

ASSESSING EYE MOVEMENT DYNAMICS
OF EXTERNALIZING BEHAVIORS

A thesis presented to the faculty of the Graduate School of
Western Carolina University in partial fulfillment of the
requirements for the degree of Master of Arts in Psychology.

By

Tiffany M. Harrop

Director: Dr. David McCord
Associate Professor of Psychology
Psychology Department

Committee Members: Dr. L. Alvin Malesky, Psychology
Dr. William Poynter, Psychology

April 2015

TABLE OF CONTENTS

List of Tables.....	iii
List of Abbreviations.....	iv
Abstract.....	v
Introduction.....	1
Chapter One: Literature Review.....	3
Research Domain Criteria Project.....	3
Minnesota Multiphasic Personality Inventory.....	6
Externalizing Behaviors.....	10
Psychopathy.....	12
Eye-tracking.....	14
Statement of the Problem.....	15
Hypotheses 1.....	15
1a.....	16
Hypotheses 2.....	16
2a.....	16
2b.....	16
Chapter Two: Methodology.....	17
Participants.....	17
Measures.....	17
Apparatus and Stimuli.....	18
Analyses.....	19
Chapter Three: Results.....	20
MMPI-2-RF Scales.....	20
PPI-Tri Scales.....	21
Chapter Four: Discussion.....	22
Limitations.....	23
Conclusions.....	24
References.....	25

LIST OF TABLES

Table	
1. RDoC Matrix.....	5
2. MMPI Correlations.....	20
3. PPI Correlations.....	21

LIST OF ABBREVIATIONS

Abbreviations

1. Research Domain Criteria (RDoC)
2. Minnesota Multiphasic Personality Inventory-2-Restructured Form (MMPI-2-RF)
3. Psychopathic Personality Inventory-Triarchic Scales (PPI-Tri)
4. National Institute of Mental Health (NIMH)
5. Behavioral/externalizing dysfunction (BXD)
6. Antisocial behavior (RC4)
7. Juvenile conduct problems (JCP)
8. Substance abuse (SUB)
9. Hypomanic activation (RC9)
10. Aggression (AGG)
11. Activation (ACT)
12. Aggressiveness- revised (AGGR-r)
13. Disconstraint-revised (DISC-r)

ASSESSING EYE MOVEMENT DYNAMICS OF EXTERNALIZING BEHAVIORS

Tiffany Harrop, M. A.

Western Carolina University (April, 2015)

Director: Dr. David McCord

The classification of mental disorders has generated enduring debate due to significant diagnostic, treatment, and research implications. Recent neurobiologic and genetic discoveries have underscored the limitations of the current categorical model and encouraged movement toward a dimensional nosology. The Research Domain Criteria (RDoC) project, introduced by the National Institute of Mental Health (NIMH), is intended to address these shortcomings and facilitate the incorporation of current research to enhance progressive scientific inquiry. The present study utilized the RDoC framework to investigate variables of externalizing disorders, focusing specifically on the constructs of physiological and self-report measures. The Minnesota Multiphasic Personality Inventory-2-Restructured Form (MMPI-2-RF) was used in combination with the Psychopathic Personality Inventory-Triarchic Scales (PPI-Tri) to serve as the psychological self-report indices. Eye-tracking measures were recorded while participants viewed three, 30-second affectively stimulating video clips, chosen to represent the behavioral constructs of interest. Bivariate correlations were run to analyze the relationship between externalizing personality traits and eye movement dynamics of emotionally evocative stimuli. Analyses revealed a significant negative relationship between the eye-tracking metric of pupil

size and the specific scales of behavioral/externalizing dysfunction (BXD), antisocial behavior (RC4), juvenile conduct problems (JCP) and disconstraint-revised (DISC-r) of the self-report measures of externalizing personality. Additionally, positive correlations between fixation duration and similar construct scales were noted. These findings may be indicative of diminished emotional reactivity for individuals who are high on these particular traits of behavioral externalization. This suggests deficits in processing affectively arousing information and stimuli, which may account for the heightened duration of fixations. Further implications of these results are discussed.

INTRODUCTION

In the recent history of the field of clinical psychology it has been the accepted practice to assign discrete labels to psychological disorders for research and classification purposes. The current *Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* uses a taxonomy based on a categorical approach of identifying and labeling psychopathology (American Psychiatric Association, 2013). While this method of classification based on signs and symptoms was seen as an improvement when first introduced in the *DSM-III* (1980), recent advances in the field of neuroscience and genetics have enabled researchers to gain a much clearer picture of the heterogeneous nature of mental disorders and have subsequently highlighted flaws in the existing diagnostic criteria (Widiger & Samuel, 2005).

Tom Insel, director of the National Institute of Mental Health (NIMH; 2013) has challenged researchers and clinicians in the field of psychology to look to the example set by other areas of medicine and move beyond the current taxonomic structure of mental disorders, which remains highly focused on behavioral indicators, to incorporate a multidimensional classification system based on neurobiological, genetic, and behavioral factors. To facilitate this change, the NIMH has introduced the Research Domain Criteria (RDoC) project, in accordance with Strategy 1.4 of the Strategic Plan (NIMH, 2008) to serve as a guide for researchers. The RDoC project aims to take a dimensional approach to the organization of psychopathology by creating a framework of five domains of functioning: negative valence system, positive valence systems, cognitive systems, systems for social processes, and arousal and regulatory systems. Each domain can be further classified into related constructs and sub-constructs. To advance the scientific investigation of these domains, variables, or units of analysis, were suggested to characterize each domain. Altogether seven variables were identified, including genes,

molecules, cells, circuits, physiology, behavior, and self-reports. The aforementioned domains and variables have been organized into a matrix, with domains (and constructs/sub-constructs) comprising the rows and units of analysis the columns.

Using the RDoC project as a framework, the present study intends to examine key concepts of the psychological constructs of externalizing disorders. More specifically, correlations will be computed between two particular units of analysis, physiological and self-report measures. The physiological variable to be assessed will be eye-movement dynamics, measured by an eye-tracking device, which are indicative of underlying neurophysiological processes. Self-report measures will include the Minnesota Multiphasic Personality Inventory-2-Restructured Form (MMPI-2RF; Ben-Porath, 2012) and triarchic construct scales of the Psychopathic Personality Inventory (PPI; Hall et al., 2014).

CHAPTER ONE: LITERATURE REVIEW

Research Domain Criteria Project

Psychological disorders, as currently operationalized, are highly heterogeneous. Diagnostic comorbidity is a common occurrence and a shared concern among researchers and clinicians (Simmons & Quinn, 2014). In an effort to address these challenges and encourage the evolution of research in psychopathology, the National Institute of Mental Health (NIMH) in 2009, introduced the Research Domain Criteria (RDoC) initiative in order to facilitate the implementation of Section 1.4 of the Strategic Plan. With the primary objective of integrating neurobiological and behavioral measures to create a new diagnostic framework for research purposes, the RDoC project marks a departure from the contemporary practice of conducting research in a manner that is complementary to the current classification systems of the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2013) and International Classification of Diseases (ICD; <http://www.who.int/classification/icd/en/>) approach to clinical diagnosis predicated on observable signs and symptoms (Morris & Cuthbert, 2012). Instead, the RDoC framework accommodates exploration of bio-behavioral measures cutting across diagnostic categories that can subsequently be linked to clinical syndromes (Insel et al., 2010).

RDoC assumes that mental disorders are best understood from the etiological perspective of disordered functioning of the brain due to abnormal neural circuitry and seeks to optimize the utility of recent empirical findings of genetic, neurobiologic, and behavioral relevance (Cuthbert & Insel, 2013). In order to accomplish this goal, the NIMH formed working groups of experts tasked to develop an accommodating structure to guide researchers. Determination of constructs to be included in the framework was informed by the integrative potential of current empirical

knowledge from neuroscience to specific aberrations in behavioral functioning (Sanislow et al., 2010).

The resultant product is a matrix formed by rows of specific behavioral domains and columns representing units of analysis. Similar to Robins and Guze (1970) suggestions for increasing diagnostic validity that paved the way for seminal changes in the *DSM-III* (Insel et al., 2010), the RDoC approach of categorizing mental illness utilizing a multitrait-multimethod matrix is a specific implementation of the model suggested by Campbell and Fiske (1959) as a means of increasing convergent and discriminant validity.

In the framework of RDoC, the rows are comprised of five domains identified as negative valence systems, positive valence systems, cognitive systems, systems for social processes, and arousal and regulatory systems (NIMH, 2011). The columns represent seven units of analysis including genes, molecules, cells, circuits, physiology, behavior, and self-reports with an additional column added for paradigms. Using the matrix as a guide, the rows represent possible independent variables of study while the columns form the dependent variables (Insel et al., 2010).

Table 1. RDoC Matrix

Domains	-----Units of Analysis-----							
	Genes	Molecules	Cells	Circuits	Physiology	Behavior	Self-Reports	Paradigms
Negative Valence Systems								
Positive Valence Systems								
Cognitive Systems								
Systems for Social Processes								
Arousal & Regulatory Systems								

Table Note: RDoC = Research Domain Criteria; Adapted from NIMH, 2011

While still in its infancy, RDoC has been relatively productive in generating forward thinking, discussion, and research conducted in the vein of the general framework. A model of researching pediatric disinhibited eating using the basic RDoC structure has been proposed by Tanofsky-Kraff et al. (2013). Additionally, a recent study using a construct-network approach to examine externalizing psychopathology by Patrick et al. (2013) is consistent with the RDoC integrative framework.

Constructs of the RDoC matrix corresponding to externalizing pathologies are aggression, distress, and anxiety within the domain of negative affect and behavioral inhibition representative of the social processes domain (Sanislow et al., 2010). These variables are also consistent with self-report instruments designed to measure externalizing behaviors. The MMPI-

2-RF will be utilized in the current study as the primary measure of these constructs.

Minnesota Multiphasic Personality Inventory

The lineage of the Minnesota Multiphasic Personality Inventory (MMPI) can be traced to the University of Minnesota during the later part of the 1930s (Buchanan, 1994).

Starke Hathaway and J. Charnley McKinley embarked on a partnership resulting in the development of a psychometric tool that would change the landscape of personality and psychological instrumentation (Buchanan, 1994). Originally published in 1943, the MMPI was introduced during a time of instability for self-report measures of personality (Graham, 2012). The authors envisioned the MMPI not only as a valuable clinical tool for diagnostic purposes, but also as a repository that could be mined to facilitate the development of scales for the assessment of personality characteristics as the field of personality research progressed (Ben-Porath, 2012; Dahlstrom, 1992).

In contrast to the myriad personality measures derived from a rational approach termed logical keying, the MMPI was constructed utilizing the psychometric methodology of empirical keying (Graham, 2012). Hathaway and McKinley examined case studies, textbooks, and psychiatric literature to amass a comprehensive pool of candidate items (Buchanan, 1994). The collection of statements was then condensed by the authors to approximately 500 true or false statements (Graham, 2012). The items were subsequently administered to both the clinical group, comprised of psychiatric patients at the university hospital, and the normative sample, which was composed of a highly homogenous grouping of mostly rural locals visiting patients at the hospital (Ben-Porath, 2012).

Scales for the instrument were built upon the Kraepelinian paradigm of dichotomous mental disorders (Ben-Porath, 2012). Determination of item inclusion was dependent upon the

discriminant ability of the item (Buchanan, 1994). From the perspective of the empirical keying method, the content of each statement was irrelevant; rather, it was whether the item distinguished between the clinical and non-clinical groups that determined the utility (Buchanan, 1994). During the inception of the MMPI, 8 scales were initially developed, corresponding to the contemporary (*circa* 1935) diagnostic categories of hypochondriasis, depression, hysteria, psychopathic deviate, paranoia, psychasthenia, schizophrenia, and hypomania (Graham, 2012). By 1946 two additional scales, masculinity-femininity and social introversion were incorporated to establish the 10 clinical scales serving as the foundation for the MMPI (Graham, 2012).

While the utilization of the MMPI primarily as a diagnostic tool for the differentiation of disorders was never fully realized, over the next few decades the application of the instrument, both for clinical and research purposes, increased exponentially and the MMPI became one of the most widely used psychological tests in the United States (Luben, Larsen, & Matarazzo, 1984; Sundberg, 1961). Despite this prolific use of the assessment tool, many consumers began to vocalize unease regarding different aspects of the instrument. Primary concerns included the highly convenient normative sample and whether it was representative of the current American public and issues with antiquated wording and statements that were no longer relevant to contemporary lifestyles, along with grammatical errors and sexist wording (Helmes & Reddon, 1993). It was noted that few items ascertained information on more modern concerns such as substance use and suicidal ideation and behaviors, while more items than necessary assessed gastrointestinal functions believed to be immaterial to the study of personality (Graham, 2012). In addition, concerns were raised about the empirical keying method of item inclusion and scale construction (Helmes & Reddon, 1993).

Although the utility and necessity of an updated MMPI was a topic of ardent discussion

for many years, restructuring was regarded as an expensive and onerous process and thus was delayed until the 1980s. With the oversight of Beverly Kaemmer an MMPI Restandardization Committee was formed to undertake the revision process, comprised of members James Butcher, Grant Dalhstrom and John Graham, and later included the contributions of Auke Tellegen (Ben-Porath, 2012). The intent of this restructuring was not to construct a wholly unrecognizable test instrument, but to address some of the more critical concerns while keeping the integrity of the MMPI intact (Butcher, Graham, & Ben-Porath, 1995). This was accomplished through the use of a more representative norming population, deletion of a small number of irrelevant statements and revision of 82 items, and the inclusion of additional, original scales and in 1989 the MMPI-2 was published (Helmes & Reddon, 1993).

The MMPI-2, while addressing many of the issues associated with the original MMPI, stayed faithful to the overall structure of the previous version and thus, the clinical and validity scales that were the hallmark of the MMPI remained mostly intact (Butcher et al., 1995). This left opportunity for additional criticism and concern regarding the scale construction, viewed as problematic due to the extensive item overlap among scales, which resulted in high correlations and low discriminability, along with the heterogeneity of the items within each scale (Weed, 2006). Tellegen endeavored to attend to these issues, and in 2003 the MMPI-2 Restructured Clinical (RC) scales (Tellegen et al.) were introduced.

Tellegen et al. (2003) generated nine RC scales including measures of demoralization (RCd), somatic complaints (RC1), low positive emotions (RC2), cynicism (RC3), antisocial behavior (RC4), ideas of persecution (RC6), dysfunctional negative emotions (RC7), aberrant experiences (RC8), and hypomanic activation (RC9) (Ben-Porath, 2012). These scales signified another important advancement for the instrument and served as a foundation for the MMPI-2-

Restructured Form (MMPI-2-RF; Ben-Porath & Tellegen, 2008). Much like RDoC, the MMPI-2-RF was developed with a commitment to the advancement of the scientific study of personality psychopathology and has been criticized as a radical deviation from the origins upon which it was built.

The MMPI-2-RF is substantially shorter than its predecessor, with an item count of 338 (Van Der Heijden, Egger, & Derksen, 2010). The RC scales replaced the clinical scales of the MMPI-2 and the validity scales have been revised and expanded (Van Der Heijden et al., 2010). Higher-Order (H-O) scales were developed based on the RC scales. The three scales of emotional/internalizing dysfunction (EID), thought dysfunction (THD), and behavioral/externalizing dysfunction (BXD) serve as dimensional measures of broad pathology (Ben-Porath, 2012). The MMPI-2-RF also includes 25 Specific Problems and Interests scales and updated Personality Psychopathology Five (PSY-5) scales (Van Der Heijden et al., 2010).

The present study will use the constructs of the MMPI-2-RF scales to replace the rows of the RDoC matrix. The areas of interest are those associated with the BXD scale. This H-O scale provides measures of behavioral disinhibition frequently associated with such factors as substance use, antisocial tendencies, unstable relationships, and impulsivity (Ben-Porath, 2012). The domain of BXD is comprised of scales assessing antisocial behavior (RC4), juvenile conduct problems (JCP), substance abuse (SUB), hypomanic activation (RC9), aggression (AGG), activation (ACT), aggressiveness- revised (AGGR-r) and disconstraint-revised (DISC-r) (Ben-Porath, 2012). These scales relate to the category of psychological constructs that have been broadly termed externalizing behaviors, which will be discussed in greater detail below.

Externalizing Behaviors

Prior to the identification of a common nomenclature, practitioners and researchers had long recognized externalizing pathologies as disconcerting due to high prevalence and societal cost. In their study of taxonomic childhood mental disorders, Achenbach and Edelbrock (1978), using a factor analytic approach, developed a dimensional classification system of pathology predicated on a two-factor model of internalizing and externalizing problems. Through the use of confirmatory factor analysis, Krueger, Caspi, Moffit and Silva (1998), were able to replicate these findings for 18 and 21-year-olds using 10 prevalent mental disorders. In both cases, the resultant externalizing domains consisted of behaviors such as substance use, antisociality, and aggression (Achenbach & Edelbrock, 1978; Krueger et al., 1998). These findings have since been extensively reproduced, further explicating the structure of this nosology.

The externalizing construct has become a classifier of both problematic personality traits as well as specific disorders (Vrieze, Perlman, Krueger, & Iacono, 2012). Pathological externalizing personality includes variables of disinhibition, aggression, violence, impulsivity, sensation and novelty seeking, callousness, abuse of substances, and general negative emotionality (Krueger et al., 2007; Sher & Trull, 1994). Individuals high on traits of externalization often engage in behavior that disrupts familial accord, negatively impacts educational attainment, and results in problems with the legal system. Theoretical models of antisocial and externalizing behaviors relating to basic neurobiological systems and structures have attempted to explain engagement in these problematic activities as resulting from autonomic hypoarousal (Gray & McNaughton, 2000; Lykken, 1995). It is suggested that increased stimulation is necessary for these individuals to derive pleasure.

The psychological syndromes most commonly associated with externalizing factors

include conduct disorder (CD), antisocial personality disorder (ASPD), and substance use disorders (SUD) (Krueger et al., 2007). Conduct disorder, a disorder of childhood and adolescence, is characterized by a disregard for the laws and norms of society and the rights of others (American Psychiatric Association, 2013). Research suggests that for individuals with this diagnosis, pathological social and behavioral difficulties often continue well beyond youth (Zoccolillo, Pickles, Quinton, & Rutter, 1992). The persistence of these violations into adulthood is a reliable predictor for ASPD, psychopathy, and SUDs (Krueger et al., 2007). Research regarding the occurrence of these mental health issues within an incarcerated population is significant. Studies suggest that as many as fifty to eighty percent of prisoners meet the criteria for ASPD and an even larger number for SUDs (Fazel & Danesh, 2002; Hare, 2003; James & Glaze, 2006).

The overwhelming evidence for the high degree of co-occurrence among these pathologies has prompted researchers to theorize a shared etiologic vulnerability (Iacono, Carlson, Taylor, Elkins & McGue, 1999; Krueger et al., 2002; Slutske et.al, 1998). In an effort to design an integrative model of externalizing adult psychopathology, Krueger, Markon, Patrick, and Iacono (2005) proposed a dimensional spectrum. Further research of the paradigm resulted in the development of a measure of externalizing constructs, known as the Externalizing Spectrum Inventory (ESI) in conjunction with a quantitative model (Krueger et al., 2007). This hierarchical conceptualization permits the exploration of both higher-order and more precise correlates (Krueger et al., 2005). Additionally, the dimensional model more accurately reflects the heterogeneity of psychopathology while simultaneously addressing issues of comorbidity within the current classification system (Krueger et al., 2007; Venables & Patrick, 2012).

Psychopathy

One of the most widely studied domains of externalizing disorders is known as psychopathy. In accordance with existing nosological standards, psychopathy is regarded as a compendium of interrelated pathological personality traits adversely impacting the interpersonal, emotional, and lifestyle functioning of incarcerated individuals as well as members of the general populace. It is often understood of as an extension of ASPD. Antisocial personality disorder, within the diagnostic framework of the DSM-5 (American Psychiatric Association, 2013), is categorized by behavioral symptoms highly correlated with delinquency. The construct of psychopathy, however, is more heterogeneous including in its defining criteria deficits in affect, behavior, and interpersonal functioning (Lykken, 1995).

Descriptions of the characteristics of what is now recognized as psychopathy date back more than two centuries prior (Millon, Simonsen, & Birket-Smith, 2002). However, the modern conceptualization can be largely attributed to Cleckley's *The Mask of Sanity* (1941), an amalgamation of clinical case studies supplemented by 16 diagnostic indicators of the disorder. Among the criteria are superficial charm coupled with good intelligence, absence of delusions and neuroticism, unreliability and insincerity, lack of remorse, poor judgment, impaired affective responding, inflated egocentricity, and inadequately motivated antisocial behavior (Cleckley, 1941), many of which inform modern research including theoretical models and instruments.

In 1980, Hare utilized Cleckley's archetypal criteria to develop a measure of psychopathy appropriate for correctional settings, known as the Psychopathy Checklist (PCL). While the construction of the scale was predicated on the interpretation of psychopathy as a unidimensional construct, subsequent analysis indicated two correlated (about .5) but distinguishable factors (Harpur, Hare, & Hakstian, 1989). Factor 1 relates to the interpersonal and affective facets of the

disorder (i.e., superficial charm, egocentricity, remorselessness, and lack of empathy) and factor 2 is more closely associated with behavioral correlates of externalizing dysfunction (impulsivity/disinhibition, aggression, and antisociality) (Harpur et al., 1989).

The introduction of the Psychopathic Personality Inventory (PPI; Lilienfeld & Andrews, 1996) represented an important addition to self-report measures of the construct of psychopathy. In contrast to the PCL, the PPI was designed as a measure that could be used in non-offender populations, founded on an assumption of the dimensionality of psychopathy (Lilienfeld & Andrews, 1996). Factor analysis completed by Benning, Patrick, Hicks, Blonigen, and Krueger (2003) assessing eight PPI subscales identified two distinct principal factors (PPI-I and PPI-II) relating to dominance/fearlessness and aggression/impulsivity, respectively. One notable exception to this two-factor structure was the subscale of coldheartedness, a measure of empathy impairment and callousness, which failed to correlate with either factor (Benning et al., 2003).

In pursuit of an integrative model of psychopathy, Patrick, Fowles, and Krueger (2009) proposed a triarchic framework for the pathology. This conceptualization encompasses the facets of boldness, meanness, and disinhibition (Patrick et al., 2009). The construct of boldness is related to self-assurance and self-efficacy, especially in stressful situations, and can be considered a manifestation of fearlessness (Patrick et al., 2009). Meanness is represented by a lack of empathy, stimulation seeking, exploitativeness, and cruelty, while disinhibition is associated with impulsivity and behavioral disconstraint (Patrick et al., 2009). On the basis of the three-factor model, Hall and colleagues (2014) extracted items from the PPI in order to construct scales to measure the triarchic domains (PPI-Tri). The PPI-Tri scales will be utilized as an additional self-report measure in the present study and will be discussed in greater detail in the methods section.

Eye-tracking

In previous sections various constructs of externalizing pathology have been elucidated corresponding to the methodology of RDoC. Within this framework, eye-tracking parameters are representative of the physiological unit of analysis. Eye-tracking is an unobtrusive instrument that analyses various eye movement metrics. Common measures of eye movement dynamics include pupillometry, pupil ratio, number of fixations, fixation duration, fixation size, gaze, and saccades (movement that occurs between fixations) (Poole & Ball, 2006). In particular, the metric of pupil diameter has been suggested as an indicator of emotional arousal. Researchers have found a positive correlation between pupil size and affective stimulation (Bradley, Miccoli, Escrig, & Lang; 2008). Based on the theories that behavioral externalization may signify deficient arousability, it is likely that these individuals would evince hyporeactive pupil dilation.

Eye-tracking data have been linked to a number of psychopathologies including schizophrenia (Streit, Wölwer, & Gaebel, 1997), autism (Boraston & Blakemore, 2007), and depression (Kellough, Beevers, Ellis, & Wells, 2008). Eye-tracking research on deficient fear processing in individuals with psychopathic and callous-unemotional traits has provided preliminary neurobiological evidence for theories of dysfunctional affective comprehension. One such study examined adolescent males and found those with callous-unemotional traits showed processing impairments of fearful facial and bodily displays (Muñoz, 2009). Dadds, Masry, Wimalaweera, and Guastella (2008) found that adolescents with elevated psychopathic traits showed lower eye fixations (number and duration) to eye regions of emotional faces.

When investigating aggressive children, Horsley, Orobio de Castro, and Van der Schoot (2009) reported youth with high rates of aggression attended longer to non-hostile than hostile

cues. It was posited that schematic bias interfered with processing the stimuli, which accounted for the increased viewing time. Additionally, a study exploring confrontational gaze-patterns of dominant and submissive individuals showed that greater dominance was positively correlated with increased gaze rates at masks depicting anger (Terburg, Hooiveld, Aarts, Kenemans, & Van Honk, 2011).

Statement of the Problem

Externalizing disorders have proven highly burdensome for society, which has prompted researchers to attempt to uncover etiologically relevant information in order to develop more effective treatment and intervention modalities. Traditional diagnostic categories have proven insufficient in facilitating the generation of empirically supported evidence illuminating the underlying vulnerability for these syndromes, and thus, additional approaches have been proposed such as the RDoC project which offers a dimensional framework of broad psychological domains and units of analysis to assist researchers in developing a more scientifically representative classification system. The MMPI-2-RF provides a similar approach to categorizing highly recognizable psychopathological characteristics.

The aim of the present study is to utilize the framework of RDoC to explore constructs of externalizing disorders. Scales of the MMPI-2-RF, along with the PPI-Tri scales, will be used in place of the broad RDoC domains. These self-report measures will be correlated with the physiological measure of eye movement dynamics, which will be assessed through the use of an eye-tracking apparatus.

Hypothesis 1:

Prior research focusing on negative emotionality rather than externalizing behaviors included findings of negative correlations between the eye-tracking dynamics of pupil size, and

positive correlations with fixation count and externalizing scales of the MMPI-2-RF (Cannon, McCord, & Poynter, 2014). Although the current methodology utilized more environmentally valid stimuli, the aforementioned study provided context relevant information.

1a: Based on this research, it is hypothesized that scales BXD, RC4, JCP, and DISC-r will be negatively correlated with the pupil size metric.

Hypotheses 2:

Previous research has reported adolescents with psychopathic traits show lower fixation duration and fixation count (Dadds, Masry, Wimalaweera, & Guastella, 2008; Muñoz, 2009).

Thus,

2a: It is expected that the MMPI-2-RF scales of BXD, RC9, AGG, ACT, and AGGR-r will be negatively correlated with measures of fixation count and duration.

2b: Based on the prior research described above, it is hypothesized that the PPI-Tri scales of Boldness, Meanness, and Disinhibition will show a negative relationship with fixation duration and fixation count.

CHAPTER TWO: METHODOLOGY

Participants

Participants were undergraduate students recruited from a southeastern university using the psychology department participant pool. Each individual received course credit for participation and signed an informed consent form prior to the commencement of the experiment. The research protocol received approval from the University Institutional Review Board. One hundred thirty eight individuals (63 % female) participated. Individuals ranged in age from 18-47 years ($M = 18.72$, $SD = 2.62$). The racial/ethnic configuration was 76.8% ($n = 106$) White, 10.9% ($n = 15$) Black, 4.3% ($n = 6$) Hispanic, 2.9% ($n = 4$) Asian, .7% (1) American Indian, and 1.4% ($n = 2$) Other.

Measures

Externalizing psychopathology was measured utilizing the nine externalizing behavior scales of the Minnesota Multiphasic Personality Inventory-2-Restructured Form (MMPI-2-RF); BXD (behavioral/externalizing dysfunction), RC4 (antisocial behavior), JCP (juvenile conduct Problems), SUB (substance abuse), RC9 (hypomanic activation), AGG (aggression), ACT (activation), AGGR-r (aggressiveness – revised), DISC-r (disconstraint – revised) as described extensively above. The response format of the MMPI-2-RF scales is “True”/“False”. The nine scales of interest demonstrate moderate to excellent internal consistency; BXD ($\alpha = .73 - .91$), RC4 ($\alpha = .73 - .89$), JCP ($\alpha = .56 - .85$), SUB ($\alpha = .62 - .87$), RC9 ($\alpha = .76 - .86$), AGG ($\alpha = .58 - .78$), ACT ($\alpha = .59 - .77$), AGGR-r ($\alpha = .71 - .84$), DISC-r ($\alpha = .69 - .93$) (Tellegen & Ben-Porath, 2008). The MMPI-2-RF has also been found to have high external validity (Tellegen & Ben-Porath, 2008).

Psychopathy was assessed via the 66-item self-report Psychopathic Personality Inventory-Triarchic Construct Scales (PPI-Tri), which measures three domains of psychopathy: Boldness, Meanness, and Disinhibition (Hall et al., 2014). Items are presented using a 4-point Likert-scale (1 = *false*, 2 = *mostly false*, 3 = *mostly true*, 4 = *true*). The PPI-Tri scales evidenced sufficient to good internal consistency reliability for both an undergraduate and forensic sample. Boldness demonstrated good reliability ($\alpha = .86$ undergraduate sample, $\alpha = .82$ forensic sample), as did Meanness ($\alpha = .82$ undergraduate sample, $\alpha = .80$ forensic sample). Disinhibition showed satisfactory reliability ($\alpha = .75$ undergraduate sample, $\alpha = .74$ forensic sample). The PPI-Tri was also found to have strong external validity (Hall et al., 2014).

Apparatus and Stimuli

Eye movement dynamics were measured using a Tobii TX300 Binocular Eye-Tracker (1920 x 1080 pixels). Participants were shown two neutral slides followed by a 30 second video clip of an advertisement in which a craftsman polishes the exterior of a camera by hand, chosen to serve as an affectively neutral control. Participants were then presented with three emotionally evocative audiovisual excerpts of approximately 30 seconds each that were selected to broadly represent behavioral externalization. The first video contained a compilation of scenes drawn from mixed martial arts fighting. The second video was a montage of hedonistic substance use from the film *Requiem for a Dream*. The final video was a scene taken from the English-speaking version of *The Girl with the Dragon Tattoo* in which the protagonist confronts her attacker. After the conclusion of each video clip, participants were instructed to answer a brief series of content relevant questions in order to reinforce continued engagement. Participants then viewed a succession of 32 emotionally stimulating still images retrieved from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 1999) and were

prompted to vocalize their initial cognition after inspecting each photo.

Analyses

Sampling rate data, indicating the accuracy of relevant eye movement tracking, was automatically calculated for each individual via the Tobii TX300 Binocular Eye-Tracker. These statistics were exported and any participant having a sampling rate of less than 30% was excluded from analysis. From the three domain relevant media clips, scenes were divided into 10 sections of equal duration, denoted as “time-buckets,” for further analytical exploration. Eye metrics of pupil diameter for the left and right pupil, fixation count, and fixation duration were exported from eye-tracking device. Z-scores were computed for the measures of pupil diameter by taking the mean pupil size for each specific time-bucket minus the mean pupil size value across all time-buckets divided by the standard deviation across all time-buckets.

Based on empirical evidence and rational examination, the videos were categorized according to emotional impact. From the audiovisual passages, the scene from *The Girl with the Dragon Tattoo* was identified for analysis. Utilizing a similar process time-bucket 9, occurring at approximately 24-27 seconds, was determined to be most stimulating and thus was chosen for investigation. Bivariate correlations examining associations between key eye-tracker metrics and scales of the MMPI-2-RF and PPI-Tri were computed.

CHAPTER THREE: RESULTS

MMPI-2-RF Scales

Results from the bivariate correlations of the domain relevant MMPI-2-RF scales and previously specified eye metrics are presented in Table 2. For the measure of left pupil diameter Z-score, a significant negative correlation was found for the MMPI-2-RF scales of BXD, RC4, JCP, and DISCr. A significant negative relationship was also found between the right pupil diameter and the MMPI-2-RF scales of BXD, JCP, and DISCr.

Table 2. MMPI Correlations^a

MMPI-2-RF Scales	Left Pupil_Z	Right Pupil_Z	Fixation Count	Fixation Duration
BXD	-.257**	-.213*	.001	.184
RC4	-.257**	-.181	-.087	.192*
RC9	-.082	-.081	.044	.181
JCP	-.277**	-.203*	-.099	.192*
AGG	-.159	-.143	-.060	.195*
SUB	-.093	-.056	-.089	.121
ACT	.114	.103	-.022	.074
AGGRr	-.053	-.084	.043	.031
DISCr	-.259**	-.237*	.027	.154

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

* . Correlation is significant at the 0.05 level (2-tailed). a. Scene Name = Tattoo, Time-Bucket = 9.0000

Table Note: MMPI-2-RF = Minnesota Multiphasic Personality Inventory–2–Restructured Form; BXD = Behavioral/Externalizing Dysfunction; RC4 = Antisocial Behavior; RC9 = Hypomanic Activation; JCP = Juvenile Conduct Problems; AGG = Aggression; SUB = Substance Abuse; ACT = Activation; AGGRr = Aggressiveness-Revised; DISCr = Disconstraint-Revised

The metric of fixation duration was found to be positively correlated with three scales of the MMPI-2-RF. Included in this positive relationship is the restructured clinical scale of RC4 and the specific problems scales of JCP and AGG.

PPI-Tri Scales

Bivariate correlates of the PPI-Tri scales and eye-tracking measures for the specified video segment can be found in Table 3. A significant relationship was found for only one eye metric. The left pupil Z-score measure showed a significant negative correlation with the PPI-Tri scale of Boldness.

Table 3. PPI Correlations^a

PPI-Tri Scales	Left Pupil_Z	Right Pupil_Z	Fixation Count	Fixation Duration
Boldness	-.191*	-.076	.031	.026
Meanness	-.176	-.062	.068	.023
Disinhibition	-.107	-.020	-.035	.062

*. Correlation is significant at the 0.05 level (2-tailed). a. Scene Name = Tattoo, Time-Bucket = 9.0000

Table Note: PPI-Tri = Psychopathic Personality Inventory – Triarchic Scales

CHAPTER FOUR: DISCUSSION

Integration of research findings in distinctive areas of psychological study may have important implications for classification, prevention, intervention, and continued exploration of mental disorders. Externalizing pathologies are especially problematic and continued effort toward a unified conceptualization of these constructs is essential. The purpose of the present study was dyadic; to expand upon the extant eye-tracking literature by utilizing ecologically valid stimuli and to examine the relationship between the physiological measure of eye movement dynamics and a self-report inventory of behavioral externalization.

It was hypothesized that the MMPI-2-RF scales of BXD, RC4, JCP, and DISC-r would be negatively correlated with pupil dilation. This hypothesis was supported for all scales for the left pupil metric and 3 of the 4 scales (BXD, JCP, and DISC-r) for the right pupil. These findings are consistent with prior research contrasting personality traits with eye movements (Cannon, McCord, & Poynter, 2014). Additional investigations exploring pupillary change in response to visual or auditory emotional stimuli found a positive relationship between affective arousal and pupil dilation (Bradley, Miccoli, Escrig, & Lang; 2008; Partala & Surakka, 2003). As prior research has suggested, a possible explanation for our findings may be that individuals who are high on traits of general behavioral dyscontrol, antisociality, impulsivity, and rule and law breaking propensities may have deficits in processing affective information and thus demonstrate less emotional arousal. This may relate to dysfunction in subcortical brain systems, such as the amygdala, which is relevant to attentional and instrumental learning processes. On a conceptual level, this information may provide further elucidation and support for the findings that individuals with elevations on the scales of BXD and JCP often have prior experience with problematic substance use, reactive aggression and violence, and criminality (Ben-Porath, 2012;

Tellegen & Ben-Porath, 2008). It may be that these individuals seek out and engage in this behavior in an effort to reach an optimal level of arousal and they are slow to associate their conduct with any resultant punishment (Eysenk, 1996; Lykken, 1995).

While no hypotheses were generated regarding PPI-Tri scales and pupil diameter, a significant negative relationship was found between the left pupil measure and the scale of Boldness. This scale is a general measure of sensation and novelty seeking along with imperturbability and dominance, which does align with the identified MMPI-2-RF scales. However, to extend the previous supposition based on findings of only the left pupil may be a bit reductionist therefore, further evidence is warranted.

It was also hypothesized that the MMPI-2-RF scales of BXD, RC9, AGG, ACT, and AGGR-r and the PPI-Tri scales of Boldness, Meanness, and Disinhibition would show a negative relationship with the eye metrics of fixation count and duration. This hypothesis was not supported. While the measure of fixation count was negatively correlated with the MMPI-2-RF scales of RC4, JCP, AGG, SUB, and ACT and the PPI-Tri scale of Disinhibition, this relationship was not found to be statistically significant. Additionally, fixation duration evidenced a significantly positive correlation with the MMPI-2-RF scales of RC4, JCP, and AGG. This association may be explained in relation to the aforementioned pupil diameter findings in that individuals who show decreased responsiveness to emotionally evocative stimuli may attend longer to affectively charged cues. It may be that it takes these individuals longer to process this information or that they generally find it less aversive.

Limitations

The results of this research should be regarded in consideration of certain limitations. First, there was no controlling for prior knowledge of the filmed segments. Participants may

have had varying levels of exposure to the videos and the impact of these exposure patterns on our results remains unclear. A second limitation relates to the identification of the particular audiovisual clip and the excerpt used for analysis. This was resolved via a combination of face validity and empirical data. However, this approach may have been subject to selectivity bias.

Conclusions

This study examined psychological and physiological constructs of externalizing behavior. Overall, the results indicate that high scores on MMPI-2-RF scales of Behavioral/Externalizing Dysfunction, Antisocial Behavior, Juvenile Conduct Problems, Aggression, and Disconstraint-revised and the PPI-Tri scale of Boldness differentially relate to measures of pupillometry and fixation duration. These findings provide support for theories of reduced emotionality and impaired processing in individuals with pathological behavioral externalization. Future research would likely benefit from utilizing participants in environments where these traits and behaviors would be expected to be elevated, such as in treatment facilities, juvenile detention centers, and jail and prison systems.

REFERENCES

- Achenbach, T. M., & Edelbrock, C. S. (1978). The classification of child psychopathology: a review and analysis of empirical efforts. *Psychological bulletin*, *85*(6), 1275-1301.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.
- Benning, S. D., Patrick, C. J., Hicks, B. M., Blonigen, D. M., & Krueger, R. F. (2003). Factor structure of the psychopathic personality inventory: Validity and implications for clinical assessment. *Psychological Assessment*, *15*(3), 340-350.
- Ben-Porath, Y. S. (2012). *Interpreting the MMPI-2-RF*. U of Minnesota Press.
- Ben-Porath, Y. S., & Tellegen, A. (2008). *MMPI-2-RF: Manual for administration, scoring and interpretation*. University of Minnesota Press.
- Boraston, Z., & Blakemore, S. J. (2007). The application of eye-tracking technology in the study of autism. *The Journal of Physiology*, *581*(3), 893-898.
- Bradley, M. M., Miccoli, L., Escrig, M. A., & Lang, P. J. (2008). The pupil as a measure of emotional arousal and autonomic activation. *Psychophysiology*, *45*(4), 602-607.
- Buchanan, R. D. (1994). The development of the minnesota multiphasic personality inventory. *Journal of the History of the Behavioral Sciences*, *30*(2), 148-161.
- Butcher, J. N., Graham, J. R., & Ben-Porath, Y. S. (1995). Methodological problems and issues in MMPI, MMPI-2, and MMPI-A research. *Psychological Assessment*, *7*(3), 320.
- Campbell, D. T., & Fiske, D. W. (1959). Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin*, *56*(2), 81-105.
- Cannon, E. M., McCord, D. M., & Poynter, W. D. (2014). *Eye-tracker correlates of MMPI-2-RF negative emotionality scales*. Paper presented at the Annual Symposium on Recent Research on the MMPI, Scottsdale, AZ.
- Cleckley, H. (1941). *The mask of sanity: An attempt to clarify some issues about the so-called psychopathic personality*. William Dolan.
- Cuthbert, B. N., & Insel, T. R. (2013). Toward the future of psychiatric diagnosis: The seven pillars of RDoC. *BMC Medicine*, *11*(1), 126.

- Dadds, M. R., El Masry, Y., Wimalaweera, S., & Guastella, A. J. (2008). Reduced eye gaze explains “fear blindness” in childhood psychopathic traits. *Journal of the American Academy of Child & Adolescent Psychiatry*, 47(4), 455-463.
- Dahlstrom, W. G. (1992). The growth in acceptance of the MMPI. *Professional Psychology: Research and Practice*, 23(5), 345.
- Eysenck, H. I. (1996). Personality and crime: Where do we stand. *Psychology, Crime and Law*, 2(3), 143-152.
- Fazel, S., & Danesh, J. (2002). Serious mental disorder in 23 000 prisoners: A systematic review of 62 surveys. *The Lancet*, 359(9306), 545-550.
- Graham, J. R. (2012). *MMPI-2: Assessing personality and psychopathology*. New York, NY: Oxford University Press, Inc.
- Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septohippocampal system* (2nd ed.). Oxford, UK: Oxford University Press.
- Hall, J. R., Drislane, L. E., Patrick, C. J., Morano, M., Lilienfeld, S. O., & Poythress, N. G. (2014). Development and validation of triarchic construct scales from the psychopathic personality inventory. *Psychological Assessment*. Advance online publication. doi: 10.1037/a0035665
- Hare, R. D. (1980). The assessment of psychopathy in criminal populations. *Personality and Individual Differences*, 1, 111-119
- Hare, R. D. (2003). *Manual for the Revised Psychopathy Checklist*. Toronto, ON: Multi-Health Systems.
- Harpur, T. J., Hare, R. D., & Hakstian, A. R. (1989). Two-factor conceptualization of psychopathy: Construct validity and assessment implications. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 1(1), 6.
- Helmes, E., & Reddon, J. R. (1993). A perspective on developments in assessing psychopathology: A critical review of the MMPI and MMPI-2. *Psychological Bulletin*, 113(3), 453.
- Horsley, T. A., de Castro, B. O., & Van der Schoot, M. (2010). In the eye of the beholder: Eye-tracking assessment of social information processing in aggressive behavior. *Journal of Abnormal Child Psychology*, 38(5), 587-599.

- Iacono, W. G., Carlson, S. R., Taylor, J., Elkins, I. J., & McGue, M. (1999). Behavioral disinhibition and the development of substance-use disorders: Findings from the Minnesota Twin Family Study. *Development and Psychopathology, 11*(04), 869-900.
- Insel, T. (2013). Transforming diagnosis [Web log comment]. Retrieved from <http://www.nimh.nih.gov/about/director/2013/transforming-diagnosis.shtml>
- Insel, T., Cuthbert, B., Garvey, M., Heinssen, R., Pine, D. S., Quinn, K., Sanislow, C. & Wang, P. (2010). Research domain criteria (RDoC): toward a new classification framework for research on mental disorders. *American Journal of Psychiatry, 167*(7), 748-751.
- James, D. J., & Glaze, L. E. (2006). *Mental health problems of prison and jail inmates*. Washington, DC: US Department of Justice, Office of Justice Programs, Bureau of Justice Statistics.
- Kellough, J. L., Beevers, C. G., Ellis, A. J., & Wells, T. T. (2008). Time course of selective attention in clinically depressed young adults: An eye tracking study. *Behaviour Research and Therapy, 46*(11), 1238-1243.
- Krueger, R. F., Caspi, A., Moffitt, T. E., & Silva, P. A. (1998). The structure and stability of common mental disorders (*DSM-III-R*): A longitudinal-epidemiological study. *Journal of Abnormal Psychology, 107*(2), 216.
- Krueger, R. F., Hicks, B. M., Patrick, C. J., Carlson, S. R., Iacono, W. G., & McGue, M. (2002). Etiologic connections among substance dependence, antisocial behavior and personality: Modeling the externalizing spectrum. *Journal of Abnormal Psychology, 111*(3), 411.
- Krueger, R. F., Markon, K. E., Patrick, C. J., & Iacono, W. G. (2005). Externalizing psychopathology in adulthood: A dimensional-spectrum conceptualization and its implications for *DSM-V*. *Journal of Abnormal Psychology, 114*(4), 537.
- Krueger, R. F., Markon, K. E., Patrick, C. J., Benning, S. D., & Kramer, M. D. (2007). Linking antisocial behavior, substance use, and personality: an integrative quantitative model of the adult externalizing spectrum. *Journal of Abnormal Psychology, 116*(4), 645.
- Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1999). *International affective picture system (IAPS): Technical manual and affective ratings*.
- Lilienfeld, S. O., & Andrews, B. P. (1996). Development and preliminary validation of a self-report measure of psychopathic personality traits in noncriminal population. *Journal of Personality Assessment, 66*(3), 488-524.
- Lubin, B., Larsen, R. M., & Matarazzo, J. D. (1984). Patterns of psychological test usage in the united states: 1935–1982. *American Psychologist, 39*(4), 451.

- Lykken, D. T. (1995). *The antisocial personalities*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Millon, T., Simonsen, E., & Birket-Smith, M. (2002). *Historical conceptions of psychopathy in the united states and europe*. In *Psychopathy: Antisocial, criminal, and violent behaviors* (Vol. 1, p. 3). The Guildford Press.
- Morris, S. E., & Cuthbert, B. N. (2012). Research domain criteria: Cognitive systems, neural circuits, and dimensions of behavior. *Dialogues of Clinical Neuroscience, 14*(1), 29-37.
- Muñoz, L. C. (2009). Callous-unemotional traits are related to combined deficits in recognizing afraid faces and body poses. *Journal of the American Academy of Child & Adolescent Psychiatry, 48*(5), 554-562.
- National Institute of Mental Health (2008). *The National Institute of Mental Health Strategic Plan*. Bethesda, MD: National Institute of Mental Health; (NIH Publication 08-6368). <http://www.nimh.nih.gov/about/strategic-planning-reports/index.shtml>.
- National Institute of Mental Health. (2011). *Research Domain Criteria Matrix*. Retrieved from <http://www.nimh.nih.gov/research-priorities/rdoc/research-domain-criteria-matrix.shtml>
- Partala, T., & Surakka, V. (2003). Pupil size variation as an indication of affective processing. *International Journal of Human-Computer Studies, 59*(1), 185-198.
- Patrick, C. J., Fowles, D. C., & Krueger, R. F. (2009). Triarchic conceptualization of psychopathy: Developmental origins of disinhibition, boldness, and meanness. *Development and Psychopathology, 21*(03), 913-938.
- Patrick, C. J., Venables, N. C., Yancey, J. R., Hicks, B. M., Nelson, L. D., & Kramer, M. D. (2013). A construct-network approach to bridging diagnostic and physiological domains: Application to assessment of externalizing psychopathology. *Journal of Abnormal Psychology, 122*(3), 902.
- Poole, A., & Ball, L. J. (2006). Eye tracking in HCI and usability research. *Encyclopedia of Human-Computer Interaction, C. Ghaoui (ed.)*.
- Robins, E., & Guze, S. B. (1970). Establishment of diagnostic validity in psychiatric illness: its application to schizophrenia. *American Journal of Psychiatry, 126*(7), 983-987.
- Sanislow, C. A., Pine, D. S., Quinn, K. J., Kozak, M. J., Garvey, M. A., Heinszen, R. K., Wang, P. S., & Cuthbert, B. N. (2010). Developing constructs for psychopathology research: Research domain criteria. *Journal of Abnormal Psychology, 119*(4), 631.
- Sher, K. J., & Trull, T. J. (1994). Personality and disinhibitory psychopathology: Alcoholism and antisocial personality disorder. *Journal of Abnormal Psychology, 103*(1), 92.

- Simmons, J. M., & Quinn, K. J. (2014). *The NIMH research domain criteria (RDoC) project: Implications for genetics research*. *Mammalian Genome*, 1-9.
- Slutske, W. S., Heath, A. C., Dinwiddie, S. H., Madden, P. A., Bucholz, K. K., Dunne, M. P., ... & Martin, N. G. (1998). Common genetic risk factors for conduct disorder and alcohol dependence. *Journal of Abnormal Psychology*, 107(3), 363.
- Streit, M., Wölwer, W., & Gaebel, W. (1997). Facial-affect recognition and visual scanning behaviour in the course of schizophrenia. *Schizophrenia Research*, 24(3), 311-317.
- Sundberg, N. D. (1961). The practice of psychological testing in clinical services in the united states. *American Psychologist*, 16(2), 79.
- Tanofsky-Kraff, M., Engel, S., Yanovski, J. A., Pine, D. S., & Nelson, E. E. (2013). Pediatric disinhibited eating: Toward a research domain criteria framework. *International Journal of Eating Disorders*, 46(5), 451-455.
- Tellegen, A., & Ben-Porath, Y. S. (2008). *MMPI-2-RF, minnesota multiphasic personality inventory-2 restructured form: Technical manual*. University of Minnesota Press.
- Tellegen, A., Ben-Porath, Y. S., McNulty, J. L., Arbisi, P. A., Graham, J. R., & Kaemmer, B. (2003). *The MMPI-2 restructured clinical scales: Development, validation, and interpretation*. Minneapolis: University of Minnesota Press.
- Terburg, D., Hooiveld, N., Aarts, H., Kenemans, J. L., & Van Honk, J. (2011). Eye tracking unconscious face-to-face confrontations dominance motives prolong gaze to masked angry faces. *Psychological Science*, 22(3), 314-319.
- Van Der Heijden, P. T., Egger, J. I. M., & Derksen, J. J. L. (2010). Comparability of scores on the MMPI-2-RF scales generated with the MMPI-2 and MMPI-2-RF booklets. *Journal of Personality Assessment*, 92(3), 254-259.
- Venables, N. C., & Patrick, C. J. (2012). Validity of the externalizing spectrum inventory in a criminal offender sample: Relations with disinhibitory psychopathology, personality, and psychopathic features. *Psychological Assessment*, 24(1), 88.
- Vrieze, S. I., Perlman, G., Krueger, R. F., & Iacono, W. G. (2012). Is the continuity of externalizing psychopathology the same in adolescents and middle-aged adults? A test of the externalizing spectrum's developmental coherence. *Journal of Abnormal Child Psychology*, 40(3), 459-470.
- Weed, N. C. (2006). Syndromal complexity, paradigm shifts, and the future of validation research: Comments on Nichols and Rogers, Sewell, Harrison, and Jordan. *Journal of Personality Assessment*, 87(2), 217-222.

- Widiger, T. A., & Samuel, D. B. (2005). Diagnostic categories or dimensions? A question for the diagnostic and statistical manual of mental disorders. *Journal of Abnormal Psychology*, 114(4), 494.
- Zoccolillo, M., Pickles, A., Quinton, D., & Rutter, M. (1992). The outcome of childhood conduct disorder: Implications for defining adult personality disorder and conduct disorder. *Psychological Medicine*, 22(04), 971-986.