

POSITIVE AFFECT AND ADHD: HAPPY BUT TROUBLED ADOLESCENTS?

A THESIS SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY OF
HAWAI'I AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
DEGREE OF

MASTER OF ARTS

IN

PSYCHOLOGY

DECEMBER 2015

By

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ACKNOWLEDGMENTS

I owe my appreciation to many people who have played a role in the completion of this thesis. First, I would like to thank Dr. Ronald Kessler at Harvard Medical School. As the Principal Investigator of the National Comorbidity Survey-Adolescent Supplement (NCS-A), he led the original NCS-A study and upon completion of the survey provided access to the data for restricted use as well as codebooks through the Inter-university Consortium for Political and Social Research (ICPSR) at the University of Michigan. In addition, I would like to thank Reseeka Premchander for her assistance with questions regarding variables in the NCS-A data. I would also like to thank the ICPSR for providing access to the NCS-A data. The NCS-A study was supported by the National Institute of Mental Health and the National Institute of Drug Abuse with supplemental support from the Substance Abuse and Mental Health Services Administration, the Robert Wood Johnson Foundation, and the John W. Alden Trust.

Second, I would like to thank my committee members, Drs. Charles Mueller, Frank Floyd, and Kentaro Hayashi. Each of these committee members provided valuable suggestions for improvement throughout the process of this thesis. I would like to thank Dr. Hayashi for his support and for providing statistical consultations throughout this study. Dr. Floyd's insightful comments and suggestions propelled me to think more critically about my work, and his comments have encouraged me to think beyond the findings and analyses presented in this study.

My most heartfelt appreciation is due to Dr. Mueller for contributing to the completion of this thesis study. He has provided strong support in establishing the contract agreement between UH and ICPSR, and without his support, access to the NCS-A data would not have been possible. I am privileged to have worked with these well-established population-based adolescent data for my thesis. In addition, throughout this series of three studies on positive affect and

ADHD, he has taught me to think critically about each step of the study from data preparation to final data analysis. Under his guidance, I learned the science of psychology---I am indebted to Dr. Mueller for invaluable research skills that I had gained while working with him.

Lastly, many thanks to Matt Milette-Winfree for reading numerous drafts of my thesis study, and Darren Olsen and Xander Krieg for statistical software support and sharing data management strategies for working with large data. Finally, Eric Schank, who provided support all along the way.

ABSTRACT

Positive affect (PA) is critical for healthy human development. However, relatively little is known about PA in children with ADHD.

Data from the National Comorbidity Survey-Adolescents (NCS-A) were used to examine PA and its associations with parental reports of emotional and behavioral problems among adolescents who met criteria for ADHD, one or more non-ADHD psychiatric diagnoses, and no diagnoses. Results indicated that adolescents with ADHD reported higher PA than adolescents with other psychiatric problems and comparable to those with no psychiatric diagnoses. A positive association was found between PA and behavioral problems in adolescents with ADHD symptoms, but these effects were partially accounted by shared variance with youth demographic variables. The association between PA and emotional problems was not significantly moderated by ADHD diagnostic status. Although effects were small there is a suggestion that PA works differently in ADHD youth compared to others.

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CHAPTER 1. INTRODUCTION

ADHD is a neurodevelopmental challenge characterized by inattention and/or hyperactivity/impulsivity problems (American Psychiatric Association [APA], 2013; Frick & Nigg, 2012), and up to 8% of adolescents in the U.S. meet diagnostic criteria for ADHD (Kessler et al., 2013). Mood lability is an associated feature of ADHD (e.g., Barkley, 1997), and emotional impairments and their adverse effects on academic and social functioning in youth with ADHD have been well documented (e.g., Anastopoulos et al., 2011; Blackman, Ostrander, & Herman, 2005; Maedgen & Carlson, 2000; Sobanski et al., 2010). Despite considerable evidence linking emotional problems and poorer outcomes in children with ADHD, relatively few studies have examined positive emotionality and its potential role in the manifestation of emotional and behavioral problems in ADHD youth.

Three points regarding the current literature on emotionality in children with ADHD are particularly relevant to this study. First, a majority of research on emotions and emotional impairment in children with ADHD has focused on negative emotionality such as anger, irritability, and low frustration tolerance (e.g., Braaten & Rosen, 2000; Geller et al., 2002; Harty, Miller, Newcorn, & Halperin, 2009; Walcott & Landau, 2004). Children with ADHD are more prone to express or act out negative emotions (e.g., Maedgen & Carlson, 2000; Walcott & Landau, 2004), and high negative emotionality has been linked to greater symptom severity and poorer social functioning (e.g., Anastopoloulos et al., 2011; Sobanski et al., 2010; Walcott & Landau, 2004). Interestingly, despite well-documented behavioral manifestations of negative emotions in youth with ADHD, according to a recent study, children with ADHD self-report lower levels of negative affect than other clinic-referred children (Okado, Mueller, & Nakamura,

2013). It is unclear what accounted for lower self-reported negative affect in children with ADHD, but one possible explanation is that given some children with ADHD demonstrate poor emotional self-awareness (Factor, Rosen, & Reyes, 2013), lower negative affect reported by ADHD youth might point to a lack of emotional self-awareness. Despite the extensive literature on negative emotions in children with ADHD, relatively few studies have examined positive emotionality in youth with ADHD (see exceptions later).

Second, research on emotion dysregulation in children with ADHD has focused primarily on lability of negative emotions. Although emotion dysregulation and its adverse effects have been well-studied, with some notable exceptions (Epstein & Rosen, 2010; Factor, Reyes, & Rosen, 2014; Jensen & Rosen, 2004; Musser et al., 2011; Musser, Galloway-Long, Frick, & Nigg, 2013; Sjowall, Roth, Lindqvist, & Thorell, 2013), a majority of prior studies examined deficits in emotion self-regulation, emotional reactivity, or intensity of negative emotions and either did not include measures of PA or used a composite measure and did not distinguish dysregulation of PA from negative affect (e.g., Anastopolous et al., 2011; Bunford, Evans, & Langberg, 2014; Factor et al., 2013; Melnick & Hinshaw, 2000; Sobanski et al., 2010; Spencer et al., 2011; Walcott & Landau, 2004). Of the limited studies that examined dysregulation of positive emotions, there is some evidence that young children with ADHD experience higher physiological arousal in response to PA stimuli than those without ADHD (Musser et al., 2013; Musser et al., 2011). That said, these studies focused on dysregulation of positive emotions, and although there is some conceptual overlap between positive emotion dysregulation and a positive mood state, it is unknown to what extent high PA found in cross-sectional studies indicates one aspect of variability in positive emotions or dysfunctions in self-regulation of positive emotions.

Third, given the high comorbidity of ADHD with numerous other psychiatric disorders, some emotion and/or mood problems found in prior studies might be associated with comorbid psychopathology rather than ADHD. More than half of youth with ADHD carry a comorbid externalizing diagnosis (e.g., Barkley, 2006; Biederman, Newcorn, & Sprich, 1991; Biederman et al., 2008; Owens & Hinshaw, 2013), and up to 39% of youth with ADHD have comorbid anxiety or depression (e.g., Biederman et al., 1991; Biederman et al., 2008; Owens & Hinshaw, 2013). The presence of additional disorders has been demonstrated to increase severity of emotional problems (e.g., Harty et al., 2009; Sobanski et al., 2010), and given that many co-occurring diagnoses are characterized by mood problems and/or share clinical features with ADHD including elevated emotionality, it is possible that some prior findings are confounded by comorbid disorders. There is preliminary evidence that associations between PA and emotional problems in children with ADHD differ by type of comorbidity (Okado & Mueller, 2014). Among clinic-referred children with ADHD, self-reported PA was positively associated with parental reports of emotional problems in youth with ADHD-only and ADHD with a comorbid externalizing disorder, whereas among youth with ADHD and comorbid internalizing disorder, an inverse trend was found (Okado & Mueller, 2014). Based on these findings, higher PA might be a subtle risk factor for emotional problems in subsets of youth with ADHD. Although these findings suggest that associations between PA and emotional problems are further moderated by the presence and type of ADHD comorbidity, given the relatively small ADHD-only sample in that study, it remains unclear whether any such associations are specific to ADHD or accounted by comorbid disorders.

Taken together, the current literature points to important gaps and limitations in research on emotions and emotionality in youth with ADHD. Given the paucity of studies on PA and its

associations with behavioral and/or emotional problems, further investigation of PA effects in youth with ADHD is an important direction for research, particularly in light of the emerging psychopathology literature on a potential maladaptive role of PA in such youth.

Positive Affect

With the advent of positive psychology (Seligman & Csikszentmihalyi, 2000), research on PA has surged in the last decade (Kochanska et al., 2007). Positive emotions are commonly conceptualized as discrete emotions such as happiness, joy, and interest (see Fredrickson, 2001, for a review). Numerous studies underscore immediate benefits and long-term adaptive outcomes associated with positive emotions including general well-being (Seligman & Csikszentmihalyi, 2000), better physical and mental health (see Fredrickson, 2001, for a review), and social support (Fredrickson, 1998). PA has also been demonstrated to foster intrinsic motivation and promote cognitive flexibility (see Fredrickson, 2001, for a review; Isen & Reeve, 2005).

Various potential roles and mechanisms of PA have been suggested. For example, temperament/personality theorists generally describe expressions of PA as positive emotionality, a core trait that defines individual differences (Clark, 2005). Within this framework, positive emotionality is most commonly described by a set of personality characteristics associated with sociability such as warm-heartedness and extraversion (e.g., Watson & Tellegen, 1985). In the neurobiological and behavioral systems framework, researchers characterize positive emotions as approach-motivation tendencies (Gable & Harmon-Jones, 2011; Harmon-Jones & Gable, 2009; Rolls, 1999). According to this model, high-approach positive emotions (e.g., excitement, enthusiasm) are associated with reward-seeking behavior, whereas low-approach positive emotions (e.g., contentment, gratitude) are generally experienced after a goal has been achieved

(Gable & Harmon-Jones, 2011). From the developmental perspective, behavioral manifestations of PA such as smiling, laughing, and orientation to positive environmental cues (e.g., parents) in infants are associated with attention from caregivers, predictive of self-regulation, and thought to facilitate successful child-parent attachment and serve to protect against parent rejections (e.g., Lengua, Wolchik, Sandler, & West, 2000; Rothbart & Bates, 2006). Furthermore, low-approach positive emotions are theorized to broaden attention and cognitive flexibility and thought to play an important role during adolescence in the development and acquisition of skills such as critical thinking, self-regulation, and social competence (see Gilbert, 2012, for a review).

In child psychopathology research, affect is often conceptualized as two independent dimensions of positive and negative states (e.g., Watson & Tellegen, 1985). Within this framework, PA refers to a dimension of positive subjective emotional experiences and overall sense of well-being and includes qualities such as joy, interest, and enthusiasm (Watson, Clark & Tellegen, 1988; Watson & Tellegen, 1985). The tripartite model based on this two-dimensional framework has been extensively used in studies on depression and anxiety in both children and adults (e.g., Clark & Watson, 1991; Chorpita & Daleiden, 2002; Joiner & Lonigan, 2000). Consistent with the tripartite model, prior studies found that low levels of PA are linked with depression but not anxiety (e.g., Clark & Watson, 1991; Chorpita & Daleiden, 2002).

Although PA is generally considered adaptive, two contrasting views regarding the functions of PA emerge from the current psychopathology literature. On the one hand, PA is most commonly conceptualized as a resiliency characteristic and is thought to buffer against adverse development (Gilbert, 2012; Olympia et al., 2013). On the other hand, high or excessive levels of PA are linked with some mood and personality disorders including mania in bipolar disorder and histrionic and narcissistic personality disorders (e.g., APA, 2013; Miller, Widiger,

& Campbell, 2010; Widiger & Mullins-Swett, 2009). Furthermore, recent studies have found that dysregulation of PA is associated with mood disorders, depression, and poorer global functioning (e.g., Carl, Soskin, Kerns, & Barlow, 2013; Gilbert, 2012; Gruber, Kogan, Quoidbach, & Mauss, 2013).

Childhood externalizing disorders (e.g., conduct disorder, oppositional defiant disorder) are associated with significant emotional challenges, most notably strong negative emotionality and mood lability. Yet, to date, research on positive emotions in children with externalizing problems is limited (Olympia et al., 2013). Within this literature, one study has suggested that PA might buffer the effects of parental rejection on the development of conduct problems (Lengua et al., 2000). In another study, self-reported happiness was modestly associated with lower externalizing problems (Kim et al., 2006). Consistent with the tripartite model, a more recent study reported that low PA distinguished between depressive and anxiety symptoms among youth with externalizing problems in a residential sample (Chin, Ebesutani, & Young, 2013).

Positive Affect and ADHD

Much of the current literature on the relationship between PA and ADHD hinges on theoretical work based in temperament/developmental and behavioral frameworks. In a developmental multi-pathway model proposed by Nigg and colleagues (2004), youth with primary ADHD-Combined Type without comorbidity are hypothesized to develop extreme exuberance or positive approach in early infancy, whereas ADHD youth with comorbid anxiety or conduct disorders and those with only inattentive symptoms are theorized to follow divergent paths, characterized by strong negative affect, low emotional arousal, and/or dysfunction in behavioral self-regulation. Based on this model, emotionality in children with ADHD may vary

widely across development by type of ADHD comorbidity. In contrast, other personality/temperament researchers have suggested that both positive and negative emotions are associated with the hyperactivity/impulsivity dimension in ADHD but not inattention symptoms (e.g., Goldsmith, Lemery, & Essex, 2004; Martel, 2009). Furthermore, within the behavioral framework, approach tendencies inherent in PA are often linked to ADHD symptomology, particularly impulsivity (Mitchell, 2010; Putnam, 2012). Taken together, these models describe a positive association between PA, approach motivation, and the hyperactivity/impulsivity aspect of ADHD. As such, youth with these characteristics of ADHD might express higher levels of PA than non-psychiatric youth and youth with other psychiatric disorders such as depression.

Of the limited empirical research to date, findings from two recent clinic-based studies revealed counterintuitive effects of PA in children with ADHD. In the first study, researchers examined PA in young children with and without ADHD (mean age = 13.27) referred for a mental health assessment at a university-based child clinic, with the majority of the non-ADHD group carrying a disruptive behavior diagnosis (Okado et al., 2013). Findings from this study indicated that youth with ADHD (both ADHD-only and ADHD+comorbidity) self-reported higher levels of PA than other clinic-referred youth (Okado et al., 2013). In the second study, contrary to the general notion of PA as a protective factor against internalizing problems, self-reported PA was positively associated with parental reports of internalizing problems in ADHD youth (Okado & Mueller, 2014). Furthermore, the effects of PA on emotional/behavioral problems in the ADHD group differed by type of comorbidity; among youth with ADHD-only and ADHD and an externalizing disorder, levels of PA were positively associated with parental reports of internalizing and somatic problems, whereas an inverse trend was found for youth with ADHD and either of the two most common internalizing disorders in this sample (anxiety and/or

depression). One possible explanation is that self-reported high PA might reflect a self-perception bias. Children with ADHD are known to self-report unrealistically high or optimistic perceptions of competence in various domains of functioning, a phenomenon termed positive illusory bias (PIB; see Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007, for a review). PIB appears to persist into adolescence, and despite parent/teacher reports of social and behavioral problems, adolescents with ADHD viewed themselves as socially accepted and well-adjusted (Bussing, Mason, Bell, Porter, & Garvan, 2010; Hoza, Murray-Close, Arnold, Hinshaw, & Hechtman, 2010). Thus, similarly to PIB, higher self-reported PA might indicate over-inflated or distortions in self-assessments of affective states or a lack of self-awareness of one's emotions in youth with ADHD.

Two important points limit conclusions that can be drawn regarding PA and its relationship with emotional/behavioral problems in children with ADHD. First, diversity in measurement approaches across prior studies calls into question whether these studies examined the same PA construct. For example, some studies used a single item (e.g., “happiness”, “good mood”) as an indicator of positive mood in children with ADHD (e.g., Sjowall et al., 2013; Whalen et al., 2009), whereas other studies used well-validated measures such as the Positive and Negative Affect Scale for Children that included multiple items to assess for PA (PANAS-C; Laurent et al., 1999; e.g., Factor et al., 2014; Okado et al., 2013; Rosen & Epstein, 2010). Overall, it is unknown whether indicating one's mood as “happy” in a single item corresponds to a positive mood state assessed in multi-item measures. Furthermore, some studies used child self-reports of PA (e.g., Factor et al., 2014; Okado et al., 2013; Whalen et al., 2002; Whalen et al., 2009), whereas many studies relied on parental reports to assess for children's affective states (e.g., Braaten & Rosen, 2004; Rosen & Epstein, 2010; Sjowall et al., 2013). Although parental

reports are commonly used in child psychopathology research, child and parental reports often differ, and as prior studies on self-concepts in children with ADHD have demonstrated, child self-reports of PA might reveal important information including a possible self-protective mechanism such as PIB that cannot be detected by parent-reports alone. Taken together, given that measurement approaches varied widely across studies, it is unknown to what extent the PA constructs measured in prior studies are consistent with the conceptualization of PA as a mood state as described in the tripartite model of emotions. It is also unclear whether these various measures reflect PA as a state (short-term) and/or a trait (long-term).

Second, a major gap in this literature is the dearth of research using community samples. With some exceptions (Factor et al., 2014; Musser et al., 2011; Musser et al., 2013; Whalen et al., 2002; Whalen et al., 2009), most studies to date on PA in children and adolescents with ADHD have been conducted on clinical samples. Furthermore, the limited extant literature presents an inconclusive picture regarding PA in community-based samples of youth with ADHD; in two studies children with ADHD demonstrated higher physiological arousal in response to PA stimuli than non-ADHD children (Musser et al., 2011; Musser et al., 2013), whereas in other studies some youth with ADHD self-reported lower PA (Whalen et al., 2002) or comparable PA levels to non-ADHD youth (Factor et al., 2014; Whalen et al., 2009). Overall, these findings are mixed at best and it is unclear whether high PA might be characteristic of ADHD in community samples. On the one hand, if higher PA is found in both clinical and community samples where one might expect less in community samples, it suggests that PA is a strong component of ADHD psychopathology. Given that community samples of youth with ADHD also include those who have not sought treatment or referrals for treatment as commonly found in clinical samples, any characteristic found in both clinical and community samples of youth with ADHD

could point to an attribute of ADHD. On the other hand, if PA levels in youth with ADHD are higher than other youth in clinical samples but comparable to other youth in community samples, this might suggest that PA might be a specific characteristic of clinical samples. The limitations of clinical samples are many, including higher comorbidity rates, more severe symptomatology and impairment, and referral bias (Angold, Costello, & Erkanli, 1999). As an example, given that parents are most commonly the referral source for clinical samples (Des Los Reyes & Kazdin, 2005), it is possible that these parents might demonstrate a stronger focus on problematic aspects of their child. Thus, it is possible that parents in clinical samples might over-report the presence of behavioral and/or emotional problems in their child. Given these limitations, it is possible that if PA levels are comparable between ADHD and non-psychiatric youth in a population sample, this might indicate that youth with ADHD are no different on PA than non-psychiatric youth. Given the limited studies, it is unknown to what extent these community-based findings are generalizable, particularly given the very small sample or geographically restricted samples used in these studies. Lastly, to date, relationships between PA and emotional/behavioral problems in youth with ADHD have not been examined in community samples. Numerous studies to date have examined ADHD using epidemiological samples; however, these studies have primarily focused on the prevalence, outcomes, and service utilization among ADHD youth (e.g., Bussing et al., 2010; Cuffe et al., 2001; Cuffe, Moore & McKeown, 2005), and PA and its potential effects in youth with ADHD have not been previously examined in a population-based sample.

Thus, it is unknown whether higher PA or paradoxical effects of PA found in clinical studies will hold in a non-clinical sample. On the one hand, findings from a prior study suggests the possibility that levels of PA in a population-based sample of adolescents who meet ADHD criteria might not differ from those of other youth with or without any psychiatric problems.

According to a clinic-based study (Okado et al., 2013), self-reported PA scores among clinic-referred youth with ADHD were nearly equivalent to those reported in community samples described in the Laurent and colleagues study (1999) ; thus, it is possible that levels of PA reported by clinic-referred ADHD youth are higher than those with other psychiatric problems (e.g., depression) but comparable to non-disordered youth. Moreover, in a clinical study, age was negatively correlated with PA in children with ADHD (Okado et al., 2013). Given that PA has been mostly studied in younger clinic-referred children with ADHD (e.g., Factor et al., 2014; Musser et al., 2011; Musser et al., 2013; Sjowall et al., 2013), it is unknown whether higher PA found in young children with ADHD holds for older youth with ADHD. It is possible that PA might not be characteristic of ADHD in a community sample of adolescents and does not predict parental reports of behavioral/emotional problems.

On the other hand, it is reasonable to believe that findings from prior clinical studies would extend to a population-based sample, particularly given that PIB, a comparable phenomenon, has been reported in both community and clinical samples. Cross-sectional and longitudinal studies indicate that the symptoms and developmental course of youth meeting the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV-TR*; APA, 2000) ADHD criteria in population-based samples are comparable to those in clinical studies (e.g., Cohen, Cohen, & Brook, 1993; Larsson, Lichtenstein, & Larsson, 2006). Thus, characteristics of adolescents who meet ADHD criteria including PA in a population-based sample are expected to be similar to youth with ADHD examined in clinic-based samples.

In summary, although numerous studies have examined emotionality and emotion dysregulation in youth with ADHD, there are many aspects of PA in youth with ADHD that remain unknown. Findings regarding PA in children with ADHD are inconclusive, and further

research on PA in a population-based sample of adolescents with ADHD will reveal whether high levels of PA are characteristic of ADHD. More importantly, research examining PA and its relationship with parental reports of emotional/behavioral problems is limited and in need of replication in a community sample. Although it is possible that PA might characterize both clinical and community samples of youth with ADHD, it is unknown whether the association of PA with parent-reported emotional/behavioral in a community sample will parallel prior findings based on a clinical sample.

Present Study

This is the first study to examine self-reported PA and its associations with parental reports of emotional/behavioral problems in adolescents with ADHD in a nationally representative sample. The aim of the present study was twofold: First, levels of self-reported PA among adolescents meeting *DSM-IV* criteria for primary ADHD-Combined Type but for no other psychiatric disorder were compared to other youth with and without psychiatric problems. Second, associations between levels of self-reported PA and parental reports of emotional and/or behavioral problems were examined between adolescents with and without ADHD symptoms. Regarding the first study aim, it was hypothesized that levels of self-reported PA in adolescents with ADHD are significantly higher than those of youth with other psychiatric diagnoses but comparable to those of youth without psychiatric problems. Regarding the second study aim, it was hypothesized that self-reported levels of PA are associated with greater parental reports of either or both emotional and behavioral problems for ADHD youth but not in the non-ADHD groups. In order to test for these hypotheses, adolescents who met criteria for ADHD and one or more psychiatric disorders were removed from the study sample.

CHAPTER 2. METHOD

The National Comorbidity Survey-Adolescent Supplement

Data from the National Comorbidity Survey-Adolescent Supplement (NCS-A; Kessler et al., 2009a; Merikangas, Avenevoli, Costello, Koretz, & Kessler, 2009), an epidemiological survey of 10,148 adolescents (ages 13-18) conducted in the continental United States between 2001 and 2004, were used. It is the first population-level survey designed to collect comprehensive data on prevalence, correlates, onset, and risk and protective factors of mental disorders among U.S. adolescents (Merikangas et al., 2009).

Study design, sampling strategy, and procedures are described in greater detail elsewhere (e.g., Kessler et al., 2009a; Kessler et al., 2009b; Merikangas et al., 2009). Briefly, the NCS-A interviews were conducted in dual frame (household and school) samples (Kessler et al., 2009b). The household survey ($n = 904$; 86.8% response rate) was conducted in parallel with the National Comorbidity Survey-Replication (NCS-R) study and examined adolescent residents of the households that participated in the NCS-R (see Kessler & Merikangas, 2004, for details on NCS-R households selection). The NCS-R household survey was designed to be representative of English-speaking adults ages 18 and over living in the non-institutionalized civilian household and college students with a permanent household address in the continental U.S. (Kessler et al., 2004). Respondents for the NCS-R survey were selected from a four-stage area probability sample based on the U.S. Bureau of the Census from the 2000 U.S. census (Kessler et al., 2004). For the NCS-A household survey, only those households that included adolescents were recruited (Kessler et al., 2009b). In addition, a total of 320 schools were randomly selected from the government list of accredited public and private schools following geographic stratification (see Kessler et al., 2009b, for details). Within each selected school, a random sample of 40-50 students were recruited, using a systematic selection of every n th student beginning at the

random start and the random end from the school roster provided by schools (Kessler et al., 2009b). A total of 9,244 adolescents (82.6% response rate) were included in the school sample. Adolescents were interviewed in-person by 197 professional survey interviewers from the Survey Research Center of the Institute for Social Research at the University of Michigan, and adolescent questionnaires were given using computer-assisted personal interviews. One parent or guardian of each adolescent was asked to complete self-administered paper-and-pencil questionnaires (see Kessler et al., 2009a, for additional details on design and field procedures). According to Kessler and colleagues (2009b), the response rate to the parent questionnaire was considerably lower than in the adolescent survey (63.0%).

The NCS-A study data were extracted from the Inter-university Consortium for Political and Social Research (ICPSR) at the University of Michigan as part of a data share agreement established between the faculty researcher (Dr. Charles Mueller) at the University of Hawai‘i and ICPSR. ICPSR maintains the NCS-A data, codebooks and a complete list of publications associated with the NCS-A data.

Participants

Participants included 4,193 adolescents with complete data on PA items and parent-reported SDQ-CP and SDQ-ES items (described below). The mean age of this sample was 15.02 ($SD = 1.44$, range 13-18), and the majority of participants were female (54%; $n = 2,265$). The sample included multiple racial groups, with 66.3% reporting as white, 16.8% black, 11.1% Hispanic, and 5.8% “other”. Among adolescents with other non-ADHD psychiatric symptoms, the most common *DSM-IV* diagnostic criteria met were for anxiety disorders (56.9%), followed by Oppositional Defiant Disorder (19.2%), mood disorders (14.9%), substance-related disorders (13.2%), and other (5.7%; e.g., anorexia, bulimia).

The present study examined data for the following three diagnostic groups; a) 94 adolescents who met lifetime *DSM-IV* ADHD criteria only (and no other disorders across the lifetime, hereafter referred to as the “ADHD group”), b) 1,642 adolescents who met criteria for one or more non-ADHD *DSM-IV* disorders based on past 30 day symptoms (hereafter referred to as the “other psychiatric group”), and c) 2,457 youth who never met lifetime criteria for any psychiatric disorders (hereafter referred to as the “non-psychiatric group”). Adolescents with ADHD and one or more comorbid disorders ($n = 518$) were excluded from the present study.

Human Subjects Considerations

Recruitment and consent procedures for the NCS-A were approved by the Human Subjects Committees of Harvard Medical School and the University of Michigan (Kessler et al., 2009a; Merikangas et al., 2009). Written informed consent was obtained from the parent, and written informed assent was obtained from the adolescent (Kessler et al., 2009a). The present archival study has approval from the University of Hawai‘i at Mānoa Human Studies Program for exempt research under the data share agreement between the faculty investigator at the University of Hawai‘i and the ICPSR at the University of Michigan.

Measures

Positive affect. Four items (happy, optimistic, confident, full of life) in the NCS-A probed for the extent of positive feelings experienced by adolescents. Adolescents were asked to rate the degree to which they have experienced each of the four descriptors in the past month on a 5-point Likert scale ranging from 1 (*all of the time*) to 5 (*none of the time*). When no response was given, interviewers indicated 8 (*don’t know*) or 9 (*refused*). In the present study, scores were reversed-coded (e.g., *all of the time* = 5, *none of the time* = 1) for interpretability prior to

analyses, and total scores (computed by summing scores for the four items) based on adolescent responses were used as the measure of PA.

These four items are similar to other items (e.g., joyful, excited, content) from PA measures identified in the literature (e.g., Laurent et al., 1999; Watson, 1988; Watson & Tellegen, 1985). These items were developed for the NCS-R and used in the identical form in the NCS-A. The items were adapted from the National Survey of Midlife Development in the United States (MIDUS II, 2004-2006; R. Premchander, personal communication, October 24, 2014) where these items were used to assess for positive affect, psychological well-being, and self-construal in adult respondents (Ryff et al., 2012). A previous study based on the NCS-R reported positive correlations between these items and sociability items (Rodebaugh, Fernandez, & Levinson, 2012). Given that sociability is strongly associated with PA (Watson & Tellegen, 1985), these findings provide preliminary support for the validity of the PA items. In the present study, the internal consistency of the PA scale demonstrated acceptable reliability (Cronbach's $\alpha = .737$), and exploratory factor analysis revealed that a one-factor solution provided the best fit for these 4 items (eigenvalue = 2.278). The factor loadings for the four items ranged from .531 (optimistic) to .746 (full of life).

Strengths and Difficulties Questionnaire (SDQ; Goodman, Ford, Simmons, Godward, & Meltzer, 2003). The SDQ is a 25-item parent-reported questionnaire that assesses emotional and behavioral functioning in the following five areas: Emotional Symptoms, Conduct Problems, Hyperactivity, Peer Problems, and Prosocial behavior (see Appendix B for copy of complete SDQ). Each subscale contains five items scored as *not true* (1), *somewhat true* (2), and *very true* (3). Prior to analyses, per the SDQ developers and common practice, one point from each score was subtracted so the scale reflected its original SDQ scoring (*not true* (0), *somewhat*

true (1), and *very true* (2)). In the present study, parental reports on the Emotional Symptoms (“often complains of headaches, stomachaches, or sickness”, “has many worries, often seems worried”, “often unhappy, depressed, or tearful”, “is nervous in new situations, easily loses confidence”, and “has many fears, easily distracted”) and Conduct Problems (“often loses his/her temper”, “is generally obedient, usually does what adults request” (reverse-coded), “often fights with others or bullies them”, “often lies or cheats”, and “steals from home, school, or elsewhere”) subscales were used to assess levels of emotional and behavioral problems.

The SDQ is a well-established measure with adequate reliability for the total score ($\alpha = .82$), Emotional Symptoms ($\alpha = .75$), and Conduct Problems ($\alpha = .72$) subscales (Goodman, Meltzer, & Bailey, 2003). In addition, factor analytic study of the NCS-A SDQ data found support for the original five-factor structure (He, Burstein, Schmitz, & Merikangas, 2013). Strong correlations have been reported between the SDQ Emotional Symptoms and the CBCL Internalizing scale as well as between the SDQ Conduct Problems and the CBCL Externalizing subscale, .74 and .84, respectively (Goodman & Scott, 1998). In the present study, the internal consistency of the SDQ-CP and SDQ-ES demonstrated acceptable reliability (Cronbach’s alphas = .713 and .715, respectively).

Psychiatric diagnoses. For diagnostic assessment, the modified World Health Organization (WHO) Composite International Diagnostic Interview Version 3.0 (CIDI; Kessler & Üstün, 2004) was administered to the adolescent, and parent/guardian completed the paper-and-pencil format of the CIDI (Kessler et al., 2009a; Merikangas et al., 2009). The CIDI is a fully structured diagnostic interview that assesses for the prevalence of *DSM-IV* diagnoses, and it was modified for the NCS-A to adjust for language and experiences to be more relevant to adolescents (e.g., school life rather than work life, peer relationships instead of parenting;

Kessler et al., 2009b; Merikangas et al., 2009). As reported elsewhere, moderate to excellent concordance between the CIDI and the Schedule for Affective Disorders and Schizophrenia for School Age Children (K-SADS-PL; Kaufman et al., 1997) diagnoses has been demonstrated (area under the receiver operating characteristic curve [AUC] range: .78 - 1.0) for all except alcohol dependency with abuse (AUC = .56; Kessler et al., 2009c). Adolescent interviews assessed for symptoms of fifteen *DSM-IV* disorders including anxiety disorders (panic disorder, generalized anxiety disorder, phobias, post-traumatic stress disorder, separation anxiety disorder), mood disorders (major depressive disorder, dysthymic disorder, bipolar disorder), behavior disorders (ADHD, conduct disorder, oppositional defiant disorder, intermittent explosive disorder), and substance disorders (alcohol and illicit drug abuse and dependence). Parental reports were obtained for four disorders (ADHD, conduct disorder, oppositional defiant disorder, and major depression/dysthymia) that have been previously determined to benefit from inclusion of multiple informant reports (De Los Reyes & Kazdin, 2005; Kessler et al., 2013). In the NCS-A, diagnostic variables based on adolescent and/or parent-reports of 30-day, 12-month, and lifetime symptoms were available for the majority of the *DSM-IV* disorders.

In order for adolescents to meet ADHD diagnostic criteria, impairment and six or more symptoms within each subtype of ADHD needed to be present in two or more settings. Prior psychometric studies on the NCS-A data have reported that the CIDI ADHD diagnosis based on parental reports had better concordance with the K-SADS ADHD diagnosis in the follow-up blinded clinical re-appraisal interviews (AUC = .78; Green et al., 2010; Kessler et al., 2009c). Thus, the present study established an ADHD diagnosis based on parental reports, and adolescents meeting ADHD diagnostic criteria (lifetime) have been included in the ADHD group (see Appendix A for a verbatim copy of the ADHD portion of the CIDI parental questionnaire).

Regarding the other psychiatric group, adolescents who met *DSM-IV* criteria for non-ADHD disorders with symptoms present in the past 30 days were included. For this group, given that the mean age of onset for some of the non-ADHD disorders has been reported as after 12 years (e.g., bipolar disorder, drug abuse, eating disorder, generalized anxiety disorder; Kessler et al., 2012), the use of 30-day symptoms rather than lifetime symptoms was thought to better capture adolescents with current psychiatric problems.

Statistical Analyses

Several preliminary analyses were conducted to characterize youth and study variables and to determine any diagnostic group differences on these variables using correlations, analysis of variance (ANOVA), and chi-square statistics. Next, bivariate correlations were conducted to examine associations between study measures and youth demographic variables. In order to determine overall group differences on PA, a one-way ANOVA across the three diagnostic groups was conducted. Next, the effects of PA and ADHD diagnostic status (Yes/No) on behavioral problems were examined using hierarchical multiple regression analyses with the SDQ-CP score as the criterion variable. Last, the effects of PA and ADHD diagnostic status on the likelihood of adolescents presenting with emotional difficulties were examined using logistic regression analyses with the SDQ-ES score as the criterion variable. In all regression analyses, dichotomous variables (e.g., gender; female = 1, male = 0) were dummy-coded, and all continuous predictor variables (e.g., age, level of PA) were centered according to procedures described by Aiken and West (1991).

Missing data. Consistent with the codebooks provided by the ICPSR (Kessler, 2004), the PA items and the SDQ CP and ES items were missing observations on one or more items (4.8%, 1.7%, and 2.1%, respectively). Missing data were examined for patterns of missingness

and for any associations with study and auxiliary variables using the Missing Values Analysis module in SPSS 21.0. Based on these analyses, missing data were deemed missing at random. Given the small proportion of missing data, listwise deletion was applied as missing data were not expected to significantly affect study findings.

CHAPTER 3. RESULTS

Preliminary Analyses

Table 1 displays youth demographic and clinical characteristics. Overall diagnostic group differences were found for age, $F(2, 4190) = 28.844, p < .001$, and gender, $\chi^2(2) = 82.98, p < .001$. The ADHD group was significantly more likely to be males, and the other psychiatric group was significantly older and more likely to be females than the other two groups. Group differences were also found for race, $\chi^2(6) = 29.25, p < .001$. The other psychiatric group was significantly more likely to be Hispanic or black whereas the non-psychiatric group was significantly more likely to be white. Overall, the most common diagnoses found in the other psychiatric group were anxiety followed by Oppositional Defiant Disorder, mood disorders, and substance use (see Table 1).

Table 1.

<i>Sample Characteristics by Diagnostic Group</i>							
Variable	ADHD-only (<i>n</i> = 94) Mean (<i>SD</i>)	Other Diagnoses (<i>n</i> = 1642) Mean (<i>SD</i>)	No diagnosis (<i>n</i> = 2457) Mean (<i>SD</i>)	F	<i>p</i>	η_p^2	
Age***	14.86 (1.48) _a	15.23 (1.46) _b	14.89 (1.41) _s	28.84	<.001	.014	
Male, <i>n</i> (%)***	68 (72.3) _a	628 (32.6) _b	1232 (50.1) _b				
Race, <i>n</i> (%)							
Black	17 (18.1)	310 (18.9)	377 (15.3)				
Hispanic	10 (10.6)	212 (12.9)	243 (9.9)				
Other	9 (9.6)	105 (6.4)	129 (5.3)				
White	58 (61.7)	1015 (61.8)	1708 (69.5)				
Diagnosis, <i>n</i> (%)							
Any anxiety		935 (56.9)					
Any mood		245 (14.9)					
Conduct disorder		52 (3.2)					
ODD		315 (19.2)					
Any substance		216 (13.2)					
Any other		93 (5.7)					
PA***	15.32 (2.63) _a	14.04 (2.73) _b	15.53 (2.31) _a	176.37	<.001	.078	
SDQ							
Conduct Problems***	2.46 (1.22) _a	2.71 (1.43) _a	2.07 (0.85) _b	162.88	<.001	.072	
Emotional Problems***	2.28 (2.06) _a	2.62 (2.21) _a	1.18 (1.46) _b	313.57	<.001	.128	
Emotional Difficulties, <i>n</i> (%)***+	20 (21.3) _a	519 (31.6) _a	206 (8.4) _b				

Note. PA = Positive Affect; SDQ = Strengths and Difficulties Questionnaire. +The SDQ Emotional Problems variable demonstrated a strong positive skew; thus, the variable was dichotomized into two categories (SDQ Emotional Difficulties) for analysis. Overall group difference was found across the three groups, $X^2(2) = 264.13$. Due to multiple comorbidities cases sum to more than 100%. Within each row, means sharing a common subscript are not statistically different at $p < .05$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Bivariate correlations between youth characteristics and study variables are shown in Table 2. For bivariate analyses the following correlations were conducted; Pearson's correlations for associations between two continuous variables, phi-coefficients for associations between two dichotomous variables, and point-biserial correlations for associations between a continuous and a dichotomous variable. Youth age was negatively correlated with PA ($r = -.031$) and SDQ-CP ($r = -.031$), and positively associated with SDQ-ES ($r = .031$) scores. Gender was associated with PA ($r = -.059$) and SDQ-ES scores ($r = .132$), with boys reporting higher mean PA and girls receiving higher SDQ-ES scores. Race categories also predicted scores on the three measures. Hispanic youth reported lower mean scores for PA and received higher mean scores on both SDQ subscales. Similarly, black youth received higher mean scores on the two SDQ scores. White youth reported higher mean PA and received lower scores on the SDQ

subscales. PA was negatively correlated with SDQ-CP ($r = -.093$) and SDQ-ES scores ($r = -.257$). Given that the study measures are correlated with youth demographics and the effects of youth demographic variables varied across diagnostic groups, all analyses were conducted both independently and after controlling for shared variance with these potentially confounding variables.

Table 2

Bivariate correlations and phi coefficients for youth characteristics and study variables

	Age	Female	PA	SDQ-CP	SDQ-ES
Age	1	.032*	-.031*	-.031*	.031*
Female		1	-.059**	.014	.132**
PA			1	-.093**	-.257**
SDQ-CP				1	.393**
SDQ-ES					1

Note. PA = Positive Affect; SDQ-CP = Strengths and Difficulties Questionnaire Conduct Problems; SDQ-ES = Strengths and Difficulties Questionnaire Emotional Symptoms; * $p < .05$. ** $p < .01$.

PA Differences across Diagnostic Groups

A one-way ANOVA with the three diagnostic groups predicting PA indicated overall group differences, $F(2, 4330) = 183.17, p < .001$ (see lower portion of Table 1). Post-hoc analyses using the Tukey’s Honestly Significant Difference (HSD) test revealed that the ADHD group (15.33, $SD = 2.63$) reported significantly higher mean PA than the other psychiatric group (14.03, $SD = 2.73$) but no difference was found between the ADHD and the non-psychiatric groups (15.53, $SD = 2.31$). Next, an analysis of covariance (ANCOVA) was conducted to control for the effects of all youth variables (age, gender, race) that significantly predicted PA in bivariate analyses. The overall group difference held after removing shared variance with age, gender, and race, $F(2, 4308) = 164.74, p < .001$. Post hoc analyses using contrast coding (with Bonferroni corrections for multiple comparisons) revealed the same pattern; the ADHD group

reported significantly higher PA than the other psychiatric group ($p < .001$), but PA levels did not differ between the ADHD and non-psychiatric groups ($p = 1.00$).

Associations between PA and ADHD Diagnostic Status Predicting Behavioral Problems

A one-way ANOVA with the three diagnostic groups predicting the SDQ-CP scores indicated overall group differences, $F(2, 4190) = 162.88, p < .001$ (see lower portion of Table 1). The other psychiatric group reported the highest mean (2.71, $SD = 1.43$) followed by the ADHD (2.46, $SD = 1.22$) and the non-psychiatric (2.07, $SD = .85$) groups. Post hoc analyses using Tukey's HSD test revealed that the ADHD and the other psychiatric groups received significantly higher mean SDQ-CP scores than the non-psychiatric group, but the mean SDQ-CP scores did not significantly differ between these two groups. Also PA was negatively correlated with the SDQ-CP ($r = -.093$; Table 2).

In order to examine the relationship between self-reported PA, diagnostic status, and parental reports of behavioral problems, hierarchical regression analyses were conducted with SDQ-CP as the criterion variable. Predictor variables were entered into regression equations in the following order: Step 1, PA; Step 2, ADHD diagnostic status (yes/no); Step 3, interaction between PA and ADHD. If present, significant interactions between PA and ADHD diagnostic status in Step 3 indicate a moderation effect that predicts behavioral problems.

Results of this regression analysis are displayed in Table 3. The main effect of PA was statistically significant (Step 1), $R^2 = .009, F(1, 4191) = 36.74, p < .001$, but ADHD diagnostic status (Step 2) did not predict SDQ-CP scores, $R^2 = .009, F(2, 4190) = 19.10, p = .227$. In Step 3, the interaction between PA and ADHD diagnostic status significantly predicted SDQ-CP scores, $R^2 = .010, F(3, 4189) = 14.03, p = .049$. A visual inspection of PA x ADHD interactions

revealed small positive trends for the ADHD group and an inverse trend for other youth (see Figure 1).

Table 3

Associations between Youth Self-Report of Positive Affect and Parent-reported Behavioral Problems as Moderated by ADHD Diagnostic Status

Variable	R ²	ΔR ²	β	F	t	p
SDQ_Conduct Problems						
Step 1 PA	.009	.009	-.093	36.74	-6.11	< .001
Step 2 ADHD diagnostic status	.009	.000	.019	19.10	1.21	.227
Step 3 PA x ADHD	.010	.001	.031	14.03	2.00	.049

Note. ADHD diagnostic status (Step 2) was dummy coded (ADHD = 1, all other = 0).

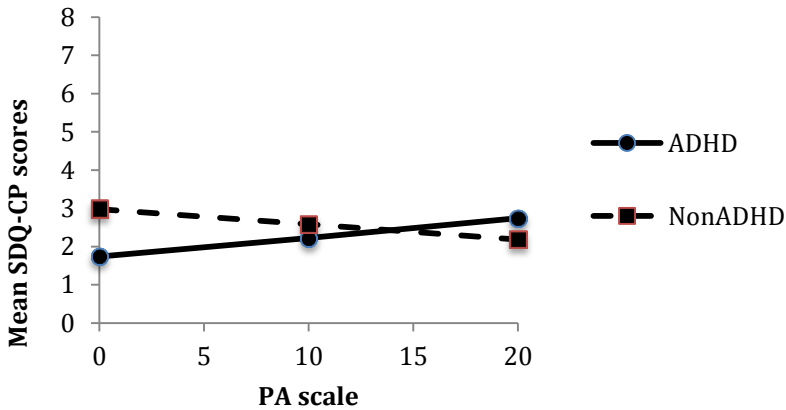


Figure 1. Interactions between PA and ADHD diagnostic status predicting SDQ-CP scores.

Next, analyses were conducted with youth demographic variables entered in the first step of the regression model to control for any shared variance with these potential confounding covariates. After controlling for these variables, the main effect of PA remained significant, $R^2 = .020$, $F(4, 4188) = 21.71$, $p < .001$. No significant main effect was found for ADHD diagnostic status. For the final step, interactions between PA and ADHD diagnostic status lost statistical significance but remained marginally significant, $R^2 = .021$, $F(6, 4186) = 15.28$, $p = .065$. Among the covariates entered, race significantly predicted behavioral problems ($p < .001$), and age was also marginally significant in predicting behavioral problems ($p = .090$).

Associations between PA and ADHD Diagnostic Status Predicting Emotional Problems

Descriptive analyses on the SDQ-ES indicated that overall group differences followed a similar pattern found for the SDQ-CP; the other psychiatric group had the highest mean SDQ-ES scores (2.62, $SD = 2.21$) followed by the ADHD (2.28, $SD = 2.06$) and the non-psychiatric (1.18, $SD = 1.46$) groups. Due to a very strong positive skew found in the SDQ-ES, various transformations (e.g., log, square root) were applied. However, the variable continued to exhibit a strong positive skew even after transformation. As a result, the SDQ-ES variable was dichotomized into two categories and logistic regression analyses were conducted. Following the strategy applied by He and colleagues (2013) on the same variable in the NCS-A data, the SDQ-ES scores were split into two groups, ‘no difficulties’ (0-4; $n = 3,448$) and ‘difficulties’ (5-10; $n = 745$) using the 80th percentile indicated in the He and colleagues study as a cut off. The overall group difference remained significant after transforming the SDQ-ES, $\chi^2(2) = 264.13, p < .001$. Adolescents in the ADHD and other psychiatric groups were significantly more likely to have emotional difficulties than the non-psychiatric group.

Results of logistic regression and parameter estimates are presented in Table 4. The main effect of PA was significant, Wald $\chi^2 = 148.94, p < .001$. ADHD diagnostic status did not predict emotional difficulties, Wald $\chi^2 = 1.42, p = .233$. The interaction between PA and ADHD diagnostic status did not predict the likelihood of youth presenting with emotional difficulties, Wald $\chi^2 = 1.97, p = .161$. A visual inspection of the interaction did not detect any moderation effects of PA and ADHD diagnostic status on emotional difficulties. After controlling for shared variance with youth demographics, the main effect of PA was still significant, Wald $\chi^2 = 132.53, p < .001$. Neither the main effect of ADHD diagnostic status nor the interaction between PA and

ADHD diagnostic status was statistically significant, Wald $\chi^2 = 3.13$, $p = .077$ and Wald $\chi^2 = 1.70$, $p = .19$, respectively.

Table 4

Associations between Youth Self-Report of Positive Affect and Likelihood of Parent-reported Emotional Problems as Moderated by ADHD Diagnostic Status

Variable	β	Wald's χ^2	df	p	e^β	95% CI	
						Lower	Upper
SDQ_Emoional Symptoms							
Step 1 PA	-.188	148.9	1	< .001	0.829	0.804	0.854
Step 2 ADHD diagnostic status	-.311	1.42	1	.233	0.732	0.439	1.222
Step 3 PA x ADHD	-.134	1.97	1	.161	0.874	0.724	1.055

Note. ADHD diagnostic status (Step 2) was dummy coded (ADHD = 1, all other = 0).

CHAPTER 4. DISCUSSION

The present study examined PA and the relationship between PA and emotional and behavioral problems in a nationally representative sample of adolescents with and without ADHD symptoms. Findings indicate that PA levels in adolescents with ADHD symptoms were significantly higher than those with other psychiatric symptoms but comparable to those without psychiatric problems. Although a small negative association (-.09) was found between PA and parent-reported behavioral problems for adolescents with ADHD symptoms, this moderation effect for behavioral problems lost statistical significance after controlling for confounding covariates. Association between PA and emotional problems was not moderated by ADHD diagnostic status. All analyses were conducted both independently and after controlling for shared variance with potential confounding covariates.

Consistent with prior clinical research, the ADHD group reported higher PA than the other psychiatric group, extending and replicating findings by Okado and colleagues (2013). Interestingly, contrary to the extent literature on the link between ADHD and mood lability and emotion problems, particularly negative emotionality, these findings suggest that adolescents

with ADHD self-report that they are happy, optimistic, confident, and full of life. Although higher PA in adolescents with ADHD might appear counterintuitive, this pattern of findings could be interpreted within the temperament and psychopathology frameworks. Temperament researchers have suggested that positive emotionality or high approach might be a liability factor for some forms of ADHD (e.g., Nigg et al., 2004; Martel, 2009; Martel, Gremillion, & Roberts, 2012), and the present findings parallel the model proposed by Nigg and colleagues (2004) where children with ADHD-Combined Type only (and no comorbidity) are conceptualized as a subset of youth with ADHD characterized by positive emotionality and normal neuropsychological functioning. Extending these theories, it is conceivable that positive emotionality defines youth with ADHD-Combined Type without comorbidity from early childhood into adolescence, and “pure ADHD”, without the additional adverse impact of co-occurring disorders, might be uniquely associated with positive emotionality.

From the psychopathology perspective, higher PA in adolescents with ADHD symptoms might indicate deficits in emotion regulation. Previous studies have found that children with ADHD have ineffective physiological responses in regulating positive emotions (e.g., Musser et al., 2011; Musser et al., 2013; Sjowall et al., 2013). Moreover, findings from empirical studies indicate that some children with ADHD demonstrate a lack of emotion self-awareness and difficulties controlling emotional expressions (e.g., Bunford et al., 2014; Factor et al., 2013; Maedgen & Carlson, 2000; Melnick & Hinshaw, 2000; Walcott & Landau, 2004). Although interpretations must be made cautiously given that the present study did not assess for emotion dysregulation, it is conceivable that higher PA found in adolescents with ADHD symptoms might be potentially indicative of deficits in positive emotion regulation or a lack of emotional self-awareness. Further research is needed to clarify whether PA as a mood state or a trait is

associated with variability, reactivity, or dysregulation of positive emotions in youth with ADHD.

As hypothesized, PA levels did not significantly differ between the ADHD and non-psychiatric groups. Prior studies pointed to three ways in which PA might emerge in community samples; youth with ADHD demonstrate higher PA (Musser et al., 2011; Musser et al., 2013), self-report lower PA (Whalen et al., 2002), or self-report comparable PA to non-ADHD youth (Factor et al., 2014; Whalen et al., 2009). The present findings point to the latter, indicating that PA levels do not significantly differ between adolescents with ADHD symptoms and those without any psychiatric problems. Although speculative, one possible explanation is that given “exuberance” and “high approach” have been most commonly used to describe very young children with ADHD (e.g., Goldsmith et al., 2004; Nigg et al., 2004; Whalen & Henker, 1985), it is possible that associations between PA and ADHD are stronger in younger children with ADHD. ADHD symptoms, particularly hyperactivity/impulsivity symptoms, are known to decrease with age (see Willoughby, 2003, for a review). Thus, it is conceivable that higher PA or high approach characterizes some younger children with ADHD but as these youth mature, they outgrow such “overly exuberant” qualities and PA levels in these youth become more or less equivalent to non-psychiatric youth by mid- to late-adolescence.

Association between PA and parent-reports of behavioral problems was significantly moderated by ADHD diagnostic status but was no longer statistically significant after controlling for confounding covariates. Consistent with prior research (Okado & Mueller, 2014), visual inspections of the moderation effect found a small positive trend between PA and behavioral problems for youth with ADHD but the more typical inverse trend for other youth. These findings suggest that contrary to the adaptive effects of PA seen in other youth (e.g., higher PA is

associated with lower levels of behavioral problems), PA might be positively associated with behavioral problems in some youth with ADHD. Given that high approach or approach-motivation tendencies inherent in PA are linked to the hyperactivity/impulsivity dimension in ADHD (e.g., Goldsmith et al., 2004; Martel, 2009; Martel et al., 2012), it is reasonable to believe that in some youth with ADHD, high PA might be correlated with elevated hyperactivity/impulsivity and manifest as greater parental reports of behavioral problems. That said, consistent with reports by other studies based the NCS-A data (e.g., Kessler et al., 2013; Merikangas et al., 2011), ADHD, PA, and behavioral/emotional problems were strongly correlated with youth demographic variables, and these confounding covariates shared variance with PA and ADHD in predicting behavioral problems. Thus, interpretations must be made cautiously given that the positive PA-behavioral problems associations found here might not hold for all youth with ADHD symptoms. Although beyond the scope of this paper, it is important to examine differential effects of demographic variables on the relationship between PA and behavioral problems to identify which youth with ADHD might be at risk for greater behavioral problems at higher levels of PA.

Contrary to prior findings, associations between self-reported PA and parent-reports of emotional problems were not moderated by ADHD diagnostic status in this study. There are several possible explanations for discrepant findings between prior research and the present study. First, given that the PA levels in the ADHD group in this study were higher than the other psychiatric group yet comparable to non-psychiatric youth, one possibility is that the ADHD group in this sample might have represented a subset of ADHD youth with greater resiliency. Given that young children with ADHD-Combined Type only without any lifetime history of comorbidity are characterized by positive approach and normal neuropsychological profile (Nigg

et al., 2004), it is possible that among adolescents with ADHD-only symptoms, these characteristics might have served to protect these youth from development of emotional problems or emotion-related difficulties (e.g., deficits in emotion regulation, lack of emotion self-awareness) similar to the adaptive effects of PA found in the general adolescent population (see Gilbert, 2012). Second, positive emotionality is known to foster healthy and adaptive parent-child interactions (e.g., Lengua et al., 2000; Rothbart & Bates, 2006). Given parent-child conflicts and their link to ADHD symptom severity have been well-documented (e.g., Lifford, Harold, & Thapar, 2008; Wells et al., 2000), it is possible that among this subset of ADHD group, high approach might have served to protect against parent-child conflicts during early and mid-childhood which, in turn, reduced the likelihood that these youth developed emotion problems. Third, parents are often the source of referrals for youth mental health services (Des Los Reyes & Kazdin, 2005); thus, it is likely that parents in clinical samples were more focused on problematic aspects of their children and possibly over-reported the presence of emotional problems in the prior clinic-based study. Lastly, it is possible that any potential effect of PA on emotional difficulties was too small to detect in this study. Compared to the effect sizes reported in prior study (R^2 range = .189-.281; Okado & Mueller, 2014), the effect size in this study was comparably smaller ($R^2 = .073$). Given these findings, further replications are needed to clarify whether PA is associated with emotional problems in youth with ADHD.

Limitations

Some limitations of this study need to be considered when interpreting these findings. First, given that diagnoses were established from adolescent or parental reports of symptoms collected by professionally trained lay interviewers, it is possible that profiles of ADHD and other psychiatric groups might not be comparable to those found in clinical samples. A clinical

reappraisal study found that ADHD diagnoses established based on parent-reports in these data had high concordance with clinical assessments of ADHD (Green et al., 2010). That said, incorporating multiple informant reports is necessary to bring more complete information on youth functioning and impairment. Second, although PA items in this study demonstrated adequate internal consistency and have been previously used in another NCS-R study, additional studies are needed to further establish psychometric properties such as convergent and divergent validity of these items. Third, as the majority of the ADHD group (52%) reported scores between 16 and 20 on the PA scale (range: 4-20), it is possible that there was a ceiling effect for this group such that any nuanced detection of PA effects on parent-reported behavioral and emotional problems was not possible given already high scores on this scale.

Future research directions

Although this study extended and replicated prior findings and provided further information regarding PA in adolescents with ADHD, further replications using different research designs are needed given the relative paucity of research in this area. For example, to date, with the exception of Whalen and colleagues studies (2002 and 2009), all prior research on positive emotions in youth with ADHD has been conducted using a cross-sectional design. Given that PA in youth with ADHD has not been examined longitudinally, it is unknown whether PA and its effects might vary across development. As suggested by researchers, positive emotionality might characterize a subset of children with ADHD, and these children might have different trajectories than other children with ADHD as a function of PA (e.g., Martel, 2009; Nigg et al., 2004). Thus, longitudinal research on PA and its potential effects on emotional/behavioral problems across development will expand current understanding of PA in children with ADHD.

Furthermore, the emerging literature on emotion dysregulation and ADHD suggests that higher PA might be a manifestation of emotion dysregulation. Given prior studies used a wide variety of measurement approaches and sampling strategies, it is unclear whether PA measured across these studies assessed for the same construct. Given the conceptual overlap between PA as a mood state and emotion dysregulation, it is possible that PA measured in this study is conflated with positive emotion dysregulation. A fruitful area of research may lie in clarifying relationships between more stable positive moods and positive emotional reactivity to environmental cues.

Lastly, although research has yielded mixed findings, there is some evidence that some children and adolescents with ADHD report higher PA than other youth. It is unknown what contributes to higher self-reported PA in these youth. There are many potential factors (e.g., temperament, positive illusory bias, greater sensitivity to positive emotions, higher resiliency, lack of emotion self-awareness), and it is possible that one or combination of these factors might account for higher PA in youth with ADHD. Further research on mechanisms behind higher self-reported PA will illuminate what processes might be correlated with or contributes to higher PA at potentially put some youth at risk for behavioral and/or emotional problems.

Appendix A

SECTION J: ATTENTION AND CONCENTRATION

J1. Before the age of 7, was there ever a time lasting six months or longer when he/she often had any of the following problems? **(If you did not know the adolescent at this age, go to question L1 on page 25. If any of these problems only started after age 7, answer “NO”.)**

		YES	NO
a.	Often lost things like homework or books.....	1	5
b.	Often had trouble paying attention to details or made a lot of careless mistakes in homework, work, or other activities.....	1	5
c.	Often forgot what he/she was supposed to be doing	1	5
d.	People often said that he/she did not seem to be listening to them	1	5
e.	Quickly lost interest in games or in work.....	1	5
f.	Was unable to keep his/her mind on what he/she was doing if things were going on nearby.....	1	5
g.	Disliked, stayed away from, or put off doing things that needed a lot of concentration.....	1	5
h.	Got confused when he/she had to make plans or decide the order in which to do things	1	5
i.	Often did not finish chores, homework or other work even when he/she meant to get them done and knew how to do them.....	1	5

DIRECTIONS: If you answered “YES” to any of the questions in the J1 series, continue with question J2. Otherwise, go to question K1 on page 22.

J2. About how old was he/she when he/she first started having attention or concentration problems?

_____ YEARS OLD

J3. About how many years altogether did he/she have attention or concentration problems?

_____ NUMBER OF YEARS

J4. When did he/she most recently have attention or concentration problems?

1. In the past month
2. 1 to 6 months ago
3. 7 to 12 months ago
4. More than 12 months ago

J5. When at their worst, how much did his/her attention or concentration problem ever cause difficulties in each of the following areas?

	NOT AT ALL	A LITTLE	SOME	A LOT	EXTREMELY
a. Home life?	1	2	3	4	5
b. Friendships?	1	2	3	4	5
c. School or work?	1	2	3	4	5

J6. During the past 12 months, how much did his/her attention or concentration problems cause difficulties in each of the following areas?

	NOT AT ALL	A LITTLE	SOME	A LOT	EXTREMELY
a. Home life?.....	1	2	3	4	5
b. Friendships?	1	2	3	4	5
c. School or work?	1	2	3	4	5

J7. How many teachers or other adults ever told you that he/she had attention or concentration problems?

_____NUMBER

J8. How many teachers or other adults ever encouraged you to see a doctor or other professional about his/her attention or concentration problems?

_____NUMBER

K1. Before the age of 7, did this adolescent ever have a time lasting six months or longer when he/she often had any of the following problems with restlessness or impatience? **(If any of these problems only started after age 7, answer “NO”.)**

	YES	NO
a. Often was very active when not supposed to be – for example, climbing on things or running around even after being asked to keep still?	1	5
b. Often was very restless and could not sit still?	1	5
c. Often was on the go taking little time to rest?.....	1	5
d. Had trouble playing quietly or doing quiet activities like reading or being read to for more than a few minutes at a time?	1	5

e. Usually fidgeted or squirmed a lot when sitting down?	1	5
f. Often got up from his/her seat when not supposed to – like at dinner, at school or at religious services?	1	5
g. Talked a lot more than other kids his/her age?	1	5
h. Often blurted out answers before someone could finish asking the question?	1	5

i. Often interrupted people or abruptly joined other people’s conversations without being asked?	1	5
j. Often tried to join games or other activities that were already happening?	1	5
k. Had a lot of trouble waiting his/her turn?	1	5

DIRECTIONS: If you said “YES” to any of the questions in the K1 series, continue with question K2. Otherwise, go to question L1 on page 25.

K2. About how old was he/she when he/she first started having problems with restlessness or impatience?

_____ YEARS OLD

K3. About how many years altogether did he/she have problems with restlessness or impatience?

_____ NUMBER OF YEARS

K4. When did he/she most recently have problems with restlessness or impatience?

1. In the past month
2. 1 to 6 months ago
3. 7 to 12 months ago
4. More than 12 months ago

K5. When at their worst, how much did his/her problems with restlessness or impatience ever cause difficulties in each of the following areas?

	NOT AT ALL	A LITTLE	SOME	A LOT	EXTREMELY
a. Home life?	1	2	3	4	5
b. Friendships?	1	2	3	4	5
c. School or work?	1	2	3	4	5

K6. During the past 12 months, how much did his/her problems with restlessness or impatience cause difficulties in each of the following areas?

	NOT AT ALL	A LITTLE	SOME	A LOT	EXTREMELY	
a. Home life?.....	1	2	3	4	5	
b. Friendships?	1	2	3	4	5	
c. School or work?	1	2	3	4	5	
K7. How many teachers or other adults ever told you that he/she had problems with restlessness or impatience?						
_____NUMBER						
K8. How many teachers or other adults ever encouraged you or put pressure on you to see a doctor or other professional about his/her problems with restlessness or impatience?						
_____NUMBER						
				YES	NO	
K9.	Did he/she receive professional treatment for problems with restlessness or impatience at any time <u>in the past 12 months</u> ?.....				1	5
K10.	Was he/she prescribed medication for problems with restlessness or impatience at any time <u>in the past 12 months</u> ?.....				1	5
K11.	Did he/she ever receive professional treatment for problems with restlessness or impatience?.....				1	5
K12.	Was he/she <u>ever</u> prescribed medication for problems with restlessness or impatience?.....				1	5

Appendix B

SECTION I: STRENGTHS AND DIFFICULTIES

II. The next questions are about this adolescent's behavior. For each item below, please circle the appropriate number indicating whether the statement is not true, somewhat true, or very true of this adolescent.

This adolescent ...	NOT TRUE	SOME- WHAT TRUE	VERY TRUE
a. ... is considerate of other people's feelings.....	1	2	3
b. ... is restless, overactive, cannot stay still for long	1	2	3
c. ... often complains of headaches, stomachaches, or sickness	1	2	3
d. ... shares readily with others' his/her own age (food, games, pens, etc.)	1	2	3
e. ... often loses his/her temper	1	2	3
f. ... is rather solitary, tends to do things alone	1	2	3
g. ... is generally obedient, usually does what adults request	1	2	3
h. ... has many worries, often seems worried.....	1	2	3
i. ... is helpful if someone is hurt, upset, or feeling ill	1	2	3
j. ... is constantly fidgeting or squirming	1	2	3
k. ... has at least one good friend	1	2	3
l. ... often fights with others or bullies them.....	1	2	3
m. ... often unhappy, depressed, or tearful.....	1	2	3
n. ... is generally liked by others his/her own age.....	1	2	3
o. ... is easily distracted, concentration wanders.....	1	2	3
p. ... is nervous in new situations, easily loses confidence	1	2	3
q. ... is kind to younger children	1	2	3
r. ... often lies or cheats	1	2	3
s. ... is picked on or bullied by other others.....	1	2	3
t. ... often volunteers to help others (like parents, teachers, and other kids)..	1	2	3
u. ... thinks things out before acting.....	1	2	3
v. ... steals from home, school, or elsewhere	1	2	3
w. ... gets along better with adults than with others his/her own age	1	2	3
x. ... has many fears, is easily scared.....	1	2	3
y. ... sees tasks through to the end, has a good attention span	1	2	3

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