fixed States	28	-9727.165	1.375	91.625	40	0.000
No States	23	-9760.711	1.301	39.112	5	0.000
Outcome: Transgressive Behaviors; 5 Traits: NEG, DET, ANT, DIS, PSY						
Full	78	-9063.201	101.331	-	-	-
Fixed States	33	-9246.335	2.404	2.106	45	1.000
No States	28	-9288.095	2.620	69.926	5	0.000
Outcome: Impulsive Behaviors; 5 Traits: NEG, DET, ANT, DIS, PSY						
Full	78	-10390.617	1.461	-	-	-
Fixed States	33	-10463.169	1.318	92.667	45	0.000
No States	28	-10496.112	1.247	38.404	5	0.000

Full Models included random slopes for personality states. Fixed States Models used fixed slopes for personality states. No States Models did not include personality states as predictors. The four sets of models here differ by the outcome variables and the number of personality traits used. These analyses tested the models using both four and five traits to ensure that trait-level variance was not missed—and thereby misattributed to states—due to methodological decisions. NEG = Negative Emotionality. DET = Detachment. DvC = Disinhibition-versus-Constraint. PSY = Psychoticism. DIS = Disinhibition.

Table 33. Within-individual level slope coefficients of from incremental validity models of personality states predicting externalizing behavior.

Transgressive Behaviors				Impulsive Behaviors			
State	Estimate	S.E.	E.S.	State	Estimate	S.E.	E.S.
N	0.046	0.011*	0.658	N	0.047	0.015*	0.479
G	0.006	0.004	0.225	G	0.002	0.008	0.037
SS	0.012	0.006*	0.306	SS	0.033	0.011*	0.479
A	-0.006	0.006	-0.154	A	0.024	0.011*	0.328
C	-0.003	0.006	-0.063	C	-0.059	0.013*	-0.491

Slope coefficients were taken from the models that use five personality traits as between-individual predictors and fixed effects for personality states at the within-individual level. N = Neuroticism. G = Gregariousness. SS = Sensation-Seeking. A = Agreeableness. C = Conscientiousness. S.E. = standard error. E.S. = effect size (Cohen's *d* equivalent).

Gregariousness, Agreeableness, and Conscientiousness in decreasing order. When predicting Impulsive Behaviors, personality state slope effect sizes ranked from Conscientiousness, Neuroticism and Sensation-Seeking (equal effect sizes), Agreeableness, and Gregariousness. If the effect sizes of personality states' slope coefficients (Table 33) in predicting externalizing behaviors are taken as a quantitative approximation of the states' incremental utility, then the amount of within-individual variation of each state did not translate into incremental utility.

Table 34. Intraclass correlations of candidate proximal mechanisms.

Variable	Between Variance	Within Variance	ICC
Constraint level	0.048	0.494	0.911
Social context	0.457	3.291	0.878
Physical exertion level	0.030	0.562	0.949
Positive affect	39.48	45.65	0.536
Negative affect	26.89	21.05	0.439
Delay discounting	0.416	4.541	0.916

Within-individual variances were the numerators of ICCs. ICC values range between 0 and 1, with values closer to 1 indicating a greater percentage of variance being accounted for by within-individual variation over time. Total variance consisted of between-individual variance and within-individual variance.

Predicting Momentary Externalizing Behavior

Transgressive Behaviors.

Model fit and comparisons. A series of two-level models were conducted to test specific hypotheses. As a prerequisite to two-level analyses, intraclass correlations showed that all candidate proximal mechanisms varied temporally within-individuals (see Table 34). Table 35 presents the parameter estimates for the Full Model (number of parameters = 65, log-likelihood = -28963.709, AIC = 58057.418, BIC = 58429.364). In this model, momentary Transgressive Behavior was regressed on positive and negative affect, delay discounting, and situational factors at the within-individual level (Level 1) and personality traits at the between-individual level (Level 2). Momentary affect and delay discounting were in turn regressed on situational factors

Table 35. Parameter estimates of Full Model predicting Transgressive Behaviors, which specified random slopes for candidate proximal mechanisms.

Parameter	Estimate	S.E.	$d_{equivalent}$	Parameter	Estimate	S.E.	$d_{equivalent}$
ext_{ij} on con_{ij}	-0.097	0.067	-0.225	β_{2j}'s intercept	0.066	0.060	0.170
ext_{ij} on soc_{ij}	0.048	0.091	0.081	β_{2j} on neg_j	-0.003	^0.001	-0.289
ext_{ij} on phy_{ij}	0.145	*0.069	0.327	β_{2j} on det_j	-0.001	0.001	-0.077
pa_{ij} on con_{ij}	0.565	^0.323	0.271	β_{2j} on dvc_j	0.002	0.003	0.124
pa_{ij} on soc_{ij}	1.273	*0.522	0.377	β_{2j} on psy_j	0.003	0.002	0.176
pa_{ij} on phy_{ij}	1.516	*0.344	0.684	β_{3j}'s intercept	-0.035	0.104	-0.052
na_{ij} on con_{ij}	0.483	^0.268	0.279	β_{3j} on neg_j	-0.003	0.002	-0.202
na_{ij} on soc_{ij}	0.083	0.429	0.030	β_{3j} on det_j	0.000	0.003	-0.014
na_{ij} on phy_{ij}	-0.454	*0.206	-0.340	β_{3j} on dvc_j	0.006	0.005	0.183
dd_{ij} on con_{ij}	-0.156	*0.073	-0.332	β_{3j} on psy_j	0.002	0.003	0.074
dd_{ij} on soc_{ij}	0.124	0.096	0.201	neg_j's intercept	56.898	*16.261	0.542
dd_{ij} on phy_{ij}	0.114	^0.065	0.271	neg_j on gen_j	8.137	*2.980	0.426
ext grand mean	11.585	*0.353	5.076	neg_j on age_j	-1.208	0.812	-0.230
β_{0j} on neg_j	-0.011	0.008	-0.215	det_j's intercept	36.851	*13.586	0.418
β_{0j} on det_j	-0.008	0.008	-0.144	det_j on gen_j	-0.157	2.594	-0.009
β_{0j} on dvc_j	0.024	0.015	0.247	det_j on age_j	-0.652	0.674	-0.150
β_{0j} on psy_j	0.019	^0.011	0.279	dvc_j's intercept	61.967	*11.567	0.832
β_{1j}'s intercept	0.023	0.026	0.138	dvc_j on gen_j	-7.073	*2.001	-0.548
β_{1j} on neg_j	0.000	0.001	-0.079	dvc_j on age_j	-1.539	*0.582	-0.411
β_{1j} on det_j	-0.001	0.001	-0.132	psy_j's intercept	67.894	*14.424	0.731
β_{1j} on dvc_j	-0.001	0.002	-0.053	psy_j on gen_j	-7.086	*2.439	-0.446
β_{1j} on psy_j	0.002	^0.001	0.301	psy_j on age_j	-2.046	*0.726	-0.435

* $p \leq 0.05$; ^ $p \leq 0.10$. Slope estimates in this table are fixed slopes. β_{0j} represents the random intercept of externalizing (ext_{ij}). β_{1j}, β_{2j}, and β_{3j} represent random slopes of ext_{ij} regressed onto positive affect (pa_{ij}), negative affect (na_{ij}), and delay discounting (dd_{ij}), respectively. β_{1j}, β_{2j}, and β_{3j}'s fixed intercepts are the average slopes of externalizing regressed onto positive affect, negative affect, and delay discounting, respectively. Positive affect, negative affect, and delay discounting were regressed onto situational factors (con_{ij}, soc_{ij}, phy_{ij}). β_{0j}'s fixed intercept is the grand mean of ext_{ij}. Person-specific intercepts (β_{0j}) and slopes (β_{1j}, β_{2j}, β_{3j}) were regressed onto personality traits (neg_j, det_j, dvc_j, phy_j). Personality traits were additionally regressed onto demographic variables (gen_j, age_j), with fixed intercepts representing sample trait means.

at the within-individual level (Level 1) and personality traits at the between-individual level (Level 2). Momentary affect and delay discounting were in turn regressed on situational factors at Level 1. Personality traits were regressed on gender and age at Level 2. Table 36 presents the parameter estimates for the Fixed Slope Model (number of parameters = 44, log-likelihood = -29184.015, AIC = 58456.031, BIC = 58707.809), which differed from the Full Model by specifying the slopes of affect and delay discounting as fixed effects. Table 37 presents the parameter estimates for the Interaction Model (number of parameters = 46, log-likelihood =

Table 36. Parameter estimates of Fixed Models predicting Transgressive Behaviors, with fixed slopes for candidate proximal mechanisms and no interactions between affective and cognitive mechanisms.

Parameter	Estimate	S.E.	$d_{equivalent}$
ext_{ij} on pa_{ij}	0.026	*0.013	0.313
ext_{ij} on na_{ij}	0.098	*0.027	0.555
ext_{ij} on dd_{ij}	0.031	0.039	0.121
ext_{ij} on con_{ij}	-0.167	*0.077	-0.334
ext_{ij} on soc_{ij}	0.007	0.107	0.010
ext_{ij} on phy_{ij}	0.101	0.072	0.218
ext grand mean	11.909	*0.380	4.848
β_{0j} on neg_j	-0.016	0.013	-0.194
β_{0j} on det_j	-0.014	0.014	-0.151
β_{0j} on dvc_j	0.036	*0.015	0.370
β_{0j} on psy_j	0.019	0.016	0.182

* $p \leq 0.05$; ^ $p \leq 0.10$. Only parameters that could differ from Full Models are listed here.

Table 37. Parameter estimates of Interaction Models predicting Transgressive Behaviors, with fixed slopes for candidate proximal mechanisms and interactions between affective and cognitive mechanisms.

Parameter	Estimate	S.E.	$d_{equivalent}$
ext_{ij} on pa_{ij}	0.043	*0.018	0.385
ext_{ij} on na_{ij}	0.143	*0.045	0.510
ext_{ij} on dd_{ij}	-0.398	*0.185	-0.332
ext_{ij} on con_{ij}	-0.179	*0.080	-0.345
ext_{ij} on soc_{ij}	0.022	0.105	0.033
ext_{ij} on phy_{ij}	0.093	0.073	0.197
ext_{ij} on $pa_{ij}*dd_{ij}$	0.007	0.004	0.250
ext_{ij} on $na_{ij}*dd_{ij}$	0.017	^0.009	0.280
ext grand mean	13.122	*0.812	2.502
β_{0j} on neg_j	-0.017	0.013	-0.207
β_{0j} on det_j	-0.012	0.014	-0.135
β_{0j} on dvc_j	0.036	*0.015	0.377
β_{0j} on psy_j	0.017	0.016	0.164

* $p \leq 0.05$; ^ $p \leq 0.10$. Only parameters that could differ from Full Models are listed here.

-29171.475, AIC = 58434.949, BIC = 58698.172), which differed from the Fixed Slope Model by the addition of fixed slopes for the interaction effects between affect and delay discounting.

Within-individual relationships common to all models. In all models predicting Transgressive Behaviors, social context and physical exertion significantly predicted positive affect, suggesting individuals experience higher levels of positive affect around others as opposed to alone as well as when engaged in activities requiring higher levels of physical exertion. Physical exertion significantly predicted negative affect, such that individuals seemed to experience less negative affect when engaged in activities requiring higher levels of physical exertion. Situational constraint trended toward being a significant predictor of positive and negative affect, suggesting individuals may experience higher levels of affect in situations with tighter behavioral constraints. Situational constraint significantly predicted delay discounting, such that individuals seemed to discount delayed rewards more when in situations with loose

behavioral constraints. Physical exertion trended toward being a significant predictor of delay discounting, such that individuals may discount delayed rewards more when engaged in activities requiring higher levels of physical exertion.

Between-individual relationships common to all models. In all models predicting Transgressive Behaviors, gender significantly predicted PID-5 Negative Emotionality, DvC, and Psychoticism. Females showed higher person-specific mean levels of Negative Emotionality than males, while the opposite pattern was shown for DvC and Psychoticism. Additionally, age significantly predicted traits DvC and Psychoticism. Younger individuals showed higher person-specific mean levels of DvC and Psychoticism as compared to older individuals.

Within-individual slopes predicting externalizing. Differences between the Full and Fixed Slope models, wherein candidate proximal mechanisms were specified as random versus fixed slopes, complicate the relationships between candidate proximal mechanisms and Transgressive Behaviors. On average across individuals, affect and delay discounting did not appear to predict Transgressive Behaviors in the Full Model. However, the Fixed Slope Model revealed significant fixed slopes for positive and negative affect. Additionally, Transgressive Behavior was significantly predicted by physical exertion in the Full Model but was significantly predicted by situational constraint in the Fixed Slope Model.

Interactions between affect and delay discounting. Adding affect-by-cognition interactions (i.e., positive affect by discounting and negative affect by discounting) in the Interaction Model resulted in the slope coefficient for delay discounting itself to become significant. In addition to changing the significance of coefficients that were already specified as part of the Full and Fixed Slope Models, the Interaction Model allowed for the testing of moderational effects between affect and delay discounting. The interaction between negative

affect and discounting trended toward significance. Moreover, a likelihood ratio test between the Fixed and Interaction Models investigated whether interaction effects significantly improved the fit of the model to the data. Indeed, test results (χ^2 statistic = 7.370, p = 0.025) show that they did significantly improve the fit of the model.

Cross-level relationships. Because random slopes allowed for moderation by between-individual level variables, the Full and Fixed Slope Models differ in their cross-level relationships. Two cross-level moderation effects in the Full Model—fixed effect of PID-5 Psychoticism and Negative Emotionality on the random slopes of positive and negative affect, respectively—trended toward significance. Additionally, the cross-level moderation of the random intercept also trended toward significance for PID-5 Psychoticism in the Full Model. In the Fixed Slope Model, DvC significantly predicted the random intercept while Psychoticism's effect was no longer trending toward significance.

Summary. In sum, the results from this series of two-level models provided support for several hypotheses. Situational factors differentially predicted candidate proximal mechanisms such as affect and delay discounting. Demographic variables differentially predicted personality traits. Momentary affect and delay discounting did not significantly interact when predicting momentary Transgressive Behaviors. Personality traits did not significantly moderate the relationship between candidate proximal mechanisms and momentary Transgressive Behaviors.

Impulsive Behaviors.

Model fit and comparisons. The models conducted for Impulsive Behaviors were the same as those for Transgressive Behaviors, with the exception of the outcome variable. Table 38, 39, and 40 present results for Full (number of parameters = 65, log-likelihood = -30326.837, AIC = 60783.674, BIC = 61155.619), Fixed (number of parameters= 44, log-likelihood =-30403.063,

Table 38. Parameter estimates of Full Model predicting Impulsive Behaviors, which specified random slopes for candidate proximal mechanisms.

Parameter	Estimate	S.E.	$d_{equivalent}$	Parameter	Estimate	S.E.	$d_{equivalent}$
ext_{ij} on con_{ij}	-0.380	*0.143	-0.411	β_{2j}'s intercept	0.127	0.083	0.238
ext_{ij} on soc_{ij}	0.003	0.204	0.003	β_{2j} on neg_j	-0.001	0.002	-0.064
ext_{ij} on phy_{ij}	0.197	0.127	0.241	β_{2j} on det_j	-0.002	0.002	-0.139
pa_{ij} on con_{ij}	0.565	^0.323	0.271	β_{2j} on dvc_j	-0.004	0.004	-0.146
pa_{ij} on soc_{ij}	1.273	*0.522	0.377	β_{2j} on psy_j	0.006	^0.004	0.259
pa_{ij} on phy_{ij}	1.516	*0.344	0.684	β_{3j}'s intercept	-0.050	0.122	-0.063
na_{ij} on con_{ij}	0.483	^0.268	0.279	β_{3j} on neg_j	0.003	0.004	0.117
na_{ij} on soc_{ij}	0.083	0.429	0.030	β_{3j} on det_j	-0.012	*0.004	-0.510
na_{ij} on phy_{ij}	-0.454	*0.206	-0.340	β_{3j} on dvc_j	-0.001	0.007	-0.019
dd_{ij} on con_{ij}	-0.156	*0.073	-0.332	β_{3j} on psy_j	0.012	*0.006	0.310
dd_{ij} on soc_{ij}	0.124	0.096	0.201	neg_j's intercept	56.898	*16.261	0.542
dd_{ij} on phy_{ij}	0.114	^0.065	0.271	neg_j on gen_j	8.137	*2.980	0.426
ext grand mean	11.002	*0.685	2.487	neg_j on age_j	-1.208	0.812	-0.230
β_{0j} on neg_j	-0.001	0.018	-0.011	det_j's intercept	36.851	*13.586	0.418
β_{0j} on det_j	-0.003	0.020	-0.019	det_j on gen_j	-0.157	2.594	-0.009
β_{0j} on dvc_j	0.077	*0.029	0.411	det_j on age_j	-0.652	0.674	-0.150
β_{0j} on psy_j	0.021	0.028	0.116	dvc_j's intercept	61.967	*11.567	0.832
β_{1j}'s intercept	-0.034	0.039	-0.134	dvc_j on gen_j	-7.073	*2.001	-0.548
β_{1j} on neg_j	-0.001	0.001	-0.107	dvc_j on age_j	-1.539	*0.582	-0.411
β_{1j} on det_j	0.002	0.001	0.192	psy_j's intercept	67.894	*14.424	0.731
β_{1j} on dvc_j	-0.001	0.002	-0.086	psy_j on gen_j	-7.086	*2.439	-0.446
β_{1j} on psy_j	0.002	0.002	0.157	psy_j on age_j	-2.046	*0.726	-0.435

* $p \leq 0.05$; ^ $p \leq 0.10$. Slope estimates in this table are fixed slopes. β_{0j} represents the random intercept of externalizing (ext_{ij}). β_{1j}, β_{2j}, and β_{3j} represent random slopes of ext_{ij} regressed onto positive affect (pa_{ij}), negative affect (na_{ij}), and delay discounting (dd_{ij}), respectively. β_{1j}, β_{2j}, and β_{3j}'s fixed intercepts are the average slopes of externalizing regressed onto positive affect, negative affect, and delay discounting, respectively. Positive affect, negative affect, and delay discounting were regressed onto situational factors (con_{ij}, soc_{ij}, phy_{ij}). β_{0j}'s fixed intercept is the grand mean of ext_{ij}. Person-specific intercepts (β_{0j}) and slopes (β_{1j}, β_{2j}, β_{3j}) were regressed onto personality traits (neg_j, det_j, dvc_j, phy_j). Personality traits were additionally regressed onto demographic variables (gen_j, age_j), with fixed intercepts representing sample trait means.

AIC = 60894.126, BIC = 61145.904), and Interaction Models (number of parameters = 46, log-likelihood = -30394.425, AIC = 60880.851, BIC = 61144.073). Situational factors' ability to predict affect and delay discounting as well as demographic variables' ability to predict personality traits are unchanged from the models predicting Transgressive Behaviors.

Within-individual relationships. On average across individuals, affect and discounting did not appear to predict Impulsive Behaviors in the Full Model. However, the Fixed Slope Model revealed a significant slope for negative affect. Impulsive Behavior was significantly

Table 39. Parameter estimates of Fixed Models predicting Impulsive Behaviors, with fixed slopes for candidate proximal mechanisms and no interactions between affective and cognitive mechanisms.

Parameter	Estimate	S.E.	$d_{equivalent}$
ext_{ij} on pa_{ij}	-0.009	0.018	-0.081
ext_{ij} on na_{ij}	0.089	*0.036	0.389
ext_{ij} on dd_{ij}	0.001	0.064	0.003
ext_{ij} on con_{ij}	-0.410	*0.149	-0.426
ext_{ij} on soc_{ij}	-0.096	0.204	-0.073
ext_{ij} on phy_{ij}	0.119	0.134	0.138
ext grand mean	11.010	*0.702	2.426
β_{0j} on neg_j	0.001	0.018	0.007
β_{0j} on det_j	-0.017	0.020	-0.133
β_{0j} on dvc_j	0.089	*0.031	0.435
β_{0j} on psy_j	0.020	0.028	0.107

* $p \leq 0.05$; ^ $p \leq 0.10$. Only parameters that could differ from Full Models are listed here.

Table 40. Parameter estimates of Interaction Models predicting Impulsive Behaviors, with fixed slopes for candidate proximal mechanisms and interactions between affective and cognitive mechanisms.

Parameter	Estimate	S.E.	$d_{equivalent}$
ext_{ij} on pa_{ij}	0.035	0.023	0.236
ext_{ij} on na_{ij}	0.124	*0.049	0.394
ext_{ij} on dd_{ij}	-0.634	*0.216	-0.460
ext_{ij} on con_{ij}	-0.435	*0.149	-0.460
ext_{ij} on soc_{ij}	-0.078	0.203	0.060
ext_{ij} on phy_{ij}	0.101	0.134	0.117
ext_{ij} on pa_{ij}*dd_{ij}	0.017	*0.007	0.399
ext_{ij} on na_{ij}*dd_{ij}	0.013	0.010	0.198
ext grand mean	12.816	*1.028	1.929
β_{0j} on neg_j	-0.001	0.018	-0.007
β_{0j} on det_j	-0.016	0.020	-0.119
β_{0j} on dvc_j	0.088	*0.031	0.435
β_{0j} on psy_j	0.018	0.028	0.095

* $p \leq 0.05$; ^ $p \leq 0.10$. Only parameters that could differ from Full Models are listed here.

predicted by situational constraint in all models. Adding affect-by-cognition interactions in the Interaction Model resulted in the slope for discounting to become significant. The interaction between positive affect and discounting also significantly predicted Impulsive Behaviors. A likelihood ratio test ($\chi 2$ statistic = 9.376, p = 0.009) comparing the Fixed and Interaction Models showed interaction effects significantly improved the model fit to the data.

Between-individual and cross-level relationships. PID-5 Psychoticism's cross-level moderation effect of negative affect's slope trended toward significance in the Full Model. Additionally, PID-5 Detachment and Psychoticism significantly moderated delay discounting's random effect on Impulsive Behaviors in the Full Model. Since the Level 2 intercept of delay discounting's slope was negative, the negative value of γ_{32} suggested delay discounting and Impulsive Behaviors were more strongly and negatively associated in individuals with lower levels of PID-5 Detachment. The positive value of γ_{34} suggested delay discounting and Impulsive

Behaviors were more strongly and negatively associated in individuals with higher levels of PID-5 Psychoticism. Impulsive Behavior's random intercept was significantly predicted by trait DvC in all models, such that individuals with higher levels of trait DvC were more likely to exhibit higher mean level Impulsive Behaviors.

Summary. General inferences from modeling Impulsive Behaviors were similar to those for Transgressive Behaviors, with the exception of inferences regarding affect-by-cognition interactions. Situational factors differentially predicted candidate proximal mechanisms while demographic variables differentially predicted personality traits. Affect and delay discounting interacted when predicting Impulsive Behaviors. Personality traits differentially moderated the relationship between candidate proximal mechanisms and momentary Impulsive Behaviors.

Externalizing Behavior Predicting Mood Change.

Using two-level models with fixed slopes, changes in momentary affect were regressed onto momentary externalizing behaviors. Impulsive Behaviors prospectively predicted changes in positive affect (slope estimate = 0.043, standard error = 0.019), suggesting that individuals feel increased positive affect after engaging in Impulsive Behaviors. However, no other prospective predictive relationships were statistically significant. Transgressive Behaviors did not predict changes in positive (slope estimate = 0.020, standard error = 0.045) or negative affect (slope estimate = -0.031, standard error = 0.059). Impulsive Behaviors did not predict changes in negative affect (slope estimate = 0.004, standard error = 0.029).

DISCUSSION

The current study aimed to contribute to the understanding of the mechanisms that cause externalizing behavior using an intensive longitudinal design. First, the Momentary-Externalizing Spectrum Inventory (M-ESI) was created to measure time-varying externalizing behavior in a comprehensive, psychometrically sound, and practically feasible manner. Second, an existing measure of personality states was modified to better capture facets of personality that are relevant to externalizing behavior, resulting in the Modified Mini-Markers (M-MM). The psychometric properties of the M-MM and M-ESI were examined. Third, personality traits were used to predict mean levels of externalizing and moderate the relationship between candidate proximal mechanisms and momentary externalizing. Fourth, the incremental utility of personality states were tested to investigate whether they offer additional predictive power for momentary externalizing behavior over and above personality traits. Finally, the relationships between situational factors, candidate proximal mechanisms, and externalizing behaviors were modeled. Whenever possible, these models attempted to explore certain hypotheses about mediation and moderation in order to refine understanding and generate new hypotheses about how these candidate proximal mechanisms influence each other.

Factor Structure of the Modified Mini-Markers (M-MM)

The pilot study began with an initial pool of 72 items. Elimination of items with the weakest psychometric properties (e.g., low factor loadings, many cross-loadings, low item-total correlations) or semantically-related concerns (i.e., intended meaning of the item differed from the interpretations of the factor) resulted in a measure with 32 items. Factor analyses showed a five-factor structure in both the pilot and the main study. EFAs resulted in a personality state hierarchy that resembled Markon and colleagues' (2005) trait hierarchy. States similar to the Big

Three (Eysenck, 1947, 1952, 1963; Eysenck & Eysenck, 1976; Tellegen, 2000; Tellegen & Waller, 2008) and Big Four (Widiger, 1998) traits were recovered. Three scales of the M-MM (i.e., Neuroticism, Agreeableness, Conscientiousness) can be interpreted as state manifestations of their corresponding traits FFM of personality. The state Gregariousness factor can be interpreted the degree to which an individual is outgoing versus reserved, a narrower facet of FFM Extraversion. The fifth factor—Openness-to-Experience/Sensation-Seeking in the pilot study and Sensation-Seeking in the main study—differs from the Openness-to-Experience domain of the FFM.

Validity of the Sensation-Seeking scale. The lack of a standalone Openness-to-Experience factor represents an interesting difference between traditional FFMs and the current study. The pilot study found items that typically measure sensation-seeking (e.g., bold, adventurous) loaded onto the same factor as items that typically measure openness-to-experience (e.g., creative, imaginative). Contrastingly, the main study found that items from the Sensation-Seeking and Gregariousness factors loaded together when only four factors were extracted. Though these findings raise obvious questions about the validity of the M-MM's Sensation-Seeking scale, they do not represent departures from past literature.

FFMs of personality have been examined alongside sensation-seeking measures in the past, showing moderate to high correlations between sensation-seeking and multiple aspects of the FFM. Costa and McCrae (1992) found NEO-PI-R Extraversion and Openness-to-Experience domains to correlate at $r = 0.40$ ($n = 1000$), a relationship that Aluja and colleagues (2003) found to be mostly explained by the Excitement-Seeking facet of Extraversion. The Excitement-Seeking facet of the NEO-PI-R was described by Costa & McCrae (1992) as "akin to some aspects of sensation-seeking" (pp. 17). Further, Aluja and colleagues (2003) found sensation-

seeking to correlate most highly with the Actions and Fantasy facets of NEO-PI-R's Openness-to-Experience, facets which measure an individual's receptivity to new experiences on an overt behavioral level and in the inner world of imagination. Garcia and colleagues (2005) replicated the associations between sensation-seeking, extraversion, and openness-to-experience. Taken in combination, previous findings suggest that openness-to-experience and extraversion share some common variance and sensation-seeking is meaningfully related to the overlap between openness-to-experience and extraversion. The M-MM Sensation-Seeking scale in the current study can be interpreted as narrower than both FFM Extraversion and Openness-to-Experience domains; however, it cannot be interpreted as facets subsumed by any one FFM domain.

The emergence of Sensation-Seeking as a factor was also in part a result of the content coverage of the M-MM's item pool. During the development of the initial item pool, the author of the current study purposefully added content to measure overt behavioral sensation-seeking in order to adequately capture personality constructs relevant to externalizing behaviors. While content that measure openness-to-experience were also included, they were eliminated during the modification process due to poor psychometric functioning. Reasons for elimination included low loadings onto factors as well as similar cross-loadings across factors. Once the elimination occurred, the content coverage of the M-MM favored overt behavioral sensation-seeking as opposed to covert internal sensation-seeking (i.e., facets of openness-to-experience as defined by Costa & McCrae [1992]). Therefore, it is important to acknowledge that while the current iteration of the M-MM is valid toward the purpose for which it was designed—to capture personality states most relevant to externalizing behaviors—it is likely not a comprehensive measure of all personality state constructs.

States reveal different within- and between-individual structures. The factor structure of between-individual variation differed from that of within-individual variation, such that Positive and Negative Self Evaluation best described the structure of between-individual variation in person-specific means of personality states. In interpreting the meaning of these two factors, previous two-factor structures such as the Big Two (DeYoung, 2006; Digman, 1997), affective models (Watson et al., 1988; Watson & Clark, 1994), self-enhancement models (Paulhus & John, 1998; Vecchione & Alessandri, 2013) were considered.

Digman's (1997) Big Two reflect shared variance of agreeableness, conscientiousness, and emotional stability in *Alpha*, and shared variance of extraversion and openness-to-experience in *Beta*. The content of the two between-individual factors here do not appear to be equivalent to *Alpha* and *Beta*. Positive Self-Evaluation appears to represent the shared variance of items that typically measure agreeableness, conscientiousness, certain aspects of extraversion, and sensation-seeking. Notably, these four M-MM scales share the highest correlations with each other, perhaps also reflecting this shared variance. Meanwhile, Negative Self-Evaluation appears to represent mainly neuroticism, though items (e.g., "sloppy") representing the less socially desirable pole of other states (e.g., conscientiousness) also loaded significantly onto this factor before they were eliminated for poor psychometric functioning. Positive and negative affective models have shown specific associations with extraversion and neuroticism, respectively (Watson & Clark, 1994). The content of the two between-individual factors here appear to be broader than affect, consisting of affectively free components such as DvC.

Individuals have self-enhancement motivations to self-report personality in directions that exaggerated own talents (i.e., agentic motivations) and minimized socially-deviant impulses (i.e., communal motivations; Paulhus & John, 1998). Previous literature on the associations

between self-enhancement motivations to personality traits have shown mixed findings. Paulhus and John (1998) found associations between agentic motivations to extraversion, openness-to-experience, and emotional stability; between communal motivations to agreeableness; and between both types of motivations to conscientiousness. Vecchione and Alessandri's (2013) findings differed such that emotional stability was strongly associated with both types of motivations, instead of only agentic motivations. Like the Big Two and affective models, the content of the Positive and Negative Self-Evaluation factors do not map onto these motivations exactly. Based on the factor content, the best interpretation of the present study's between-individual factors appear to be Positive and Negative Self-Evaluation.

It is non-intuitive that when personality states are analyzed, their between-individual variation do not exhibit a five-factor structure similar to the traditional FFM of personality traits. One way to understand this is by noting that multilevel modeling partitions each individual's responses to items into person-specific means and temporally varying deviances from those means. While individuals have their temporally stable tendencies to conceptualize themselves along two dimensions, their repeated ratings exhibit time dependent variation from these stable average tendencies that vary along five dimensions. That there is meaningful covariation in addition to the five-factor within-individual structure may speak to how personality trait measures are correlated with but not equivalent to aggregated momentary measures of personality (Fleeson & Gallagher, 2009; Heller et al., 2007; Sharma et al., 2013; Wu & Clark, 2003). Individuals may differ in their baseline tendency to evaluate themselves in specific ways, a tendency which may impact trait measures undetected because of the single occasion measurement but which can be detected using repeated state measures via multilevel modeling. It is also possible the two-factor structure arose as a methodological artifact of the positively versus

negatively valence in the wording of the items. Future research may find it useful to investigate how these self-evaluative dimensions relate to other trait measures, including those that assess impression management and affective tendencies, as well as method variance among the items.

Summary of the M-MM's structural validity. Overall, the findings of the current study supported the validity of the M-MM as a measure of personality states, with a few caveats. Within-individual factor structures were retrieved from two separate validation samples that were broadly consistent with the purpose of the measure and previous literature. The Mini-Markers (Saucier, 1994) were explicitly modified to increase the relevance of personality scale scores to the study of externalizing behaviors. Toward this end, results wherein sensation-seeking replaced openness-to-experience as the construct measured by the fifth personality state scale are consistent with the purpose of the M-MM. It is unclear whether the narrowness of the Gregariousness scale represents a limitation of the M-MM, and future research may expand this scale to measure extraversion more broadly. The validity and interpretation of the between-individual factor structure is less clear—indeed, it between-individual factor structure was not prioritized in the current study—and future research may clarify its meaning. The results of the current study broadly support the use of the M-MM in the context of externalizing behaviors, but not as an omnibus measure of personality states as facets of extraversion and openness-to-experience may not be well measured with the M-MM.

How Personality Varies and Why it Matters

Distributions of personality states. The current study aimed to describe the distribution of personality states and replicate findings of within-individual variability (Fleeson & Gallagher, 2009). This establishes that personality states do vary, which is a prerequisite for answering the other questions posed by the current study. It should be noted that where differences in

distributional descriptors were found between the current and other studies, the data cannot answer questions of causality. In other words, distributional differences cannot be assumed to be due to differences in personality between samples nor can they be assumed to be due to differences in measures used. Future studies may make use of item-response analyses and measurement invariance analyses to disentangle these equally plausible hypotheses.

The measured central tendency of personality states in the current study were generally consistent with distributional descriptors found by Fleeson and Gallagher (2009), with a few notable differences. It is possible that the present sample was for whatever reason less agreeable (mean of person-specific means [M of Ms] = 63.56%) and conscientious (M of Ms = 56.05%) than Fleeson and Gallagher's sample (M of Ms = 69.52% and 61.65%, respectively), though differences may also be due to personality state scales' different item content. State sensation-seeking likely shares overlapping variance with state intellect in other studies, but is neither as broad nor entirely subsumed by state intellect. Further, sensation-seeking (M of Ms = 47.88%) may tap into a slightly more pathological state than intellect (M of Ms = 51.50%; Fleeson & Gallagher, 2009), though this is an open empirical question without item-response analyses. Finally, neuroticism in the current study (M of Ms = 34.50%) is oppositely keyed (i.e., such that higher scores represent more emotional instability) when compared to emotional stability in Fleeson and Gallagher's (2009) study (M of Ms = 70.00%).

The spread of the person-specific means represented how much individuals differed from each other in mean levels of personality states expressed. Here, it is important to examine both numerical and graphical representations of spread to understand the distributions of states. Though state neuroticism's numerical indicators of spread were somewhat unremarkable, Figure 6 revealed that it had a distribution most closely approximating a uniform distribution. Compared

to other states, this indicates that individuals are more likely to exhibit mean levels of neuroticism that are not clustered around the sample mean and that are at or near the extreme poles of neuroticism. Contrastingly, state extraversion showed the tightest clustering of observations around the mean. Finally, sensation-seeking's person-specific means showed a slightly right-skew (i.e., longer tail to the right) while agreeableness showed a clear left-skew (i.e., longer tail to the left). The former is consistent with the hypothesis that sensation-seeking may measure a somewhat pathological construct while the latter is consistent with state agreeableness distributions found in prior research (Fleeson & Gallagher, 2009).

Associations between states and traits. Exploratory analyses in the current study examined correlations between distributional descriptors of personality states and personality traits (see Table 25). Consistent with previous research showing the convergent validity of measures of adaptive and maladaptive personality traits (De Fruyt et al., 2013; Gore & Widiger, 2013; Markon et al., 2005; Thomas et al., 2013; Watson et al., 2013), the present study would expect state neuroticism to be associated with trait negative emotionality, gregariousness with detachment, agreeableness with antagonism, and conscientiousness with disinhibition. Fleeson and Gallagher (2009) used similar analyses to elucidate aspects of personality states that trait standings represent. Consistent with this previous research, trait standings generally show the ability to predict mean and maximum levels of corresponding personality states quite well. To the extent that each state is associated with its corresponding trait, findings lend support to the convergent validity of the measurement of neuroticism, gregariousness, agreeableness, and conscientiousness by the M-MM scales.

The association between trait psychoticism and personality states are more complex. Trait psychoticism's associations with mean and maximum levels of states gregariousness and

sensation-seeking trend toward significance. Given previous findings that both traits extraversion and sensation-seeking share overlapping variance with trait psychoticism, these trends may tentatively suggest the need for larger sample sizes. Indeed, the numerous correlations that trend toward significance indicate the need for replication with larger sample sizes in general. Taking this in combination with previous discussion above regarding the Sensation-Seeking scale's validity, associations with traits neither adds or detracts from the validity of the M-MM Sensation-Seeking scale.

The current study also went beyond the previous research and examined the associations between all states and traits, even those not typically expected to correspond to each other. Results clearly show that traits and states are not isomorphically associated with one another, such that standing on any one trait being associated with mean level, variability, and extreme level expressions of multiple states seemed to be the rule rather than the exception.
For example, all five maladaptive personality traits similarly shifted the distribution of neuroticism to the right, consistent with the previously posited notion that neuroticism may represent general levels of distress (Eysenck, 1970; Gotlib, 1984; Watson & Clark, 1984; Zurawski & Smith, 1987) and implying that state neuroticism may represent momentary levels of distress. Another notable example is that while trait antagonism's links to state agreeableness are expected, antagonism's association with sensation-seeking is less so. One possible explanation is that perhaps extremely high levels of state sensation-seeking requires the violating of social norms in which only some individuals engage.

The associations between trait disinhibition and personality states also warrant discussion. Like other five-factor models of personality, the conceptualization of PID-5 Disinhibition is narrower than four-factor models' DvC, reflecting low FFM conscientiousness

rather than a combination of low FFM conscientiousness and agreeableness. Based on previous research, one would expect a PID-5 Disinhibition to show more discriminant associations for traits conscientiousness as compared to agreeableness. Though the current study's results are agnostic about why, there is a possible explanation for the association between PID-5 Disinhibition and state agreeableness. De Fruyt and colleagues (2013) found that some PID-5 facets show cross-loadings in a five-factor EFA; specifically, that facet Callousness cross-loaded onto an Antagonism factor in addition to the Disinhibition factor. Given the M-MM's Agreeableness scale's item content (e.g., kind, considerate, helpful), it is possible that the observed association is tapping into the same overlapping variance as facet Callousness.

Incremental validity. Results supported the hypothesis that personality states would have incremental validity over and above personality traits in predicting externalizing behaviors. Moreover, the use of momentary predictors allows for within-individual variation to be analyzed separately from between-individual variation through the use of random effects, which was shown to be useful for impulsive behaviors. The association between temporal changes in personality states and transgressive behaviors may be more uniform across individuals, while the association between temporal changes in personality and impulsive behaviors may vary more across individuals. This suggests a larger role for individual differences (e.g., demographic variables, personality traits) to moderate the association between personality states and impulsive as compared to transgressive behaviors. Other analyses in the current study—discussed later—provide further investigation into this issue.

The current study also hypothesized that the amount of within-individual variation for each state would be related to its incremental utility. If the effect sizes of personality states' slope coefficients in predicting externalizing behaviors are taken as a quantitative approximation of the

states' incremental utility, then the amount of within-individual variation of each state did not translate into incremental utility. In hindsight, one must take into account that the incremental utility is specific to the outcome variable states are trying to predict, as shown by the two analyses which vary by the outcome variable (i.e., transgressive versus impulsive behaviors). Thus, those states that are more strongly associated with the outcome variable may play a larger role in incremental utility.

For example, all states except for gregariousness significantly predicted impulsive behaviors, while only neuroticism and sensation-seeking significantly predicted transgressive behaviors. The specificity with which agreeableness and conscientiousness predicted impulsive behaviors is consistent with previous impulsivity research establishing a role for trait DvC (Sharma et al., 2014). However, agreeableness' positive predictive relationship to impulsive behaviors is surprising. This unexpected relationship may be a true effect—perhaps those who are more easily influenced by others are more likely to behave at the spur of the moment—or it may be a statistical artifact. Misspecified prediction models (e.g., that fail to combine agreeableness and conscientiousness into a variable representing DvC) and multicollinearity in simultaneously entered predictors comprise possible culprits that may yield artifactual regression coefficients. The lack of clarity regarding this issue points to the need for further work testing the associations between time varying personality stats and externalizing behaviors.

Summary of temporal variance in personality states. Personality states do vary, with measured central tendency of personality states that were generally consistent with distributional descriptors found by Fleeson and Gallagher (2009). The finding that trait standings generally show the ability to predict mean and maximum levels of corresponding personality states quite well was also replicated. Notable differences from previous findings include lower mean

agreeableness and conscientiousness in the current sample, as well as expected differences in distribution and associations with personality traits for state sensation-seeking. Further, the current study demonstrated that traits and states are not isomorphically associated with one another. Overall, results supported the incremental utility of personality states over and above personality traits in predicting externalizing behaviors, perhaps illuminating a need to incorporate time varying components of personality into the prediction of other psychopathological phenomena.

The Momentary-Externalizing Spectrum Inventory (M-ESI)

Content validity of the M-ESI. Thirty-six items were adapted from a combination of the 23 facets of the ESI (Krueger et al., 2007) and daily behaviors from Sharma and colleagues' (2013) behavioral checklist. The former targeted comprehensiveness of types of externalizing behaviors while the latter targeted comprehensiveness of severity or frequency of externalizing behaviors. Elimination of items with the weakest psychometric properties (e.g., low factor loadings) or semantically-related concerns (i.e., with potential to reduce discriminant validity between predictors and outcomes) resulted in a final measure with 20 items.

Some ESI facets were only represented in the M-ESI item pool by one initial item and were subsequently removed due to poor psychometric functioning. While this does not necessarily represent a problem for the M-ESI, it does mean that the content coverage of the M-ESI may have been substantially altered from the ESI from which it was originally adapted. In the process of increasing discriminative utility from personality and affective constructs, items adapted from ESI facets referencing internal or covert experiences without external behavioral indicators (i.e., Alienation, Boredom Proneness, Blame Externalization, Empathy) were eliminated. Additionally, items adapted from the ESI facets of Marijuana Use, Excitement-

Seeking, and Planful Control were eliminated. Due to these substantial alterations from the content coverage of the ESI, comprehensiveness decreased while brevity was improved.

Factor structure of the M-ESI. Factor analyses showed mixed support for a two- versus a three-factor structure in the pilot study, while the main study showed the optimal structure to be a two-factor model. The EFAs resulted in a hierarchy that reflected the meaningful heterogeneity within externalizing behavior. At a coarser level of abstraction, the meaningful difference may be between behaviors marked by an internal sense that they are difficult to inhibit (i.e., Impulsive Behaviors) and those that are marked by their effect upon others' rights or sense of safety (i.e., Transgressive Behaviors). At a finer level of abstraction, different types of transgressive behaviors may be distinguished by those that are driven by the desire to reduce negative affect (i.e., Emotional Aggression) and those that are motivated toward obtaining specific outcomes (i.e., Instrumental Aggression). The reliability, validity, and utility of this three-factor structure, wherein the Transgressive Behaviors factor separates into Emotional and Instrumental Aggression, was not further explored in the present study. Future research may find this finer level of abstraction more useful, depending on the research purpose. Regardless of the desired level of abstraction, the different ways to understand the multidimensionality of the M-ESI supported the existence of meaningful heterogeneity within externalizing behaviors.

Understanding heterogeneity within externalizing behaviors may also require the use of higher-order or hierarchical structural models. Structural analyses of the ESI (Krueger et al., 2007) revealed a hierarchical structure, wherein a general factor represented externalizing spectrum liability and two specific factors represented aggression and drug use, respectively. Because hierarchical factor structures would complicate the calculation of M-ESI scale scores used in the longitudinal analyses, they were not investigated within the current study. The

limitation of the current study did not allow for support for this type of structure to arise, though future M-ESI research may certainly investigate this and other possible structures.

Summary. Support was mixed for two- versus three-factor structures and the fit of hierarchical and higher-order structures is unknown in the M-ESI. Additionally, the M-ESI may not be a comprehensive measure of all types of externalizing behaviors, especially those that are covert or internal experiences without external behavioral indicators. Despite these caveats, many findings regarding the M-ESI's psychometric strengths are notable. Item-total correlations and Cronbach's alphas indicated adequate internal consistency, with the latter being surprisingly substantial given the small number of items per scale. Discriminative validity between M-ESI scales and other constructs (i.e., momentary affect and personality state) were established in both the pilot and main studies. The factor structures retrieved from two separate validation samples were broadly consistent with each other. Further, the same two-factor structure was shown to be optimal at both within- and between-individual levels within the main study's CFAs. The brevity and psychometric properties of the current iteration of the M-ESI encourage its future use and improvement as a measure of momentary externalizing behaviors.

Temporal Variation in Delay Discounting

Intraclass correlations showed that the candidate proximal mechanisms did indeed vary over time, which is an important finding in its own right. While it is not surprising that situational factors or affect varied over time, delay discounting has not, to the author's knowledge, been repeatedly measured with the temporal resolution or sample size of the current study. Even though the temporal variation of delay discounting is clear, the meaning of the intraclass correlation of 0.916 is unclear without knowing sources of variation that contribute to within-individual variation. Sources of variation may include true change in delay discounting

from moment to moment, measurement error due to the instrument used, and measurement error due to person-specific response biases. It may also be that individuals low on conscientiousness may be more careless in completing the measure of delay discounting, thereby increasing missing-not-at-random time points and biasing results. Therefore, while the current study represents an encouraging starting point, methodological improvements on the measurement of delay discounting in an intensive longitudinal context is needed.

Predicting Momentary Externalizing Behavior

The primary aim of the current study was to examine the ability of candidate proximal mechanisms on externalizing behavior. Results from two-level models provided support for several hypotheses, and mixed or no support for other hypotheses. Mixed support for hypothesized relationships arose in the form of effects that trended toward significance as well as effects that were significant in some models but not others.

Relationship of mean level externalizing to personality traits. When personality traits were used to predict mean level externalizing behaviors without the use of multilevel modeling, trait disinhibition emerged as the only significant predictor. The current study's hypotheses was partially borne out by the data, such that trait negative emotionality did not emerge as a significant predictor of mean externalizing. An examination of the item content of the externalizing behavior scales suggests that neither impulsive nor transgressive Behaviors are defined solely by affectively driven behaviors. It may be possible that the mixture of affect laden emotional aggression and affect free instrumental aggression within the Transgressive Behaviors scale of the M-ESI reduced the association between trait negative emotionality and mean transgressive behaviors. This again speaks to the mixed support for two- versus three-factor structures of the M-ESI, such that the three-factor structure may have utility as it relates to

affectively relevant personality constructs or affective constructs. As the discussion turns toward multilevel modeling results, it is important to remember that predicting mean levels of behaviors may obscure moment-to-moment covariation between affect and behaviors.

Power of the situation operate through specific and general factors. Results supported social context and physical exertion's associations with affect and situational constraint's association with cognition. Consistent with research linking social interaction with positive affect (McIntyre, Watson, & Clark, 1991), individuals in the current study experienced higher levels of positive affect around others as compared to when alone. Consistent with a body of literature linking physical activity and mood (Biddle, 2000; Fox, 1999; Giacobbi, Hausenblas, & Frye, 2005; Lane & Lovejoy, 2001; Steptoe, Kearsley, & Walters, 1993), individuals experienced higher levels of positive affect and lower levels of negative affect during activities requiring higher levels of physical exertion. Showing situation predicts affect is a prerequisite to supporting mediational hypotheses about how the situation influences externalizing.

With regard to cognitive processes, individuals seemed to discount delayed rewards more in situations with loose behavioral constraints. To the degree that individuals are motivated to behave appropriately in any context (Dixon et al., 2006; Price & Bouffard, 1974), situational constraints place demands on individuals to engage effortful/reflective modes as opposed to automatic/reflexive modes of self-regulation (Carver et al., 2008; Dvorak & Simons, 2009; Johnson et al., 2013). Situational constraints also demand that individuals postpone inappropriate behavioral urges, which engages delay of gratification strategies (Casey et al., 2011; Metcalfe & Mischel, 1999). If successful, effortful self-regulation and delay of gratification strategies are both consistent with decreased delay discounting.

Effects trending toward significance include associations between situational constraint

and affective states as well as physical exertion and cognitive processes. Individuals may experience higher levels of both positive and negative affect in situations with tighter behavioral constraints. While it is possible that the presence of constraints amplifies already existing mood states, this hypothesis runs counter to existing hypotheses that posit individuals are motivated to control mood toward neutrality in the presence of situational constraints (Erber & Erber, 2001). Individuals may also discount delayed rewards more when physically exerting themselves. Considered in the context of Kurth-Nelson and colleagues' (2012) model of delay discounting—wherein the value assigned to the future outcome is proportional to how easy it is to find—this link between physical activity and delay discounting may not be so puzzling. It may be that physical activity functions in the moment in the same way as cognitive load, making delayed rewards more difficult to mentally access and engaging more automatic/reflexive modes of self-regulation. Thus, the association between delay discounting and situational constraint is consistent with the conceptualization of delay discounting as a proximal mechanism of behavioral inhibition versus disinhibition. Though care should be taken not to over-interpret these nonsignificant effects, they do raise questions about differential mood and cognitive processing in the presence versus absence of certain situational factors.

Over and above situational factors effects on specific proximal mechanisms, they may also more directly influence externalizing behavior. The most consistently found effect across the multilevel models in this study was that of situational constraint on externalizing behavior, significant across all models except for one (i.e., the Full Model predicting transgressive behaviors, wherein physical exertion was significant instead of situational constraint). Similar to situational constraint's effect on delay discounting, situational constraint's direct relationship with externalizing is consistent with effortful self-regulation and delay of gratification strategies

in contexts where behavioral norms are more constrained. While the combination of situational constraint's effects on both delay discounting and externalizing behavior hint at partial mediation of situation-on-externalizing effects by candidate proximal mechanisms, future research needs to prioritize power to test mediational effects in order to make stronger inferences. In the current study, complexity of multilevel models preclude formal mediational testing, which relies on possibly minute changes in the significance of estimated parameters.

Cognitive-independent affective and affect-dependent cognitive mechanisms. Affect and delay discounting play significant roles in predicting both types of externalizing behaviors, with differences in whether and how they interact. Positive affect as well as the interaction between negative affect and delay discounting predicted transgressive behaviors. Contrastingly, negative affect as well as the interaction between positive affect and delay discounting predicted impulsive behaviors. These results tentatively suggest that while affective processes may be able to influence externalizing behaviors independently of cognitive processes, the reverse is not true. Due to the instability of parameter effect sizes across different two-level models in the current study, these results warrant replication in larger sample sizes. Future studies should also seriously consider measuring both affect and cognition toward predicting externalizing behaviors, else run the risk of misspecifying statistical models during analyses.

Moderation of proximal relationships by distal individual differences. In addition to the clear ability of trait DvC to predict mean levels of externalizing behavior, personality traits differentially moderated the relationship between candidate proximal mechanisms and externalizing behaviors. The cross-level moderation of traits detachment and psychoticism of delay discounting's effect on impulsive behaviors was clearly supported by the multilevel analyses. That people who are lower in detachment—and thereby higher in extraversion—and

higher in psychoticism showed stronger relationships between delay discounting and impulsive behaviors may suggest a moderating role for trait sensation-seeking. In other words, there may be a subset of people high in sensation-seeking who are particularly susceptible to temporal variations in their cognitive ability to use self-regulation strategies. This may differentially impact impulsive behaviors as opposed to transgressive behaviors.

The evidence for cross-level moderation between candidate proximal mechanisms and transgressive behaviors was more equivocal, consisting of effects that trended toward significance. The finding that when cross-level moderation effects were included in two-level models, the effect of proximal mechanisms on externalizing failed to reach significance also showed mixed support for cross-level effects. When cross-level moderation effects were excluded, however, proximal mechanisms significantly predicted externalizing. Therefore, these cross-level moderation relationships remain hypotheses without replication in a larger sample.

Summary. Candidate proximal mechanisms such as situational factors, momentary affect, and delay discounting have the ability to predict momentary externalizing behavior in an ongoing temporally varying manner. Situational factors appear to exert their influence on externalizing behaviors both directly and indirectly through other proximal mechanisms. While affective processes may be able to influence externalizing behaviors independently of cognitive processes, the reverse is not true. In addition to the ability of trait DvC to predict mean levels of externalizing behavior, personality traits differentially moderated the relationship between candidate proximal mechanisms and externalizing behaviors. Though specific hypothesized relationships received mixed or no support in the current study, the broad aims of the study were fulfilled such that intriguing new hypotheses were generated to fuel future research.

Externalizing Behavior Predicting Mood Change

The intensive longitudinal nature of the current study's design allowed for time-lagged analyses; specifically, those investigating whether changes in mood occurred after externalizing behaviors. Results indicate that the type of externalizing behavior matters, such that impulsive behaviors prospectively predicted increases in positive affect. That individuals appear to feel more positive affect following externalizing is consistent with previous research on enhancement motives. However, not finding support for negative affect change following externalizing behaviors may also be informative. One possible hypothesis regarding the lack of negative affect change is that individuals in this study did not successfully use externalizing behaviors to regulate negative affect. Another possible explanation may be related to the "resolution" with which externalizing behaviors are examined. In other words, perhaps the division of externalizing behaviors into transgressive versus impulsive Behaviors is one of many levels of abstraction. Detecting causal relationships between candidate mechanisms and externalizing behaviors will demand that researchers be more aware of the optimal level of abstraction at which to examine externalizing behaviors, which may very well differ depending on the candidate mechanism in question.

SUMMARY AND FUTURE DIRECTIONS

Generally, the current study aimed to contribute to the understanding of the mechanisms that may play causal roles toward externalizing behavior using an intensive longitudinal design. The Momentary-Externalizing Spectrum Inventory (M-ESI) was created and shown to be a practically feasible measure to administer multiple times per day with some desirable psychometric properties. An existing measure of personality states was also modified to better capture facets of personality that are relevant to externalizing behavior, resulting in the five-factor Modified Mini-Markers (M-MM). Results supported the incremental utility of personality states, such that they appear to offer additional predictive power for momentary externalizing behavior over and above personality traits. Results also supported the temporal variation in delay discounting, which is a novel finding in its generalizability. The purpose of these analyses were to enable multilevel modeling of predictors of momentary externalizing behavior.

Candidate proximal mechanisms such as situational factors, momentary affect, and delay discounting were shown have the ability to predict momentary externalizing behavior in an ongoing temporally varying manner. Preliminary evidence tentatively suggested partial mediation of situation-on-externalizing by proximal mechanisms, which possibly may cognitive-independent affective and affect-dependent cognitive mechanisms. Preliminary evidence also supported the cross-level moderation of proximal relationships by distal individual differences. Finally, longitudinal change in affect was found after certain types of externalizing behaviors.

The primary strength of this study is the intensive longitudinal design, which allows for finer temporal resolution of the measurement of momentary constructs as well as stronger inferences about the nature of relationships between such constructs. Another strength of the current study is the measurement and modeling of both distal and proximal candidate

mechanisms, allowing for the bridging of several somewhat disparate bodies of literature as well as the examination of cross-level moderation effects. While the sample size can be considered substantial for such an intensive longitudinal design, it may not have allowed for enough power to adequately detect all between-individual level and cross-level effects. However, recall that power analyses from the pilot study indicated that any detected effects at the between-individual level or across levels should motivate some confidence. I would argue that they should motivate at least enough interest to be examined in future work.

In addition to the strengths of the study, there are limitations that restrict the strength of inferences that can be made from the results. First, the M-ESI does not measure covert externalizing behaviors well and mixed support was found for two- versus three-factor structures. Second, the M-MM may not measure certain facets of openness-to-experience and extraversion well and the between-level factor structure may contain some method variance among items. These measurement-related limitations may propagate through the study, such that multilevel modeling effects may have been obscured in some cases and inflated in others.

The results of the current study suggest a few additional avenues for future research. First, both the M-MM and the M-ESI would benefit from continued measure revision and validation. M-ESI factor analyses may want to consider testing higher-order and hierarchical structures, especially given the hierarchical structure found in the ESI (Krueger et al., 2007). Related to M-ESI's structure, future research aimed at detecting causal relationships between candidate mechanisms and externalizing behaviors will demand that researchers be aware of the optimal level of abstraction at which to examine externalizing behaviors. This means perhaps examining differences between emotional and instrumental aggression, in addition to differences between transgressive and impulsive behaviors. Second, researchers interested in mediational or

cross-level moderational effects would benefit from prioritizing power to test such effects in order to make those inferences. Finally, the finding of incremental utility of personality states may be expanded from predicting momentary externalizing behaviors to a wide range of psychological phenomena. Additionally, a formal procedure to quantify the amount of incremental utility for each personality state would be helpful.

In conclusion, the current study contributed a rich dataset and valuable findings to the existing externalizing psychopathology literature. It also combined an intensive longitudinal design, a substantial sample size, and the use of a wide range of advanced statistical modeling techniques. This combination allowed the current study to explore the relationships of candidate proximal and distal mechanisms and externalizing behavior in novel ways that not only replicated previous findings but generated a set of new hypotheses that hopefully will propel future externalizing research.

FOOTNOTES

[1] It should be noted that while disinhibition encompass "interpersonally disagreeable" behaviors such as aggression, the inclusion of predatory forms of aggression (i.e., behaviors with intent to harm others that involve low levels of emotional arousal and high levels of planfulness) within externalizing behaviors may be controversial. Predatory types of aggression requires planning (i.e., are not impulsive) and are sometimes considered to be outside the scope of externalizing behaviors (Frick & Marsee, 2006; Frick & Morris, 2004; Patrick, Fowles, & Krueger, 2009). Because some researchers consider disinhibition to be the core deficit of externalizing behaviors, predatory aggression may be too planful to fall within the boundaries of externalizing behaviors (Frick & Marsee, 2006; Frick & Morris, 2004; Patrick et al., 2009). However, some other researchers consider predatory aggression to be encompassed by externalizing behavior because they co-occur in some externalizing spectrum disorders (e.g., antisocial personality disorder) at rates higher than chance. A somewhat neutral position would be to acknowledge that the boundaries of externalizing behaviors is constantly being refined according to new evidence and that it is important not to reify constructs. Because the current study aimed to study externalizing behavior as broadly as possible, I included a comprehensive sampling of aggressive behaviors within externalizing behavior. Findings could thus contribute to the understanding of how affective, decision-making, and personality processes are related to these less disinhibited aggressive behaviors.

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APPENDIX: POWER SIMULATIONS CODE

Mplus code used in power simulations:

```
MONTECARLO: NAMES ARE mconsc magree mcxa ext consc agree cxa;
        !person-specific means of: conscientiousness (mconsc), agreeableness (magree), their
        interaction (mcxa)
        !outcome variable: momentary externalizing (ext)
        !within-person deviations from person-specific means: conscientiousness (consc),
        agreeableness (agree), their interaction (cxa)

NOBSERVATIONS = 3150;
NCSIZES = 1;
CSIZES = 150 (21);
SEED = 5859;
NREPS = 1000;
WITHIN = consc agree cxa;
BETWEEN = mconsc magree mcxa;

ANALYSIS:  TYPE = TWOLEVEL RANDOM;

MODEL POPULATION:
    %WITHIN%
    s1 | ext ON consc;
    s2 | ext ON agree;
    s3 | ext ON cxa;
    [consc*0 agree*0 cxa*0];
    ext*0.295; consc*0.242 agree*0.376 cxa*0.234;
    %BETWEEN%
    ext ON mconsc*0.340 magree*0.247 mcxa*0.047;
    ext WITH s1-s3*0.123;
    [ext*0]; [s1-s3*0.211]; [mconsc*0 magree*0 mcxa*0];
    ext*1; s1-s3*0.5; mconsc*0.989 magree*0.997 mcxa*0.961;
MODEL:
    %WITHIN%
    s1 | ext ON consc;
    s2 | ext ON agree;
    s3 | ext ON cxa;
    [consc*0 agree*0 cxa*0];
    ext*0.295; consc*0.242 agree*0.376 cxa*0.234;
    %BETWEEN%
    ext ON mconsc*0.340 magree*0.247 mcxa*0.047;
    ext WITH s1-s3*0.123;
    [ext*0]; [s1-s3*0.211]; [mconsc*0 magree*0 mcxa*0];
    ext*1; s1-s3*0.5; mconsc*0.989 magree*0.997 mcxa*0.961;
```