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# The Relationship between ADHD Symptomology, Executive Functions, Morality, and Humor

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Attention-deficit/hyperactivity disorder (ADHD) is characterized by a persistent pattern of inattention and impulsivity/hyperactivity and is estimated to affect 3% to 7% of the school-population (American Psychiatric Association, 2000). In the majority of cases the disorder persists into adolescence and adulthood (Barkley, Murphy, & Fischer, 2008; Simon, Czobor, Bálint, Mészáros & Bitter, 2009). Although many studies have reported on the relationship between ADHD and younger children, there are fewer studies examining this with older participants. Recent research indicates that increasing numbers of high school students with ADHD are pursuing college (Wolf, Simkowitz, & Carlson, 2009). While the exact rates of ADHD among college students are unknown, approximately 2% to 4% of college students report clinically significant levels of ADHD symptomology (Weyandt & DuPaul, 2006). Even though various studies in recent years have focused on unique aspects of functioning among college students diagnosed with ADHD, less empirical evidence is available concerning how these aspects of functioning specifically relate to ADHD symptomology in college students.

Preliminary studies concerning ADHD and college students indicates that, in general, individuals who report high ADHD symptomology are at greater risk for academic, psychological, and social difficulties as well as deficits in executive functions (DuPaul, Weyandt, O'Dell, & Varejao, 2009; Lewandowski, Lovett, Coddington, & Gordon, 2008; Norvilitis, Ingersoll, Zhang, & Jia, 2008; Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2008; Weyandt et al., 2009). College students with high ADHD symptomology are more likely to report difficulty in relations with parents and peers, lower levels of social skills and social adjustment (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005), and diminished levels of self-esteem (Grenwald-Mayes, 2002; Norvilitis et al., 2008). In addition, college students with high ADHD symptomology are also more likely than non-diagnosed peers to exhibit higher

levels of depressive symptoms (Rabiner et al., 2008) and lower levels of general psychological functioning (Blase et al., 2009).

Morality and humor are additional aspects of psychological functioning that may have implications for students' psychosocial functioning. This information is important as some studies have found that teachers may perceive students with ADHD more negatively (Eisenberg & Schneider, 2007) and as more disruptive (Ohan et al., 2008). It is therefore important to better understand if students with high ADHD symptomology report different levels of moral reasoning. To date, only a handful of studies have explored the relationship between ADHD symptomology and morality, and the research that exists has generated inconsistent results. For instance, researchers have found that both children and adolescents with ADHD show lack of moral control (Barkley, 1998) and may be at risk for less mature moral development. However, a study that focused on college students discovered no significant differences between the low and high ADHD symptomology groups in their response to moral dilemmas (Kitchens, 2001).

In several studies, Forsyth's Ethics Position Questionnaire (EPQ, 1980) has been used to assess individual moral reasoning orientations of college students (Forsyth, 1992; Barnett, Bass, & Brown, 1994). The EPQ assesses individual's ethics position based on idealism and relativism. Specifically, individuals who assume that desirable outcomes will be obtained with the "right" action will generate higher idealism scores. Those individuals who endorse beliefs that exceptions to moral rules exist and that various aspects of a situation must be integrated in order to evaluate a situation accurately will generate higher relativism scores (Forsyth, 1980). Moral orientations, as measured by the EPQ, have been found to vary across cultures (Deering, 1998) and across professional specializations (Hadjistavropoulos, Malloy, Sharpe & Fuchs-

Lacelle, 2003). Information concerning moral functioning of college students with ADHD and/or high levels of ADHD symptomology is lacking however, and warrants investigation.

There is also a paucity of research concerning the relationship between ADHD and humor. Because previous research has found that humor is sometimes used as a method of coping with stressful social situations (Abel, 2002), it is reasonable to wonder whether students with high ADHD symptomology may use humor to help cope with daily stressors. Although the current literature does not reveal this relationship directly, it does suggest a relationship between various aspects of humor and symptoms typically observed in individuals with ADHD. For example, students with high ADHD symptomology have demonstrated higher levels of original creative thinking and a higher affinity for idea generation as compared to other students (White & Shah, 2011), a finding that also supports the notion that students with high symptomology would generate more humor than peers. Excitement-seeking and creativity, attributes associated with high ADHD symptomology, have also been observed to correlate positively with use and appreciation of humor (Thorson, Powell, Sarmany-Schuller & Hampes, 1997).

However, other evidence suggests a negative correlation between ADHD symptomology and humor. For instance, findings from humor studies provide evidence that inattention might interfere with humor comprehension in adults, as humor comprehension research has identified the necessity of a “setup phase” in allowing an individual to appropriately process humor (Attardo, 1997). Studies of latency of comprehension of humor and humor appreciation have found that the more quickly a humorous stimulus can be processed, the funnier the individual thinks it is (Cunningham & Derks, 2005), meaning that slow processing of humorous information can impact perception of humor. Considering that more students with ADHD are attending higher education, it is crucial to understand the attitudes of students with ADHD have

towards humor; if they have a more negative attitude they may be less likely to benefit from such teaching styles.

With regard to ADHD and executive functions, a large body of literature exists regarding the performance of children, adolescents, and more recently adults with ADHD on executive function tasks. In general, research suggests that individuals with ADHD often exhibit executive function deficits, although these deficits are not unique to ADHD and are not necessary for a diagnosis of ADHD (Weyandt, 2005). For example, adults with ADHD have demonstrated weaker performance on executive functions measures compared to non-diagnosed control participants (Nigg et al., 2005), especially in the areas of inhibition, interference control, and nonverbal working memory (Murphy, Barkley, & Bush, 2001). What remains unclear, however, is whether college students with high ADHD symptomology also exhibit executive function deficits.

Currently, far less information is available with regard to executive functions and morality. In one study, Wain and Spinella (2007) investigated the relationship between moral attitude and executive functions by utilizing self-report measures. Results of this study revealed that moral attitude, as measured by Sociomoral Reflection Measure (Gibbs & Widaman, 1982), was positively related to performance on executive functioning tasks, even after controlling for demographic factors. Neuroimaging studies have also examined the relationship between executive function and morality and some researchers have explained that refinement of morality and abstract thinking is the manifestation of continuing maturation of the prefrontal cortex (Moll, de Oliveira-Soiiza, & Eslinger, 2003).

The relationship between executive function and humor appears more straightforward in the literature. Specifically, deficits in executive functions have been found to correlate with

deficits in humor comprehension (Uekermann, Channon, Lehmkamper, Abdel-Hamid, & Daum, 2008). Most studies that have examined the relationship between humor and executive functions frequently implicated the prefrontal cortex. For instance, Uekermann, Channon and Daum (2006) examined the effects of aging on humor processing and suggested that the cognitive component of humor processing might be a major deficit encountered with increasing age.

Finally, a small body of research has examined the relationship between morality and humor. Strohminger, Lewis, and Meyer (2011) examined the effect of positively-valenced emotions on moral judgment, and examined two emotions, mirth and elevation. Mirth was characterized as the positive emotion associated with humor. Because humor sometimes involves “making light of” a serious situation, the authors suggested that increased mirth would lead to permissiveness for moral violations. On the other hand, elevation was characterized as “witnessing acts of moral beauty (p. 256),” and acting in extremely ethical manners. This study revealed that individuals demonstrating mirth were more likely to tolerate unconventional utilitarian solutions in moral dilemma tasks. Additional studies have found that individuals exposed to humorous videos were also more likely to choose unconventional utilitarian solutions to moral dilemmas (Valdesolo & DeSteno, 2006). Although humor, executive functions, ADHD symptomology, and morality are core factors that influence and guide our daily behavior, a comprehensive investigation of these factors has not yet been conducted.

The purpose of the present study was to explore how executive functions, humor, and morality relate to ADHD symptomology. First, it was hypothesized that a) individuals with high ADHD symptomology would report lower levels of executive functions. Also, building upon the small body of literature regarding the social use of humor, it was hypothesized that b) individuals with high ADHD symptomology would exhibit more use of humor (higher levels of creation,

more use in coping and social use of humor, and a more positive attitude towards humor). Finally, based on studies that have found children with ADHD tend to be more impulsive and have more difficulties with moral control and development, the third hypothesis was that c) individuals who reported higher levels of ADHD symptomology would report higher levels of moral relativism.

## **Method**

### **Participants**

The study was conducted at a large public university in the Northeast region of the United States. A total of 300 undergraduate students agreed to participate in the project (female = 194; male = 106). The ethnic composition of the sample accurately reflected that of the greater university population. Within this sample, a total of 28 students reported that they were diagnosed with ADHD. For the purpose of analysis, participants were divided into “high” and “low” ADHD symptomology groups. Participants who scored 1.5 standard deviations above the mean on the ADHD symptomology subscale of the Conners Adult ADHD Rating Scale (CAARS) were included in the high ADHD symptomology group ( $N = 53$ ), and the remaining participants were included in the low symptomology group ( $N = 247$ ).

### **Measures**

**Executive functions.** The Behavior Rating Inventory of Executive Function-Adult Version (BRIEF-A; Roth, Isquith, & Gioia, 2005) is a standardized self-report measure that assesses adults’ perceptions of their level of functioning in a variety of areas of their everyday environment (Roth, et al., 2005). In the present study, the Inhibit subscale, the Metacognition Index, and the Global Executive Composite of the BRIEF-A were used as dependent variables. The Inhibit subscale measures the respondent’s inhibitory control and ability to control his or her

own impulsive behaviors. In addition, the Metacognition Index measures individual's ability to systematically solve problems via planning and organization while sustaining task-completion efforts in active working memory. The Global Executive Composite is a summary score that incorporates all clinical scales of the BRIEF-A. Adequate psychometric properties have been reported for this measure (Roth et al., 2005).

**ADHD symptomology.** The Conners Adult ADHD Rating Scale (CAARS-A; Conners, Erhardt, & Sparrow, 1999) self-report version was used to assess ADHD symptomology. The DSM-IV Total ADHD Symptoms subscale was used as an independent variable. Internal reliability was adequate for this measure, and the internal consistency coefficients of the DSM-IV Total ADHD Symptoms subscale have been found to range from 0.79 to 0.82 across adult age groups ages 18 and older.

**Humor.** The Multidimensional Sense of Humor Scale (MSHS; Thorson & Powell, 1993a) was used to assess individuals' sense of humor. A total score is generated for: generation of humor, attitudes toward humor, recognition of humor, and use of humor for social purposes. Higher scores on this assessment reflect higher uses or more positive attitudes toward humor. The psychometric properties of this instrument were adequate (Boyle & Joss-Reid, 2004; Thorson & Powell, 1993a).

**Morality.** The Ethics Position Question (EPQ; Forsyth, 1980) is a self-report instrument designed to classify individual moral reasoning identities using scores from measures of idealism and relativism. The present study used a modified version of the EPQ. The two subscales of EPQ were used as dependent variables in this study.

## Results

**Executive Function.** To test the hypothesis that individuals with high ADHD symptomology would report lower levels of executive functioning, a one-way between groups multivariate analysis of variance (MANOVA) was conducted with ADHD symptomology level (high, low) as the independent variable and executive function measures, namely results of the Global Executive Composite, Metacognition Index, and Inhibit from the BRIEF-A, as the dependent variables. Basic assumption testing was conducted to check for normality, linearity, homogeneity of variance, and multicollinearity. Results of the analysis indicated that there was statistically significant differences between the two groups on the dependent variables,  $F(3, 296) = 22.43, p < .001$ ; Pillai's Trace = .19; partial  $\eta^2 = .19$ . Specifically, the High ADHD symptomology group demonstrated significantly higher scores on the BRIEF Global Executive Composite,  $F(1, 298) = 66.31, p < .001$ ; partial  $\eta^2 = .18$ , the BRIEF Metacognition Index,  $F(1, 298) = 60.65, p < .001, \eta^2 = .17$ , and the BRIEF Inhibit subscale,  $F(1, 298) = 60.62, p < 0.001, \eta^2 = .17$ , compared to the Low ADHD Symptomology group.

**Humor.** To test hypothesis that individuals with high ADHD symptomology would demonstrate higher levels of creation, coping and social uses of humor and a more positive attitude towards humor, a one-way between-groups MANOVA was conducted to explore the influence of ADHD symptomology level (High versus Low) on humor. Results pointed out that individuals with High ADHD symptomology had significantly lower scores compared to individuals with Low ADHD symptomology on the MSHS Attitudes toward Humor Scale,  $F(1, 298) = 36.07, p < 0.001, \eta^2 = 0.11$ . There were no significant differences between groups on any of the other MSHS scales.

**Morality.** To test the hypothesis that individuals who demonstrate higher levels of ADHD symptomology would demonstrate higher levels of moral relativism, a one-way between-

groups MANOVA was conducted to explore the influence of ADHD symptomology level (high versus low) on morality. Results showed that there were no significant differences between groups on the EPQ Relativism scale:  $F(1, 298) = 0.00, p = 0.99$ . Individuals with High ADHD symptomology, however, had significantly lower scores on the EPQ Idealism Scale,  $F(1, 298) = 14.96, p < 0.001, \eta^2 = 0.05$ .

### **Discussion**

The results of this study support the first hypothesis that college students with high ADHD symptomology would demonstrate lower levels of executive functions as measured by the BRIEF-A. Specifically, scores on two composite indices of the BRIEF-A (Metacognition and Global Executive Composite) as well as the Inhibit subscale were significantly related to more ADHD symptomology and are supportive of previous findings (Berlin, Bohlin, Gunilla, & Rydell, 2003; Murphy, Barkley, & Bush, 2001; Shallice et al., 2002). While previous studies have used the BRIEF with preschoolers (Isquith, Gioia, & Epsy, 2004), children and adolescents (McCandless & O'Laughlin, 2007; Reddy et al., 2011), the present study is one of the first to examine the relationship between executive functions and ADHD symptomology in college students using the BRIEF-A and the CAARS.

While the findings of the present study clearly illustrate a relationship between ADHD symptomology and executive function deficits, results between ADHD symptomology and humor were equivocal. Contrary to our hypotheses that individuals with high ADHD symptomology would demonstrate higher scores on the MSHS, only attitude toward humor emerged as significantly correlated with ADHD symptomology. Specifically, high ADHD symptomology was associated with less positive attitudes towards humor, suggesting that

students with more ADHD symptoms may experience difficulties in processing humor. As Attardo (1997) has suggested, perhaps attention difficulties are inhibiting humor comprehension.

The negative attitude towards humor observed in students with elevated ADHD symptomology is important because it relates to frequently observed difficulties among these students in maintaining relationships and showing appropriate social skills. Previous research has found that teachers and peers perceived children with higher humor abilities more positively than those with lower humor abilities (Masten, 1986), suggesting that humor may play an important role in social and interpersonal development. The relationship between ADHD and social difficulties may therefore be influenced, in part, by negative humor attitudes. Although the present study showed no significant differences between the two groups in relation to social uses of humor, at this point it is unclear whether or not social difficulties are directly related to the use of social humor and additional research is warranted.

Contrary to the expectations, ADHD symptomology was not significantly related to humor creation, humor for coping, or social uses of humor. It is certainly possible that students who report high ADHD symptomology do experience similar levels of humor creation and coping and social uses of humor as students who exhibit low ADHD symptomology. One possible reason group differences may not have been found within humor creation may relate to the association between high creativity and idea generation within persons with ADHD discussed previously (White & Shah, 2011). Although speculative, higher creativity generation may have allowed students with high ADHD symptomology to overcome potential humor comprehension delays, and ultimately endorse similar levels of humor creation to other students. If humor creation, humor for coping, and social uses of humor are indeed similar for students at differing

ADHD symptomology levels, then it is possible students high in ADHD symptomology will relate more easily with others.

Finally, the hypothesis that individuals who demonstrate higher levels of ADHD symptomology would demonstrate higher levels of moral relativism was not supported. This finding may imply that when it comes to following universal moral standards, there are no differences between individuals in high and low ADHD symptomology group.

Interestingly, there were unanticipated significant group differences in the EPQ idealism subscale. Students who showed lower levels of ADHD symptomology were more inclined to believe that they could achieve positive consequences, whereas those who revealed higher levels of ADHD symptomology believed that negative consequences could not always be avoided. This is consistent with literature suggesting families with children with ADHD may be more inclined to have an external locus of control (Rucklidge, Brown, Crawford & Kaplan, 2007). In addition, compared to those with high ADHD symptomology, those with low levels of ADHD symptomology may have more positive beliefs about themselves and their surroundings. Although some researchers have reported that children with ADHD may have lower self-concepts and self-esteem (Ren et al., 2002), other studies have consistently reported a positive illusory bias wherein students with ADHD endorse inflated self-perceptions (Owens et al., 2007).

**Limitations.** While an association between executive functions and ADHD clearly emerged as expected, the findings were less clear with regard to the relationships among morality, humor, executive functioning, and ADHD symptomology. An overall limitation of the current research involves the use of a convenience sample of college students, which therefore limit the generalizability of this study. The findings of this study also depended on self-report

measures, which may not accurately capture all aspects of ADHD symptomology, executive functions, humor and morality. In addition, although the measures used in this study are popularly employed in the field, there is a possibility that the use of different assessments may produce a different result.

**Future directions.** Considering that young adults in most settings encounter individuals with various levels of humor, morality, executive functions, and ADHD symptomology, future research should examine these relationships in more detail. A variety of measures that assess humor comprehension, humor attitude, and ADHD symptomology, as well as ADHD subtype, should be used to further investigate the possible relationship between these variables. It would also be valuable to determine if the results of this study remain stable when using different morality measures.

In summary, results supported a relationship between ADHD symptomology and executive functioning, and partial support for the relationships between ADHD symptomology and both humor and morality. Specifically, college students who rated themselves high in ADHD symptomology also reported problems with executive functions. These results provide meaningful implications for educators at the college level as more students with ADHD are enrolling in higher education. Although these results contribute to the lack of research in this area, future research is needed to further explore the relationship among these constructs among college students.

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Table 1

*Means and Standard Deviations for Low ADHD Symptomology and High ADHD Symptomology Groups*

Measures	<i>Group</i>			
	<i>Low ADHD Symptomology</i>		<i>High ADHD Symptomology</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
<b>Executive Function</b>				
Global Executive Composite	53.66	12.15	68.66	12.25
Metacognition Index	53.85	11.68	67.68	11.96
Inhibit Scale	53.38	11.28	66.81	11.96
<b>Morality</b>				
EPQ Relativism	33.46	4.42	33.47	7.24
EPQ Idealism	36.94	5.29	33.74	6.28
<b>Humor</b>				
Humor Creation Performance	18.58	4.09	19.00	4.98
Uses of Humor for Coping	19.50	4.27	19.13	4.31
Social Uses of Humor	13.93	2.72	13.57	3.41
Attitudes toward Humor	16.13	2.48	13.72	3.49