Comparing Adolescent and Adult Offenders’ Patterns of Response Modulation as a Function of Psychopathy

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Abstract
Since measures of psychopathy have been extended downward from adults to adolescents, investigators have examined the validity of “juvenile psychopathy” by assessing whether its pattern of association with other constructs (e.g., symptoms, antisocial behavior) replicates the pattern found in adults. Few of these studies have focused on potentially explanatory constructs like response modulation (RM). According to Newman (1998), psychopathy reflects cognitive deficits in processing relevant peripheral stimuli while pursuing a goal. These RM deficits could be less indicative of psychopathy during adolescence than adulthood, given that cognitive control develops throughout adolescence. In this study of 84 adult and 98 adolescent offenders, we use a picture-word interference task and multiple measures of psychopathy to assess how strongly RM deficits relate to psychopathy (affective, interpersonal, & lifestyle features) and antisocial features, and explore the consistency of these relationships across adults and adolescents. Although the picture-word task reliably created semantic interference for both the adult and adolescent sample, we found that (a) among adults, RM deficits (low semantic interference) related weakly to affective features of psychopathy ($r = -.25$), whereas (b) among adolescents, enhanced RM (high semantic interference) related moderately to antisocial features ($r = .37$). Beyond suggesting that RM relates less to global psychopathy than specific trait constellations, these findings suggest that youth with classic psychopathic features do not manifest the same cognitive deficits as psychopathic adults. The possibility that immaturity in cognitive control acts as a confound is consistent with developmental concerns about the downward extension of psychopathy to adolescents.

Keywords: psychopathy, antisocial behavior, juvenile psychopathy, response modulation
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Psychopathy is a personality disorder characterized by traits including egocentricity, superficial charm, lack of anxiety, shallow affect, lack of remorse, and unreliability (Cleckley, 1976). There has been debate about the appropriateness of extending psychopathy downward from adults to adolescents. Some have expressed concern that psychopathy measures include features that are quite normative during adolescence (e.g., egocentricity, irresponsibility)—and therefore risk over-classifying youth as psychopathic (Hart, Watt & Vincent, 2002; Seagrave & Grisso, 2002; Skeem & Cauffman, 2003). According to this view, psychopathy may present differently in adolescence than adulthood and/or may change during the transition to adulthood. Others have argued that juvenile psychopathy is a valid construct, principally because it relates to other constructs in a pattern similar to that observed for adults (Salekin & Lynam, 2010; Lynam, 2010; Salekin, Rosenbaum, & Lee, 2008). Typically, however, these “other constructs” involve symptoms, traits, and indices of antisocial behavior. Few generalizability efforts have focused on explanatory constructs and operationalized these constructs in the same way across age groups.

A leading cognitive theory of psychopathy is the Response Modulation (RM) hypothesis. According to Newman and colleagues (Newman, 1998; Patterson & Newman, 1993; Vitale, Newman, Bates, Goodnight, Dodge, & Pettit, 2005), psychopathy results from a deficit in the ability to shift attention from goal directed behavior to feedback from the environment. Specifically, during a task, individuals with psychopathic traits become so focused on a dominant response or goal that they fail to process relevant contextual information like environmental cues that would help them appropriately modify their behavior. Using the same cognitive task and comparable interview-based and self-report measures of psychopathy, the present study (a)
assesses the association between RM deficits and psychopathic traits and (b) explores whether these relationships are consistent across adults and adolescents.

**Response Modulation and Global Indices of Psychopathy**

Early research on the RM hypothesis treated psychopathy as a global entity (Newman, Schmitt & Voss, 1997; Lorenz & Newman, 2002)—one operationalized by high scores on the Psychopathy Checklist-Revised (PCL-R; Hare, 2003) and low scores on a measure of anxiety (as low anxiety is included in key conceptualizations of psychopathy, but not assessed by the PCL-R). For example, Hiatt, Schmitt, and Newman (2004) used the PCL-R and a measure of anxiety to classify 75 offenders into extreme groups. They compared these groups’ performance on a picture-word interference task that required naming pictures while ignoring peripheral distractor words. The psychopathic/low anxious group (i.e., PCL-R > 29; anxiety below median; \( n = 12 \)) completed the task faster, \( F(1, 70) = 14.05, p < .001 \), than the non-psychopathic/low anxious group (i.e., PCL-R < 20; anxiety below median anxiety; \( n = 24 \)), suggesting that the former group was less distracted by contextual information. This led the authors to conclude that psychopathy is characterized by a RM deficit.

Although the RM hypothesis has been understudied in adolescents, similar findings have been observed in a juvenile sample using a similar task. Specifically, Vitale et al. (2005) used the Antisocial Process Screening Device (APSD; Frick & Hare, 2001) and a measure of anxiety to classify a community sample of male 16-year-olds into extreme groups. They found that the psychopathic/low anxious group (\( n = 83 \)) displayed moderately faster response times (\( d = .42 \)) on a picture-word interference task than the non-psychopathic/low anxious group (\( n = 84 \)). They concluded that psychopathic youth “demonstrate a response modulation deficit that could undermine their ability to attend to the non-dominant interpersonal, affective, and inhibitory cues that others use to achieve effective self-regulation” (Vitale et al., 2005, p. 468).
Despite the consistency of the pair of findings summarized above, support for the RM hypothesis as a whole is mixed. For example, Howard, Payamal and Neo’s (1997) study of Singaporean prisoners and Arnett, Smith and Newman’s (1997) study of Caucasian American prisoners provided no support for the RM hypothesis. In fact, studies have reported everything from moderate to large correlations consistent with the RM hypothesis to correlations in the opposite direction (Smith, Lilienfeld, Jordan, & Kang, 2014). This variability may reflect problems with the RM hypothesis itself or methodological differences, i.e., different samples, RM tasks, and indices of psychopathy.

**Response Modulation and Specific Psychopathic Traits**

With respect to the last point, studies that operationalize psychopathy as a global construct may mask specific associations between RM deficits and particular psychopathic features. For example, the PCL-R has subscales designed to measure four facets (Hare, 2003): interpersonal (e.g., superficial charm, conning/manipulative), affective (e.g., shallow affect, lack of empathy), lifestyle (e.g., impulsivity, irresponsibility), and antisocial (e.g., juvenile delinquency, criminal versatility) features. These facets can be combined to form larger scales or “factor scores” that reflect Interpersonal-Affective traits (i.e., Factor 1) and Social Deviance (i.e., Factor 2, including lifestyle/antisocial facets). These “factor scores…permit the social deviance component of psychopathy to be separated from the cluster of personality traits that are fundamental to the construct” (Hare et al., 1990, p. 340).

Are RM deficits specific to interpersonal and affective traits of psychopathy, or instead related more broadly to social deviance? The few investigations that have addressed this question have yielded inconsistent results. For example, based on a sample of 47 Spanish male inmates, Molto, Poy, Segarra, Pastor and Montanes (2007; see also Heritage and Benning, 2013) found that the PCL-R’s Social Deviance scale, but not its Interpersonal-Affective scale,
significantly predicted RM deficits (operationalized as perseveration on a card task, $\beta = .38, p < .05$). However, based on a sample of 107 men drawn from the community, Sadeh and Verona (2008) observed the opposite pattern: Scores on the Psychopathic Personality Inventory’s (PPI; Lilienfeld & Andrew, 1996) Callous-Unemotional scale, but not its Impulsive Antisociality scale, significantly predicted RM deficits (as indexed by less interference by distractors on a perceptual load task). Thus, studies of adults vary in their findings, perhaps as a function of differences in samples, psychopathy measures, and RM indices.

Only one published study of adolescents has examined how RM relates to specific psychopathic features. In this study of youth with behavioral problems ($n = 79$), Roose, Bijttebier, Van der Oord, Claes, and Lilienfeld (2013) found that indices of callousness on two self-report measures of psychopathy (Frick, 2004; van Barrdewijk et al., 2010) related weakly ($r = -.23, -.25$) to RM deficits (as indexed by a self-regulation on a computer-based performance task). RM deficits did not relate to any other psychopathy subscales.

In summary, although growing evidence indicates that RM deficits among adults relate to general social deviance, some studies indicate a more specific association with interpersonal-affective features of psychopathy. Although the single study of adolescents is consistent with the latter findings, the index of RM used in that study differed from that used in the adult studies. We were unable to locate any study that compared (a) similar samples of adults and adolescents, (b) on the same cognitive task, and (c) using parallel measures of psychopathic features.

**Present Study**

For two reasons, a study of the nature just described is necessary to explore developmental influences on the relation between RM and psychopathic features. First, alternative measures of psychopathy assess only partially overlapping constructs (Poythress, Lilienfeld, Skeem, Douglas, Edens, & Epstein, 2010; Skeem & Cauffman, 2003). Second and similarly, alternative measures of RM (e.g. picture-word interference, flanker, stop-signal,
perceptual load tasks)—particularly with varying dependent variables (e.g. response time, performance errors, ERN amplitude)—assess only partially overlapping constructs (Smith, Lilienfeld, Jordan, & Kang, 2014).

The present study addresses this issue by using multiple measures of psychopathy (interview-based and self-report) and the same RM task (picture-word interference) across matched samples of adult and adolescent offenders. The study has three aims. First, to contextualize the present results against early RM findings (i.e., Newman & Schmitt, 1998; Vitale et al., 2005), we assess how the RM index relates to global indices of psychopathy and extreme groups (i.e., high PCL/low anxiety). Second, we assess the association between the RM index and (a) interpersonal and affective features of psychopathy (within Factor 1) and (b) social deviance (or impulsive, irresponsible, and antisocial features within Factor 2). Third, and most importantly, we explore the consistency of these RM-psychopathy relationships across adults and adolescents.

Our primary hypothesis is that RM deficits relate to psychopathic features more weakly among adolescents than among adults. Adolescents have more immature cognitive control processes than adults (e.g., Crone, 2009; Casey et al., 1997). These cognitive control processes include interference suppression (the ability to control for distracting stimuli) and response inhibition (the suppression of a pre-potent response; see Bridges, Anderson, Reid & Fox, 2013; Bunge et al., 2002), both of which can affect performance on tasks designed to tap RM. This raises the possibility that developmental immaturity confounds the association between RM deficits and psychopathy.

Method

To address these study aims, adolescent and adult offenders were assessed for psychopathy using alternate measures of psychopathy (one interview-based and one self-report)
and a self-report measure of anxiety. RM was assessed by response time on the picture-word interference task.

Participants
Participants were 85 adult and 99 juvenile male offenders incarcerated in correctional facilities in a large Northeastern state. Adult participants were between the ages of 26 and 29 ($M = 27.50, SD = 1.16$) and adolescent participants were between the ages of 14 and 17 ($M = 15.69, SD = 0.92$) – both samples were predominantly African American and Caucasian. During recruitment, efforts were made to obtain similar adolescent and adult samples (particularly with respect to PCL scores). As shown in Table 1, there were no significant differences between the adult and adolescent samples on PCL total scores, ethnicity, or estimated IQ. However, adults were most likely to be currently incarcerated for a violent offence (e.g. murder, assault), whereas adolescents were most likely to be currently incarcerated for procedural offences (e.g. probation violation), followed by violent offenses.

Procedures
Recruitment chiefly focused on obtaining equivalent numbers of participants in the psychopathic (total score ≥ 25) and non-psychopathic (total score < 25) range as indicated by scores on the Psychopathy Checklist-Revised (PCL-R; Hare, 2003) and Psychopathy Checklist: Youth Version (PCL:YV; Forth, Kosson, & Hare, 2003). Eligible inmates were approached for recruitment and given a brief description of the study. Of those approached, 13% of adult, 11% of juveniles, and 4% of juvenile parents declined to participate. Variables included in the current study were collected at baseline (demographic information, IQ, anxiety, and psychopathy) and the one year follow-up (picture-word task and psychopathy). The retention rate between these two time points was 93%. Of those retained for the one year follow-up interview ($n = 338$), approximately 54% ($n = 85$ adults, $n = 99$ adolescents) completed the picture-word task, which was added after one-year data collection had begun. There were no significant differences in
ethnicity, age, number of prior offences, type of current offense, or IQ score between those who
completed the picture-word task and those who did not.
In keeping with prior research (Hiatt et al., 2004; Vitale et al., 2005), and to control for a
trade-off effect between accuracy and speed on the picture-word task, participants (1 adult; 1
adolescent) who made more than 5 errors were excluded from analyses. This left a final sample
of 84 adults and 98 adolescents.

Measures
Psychopathy. As noted earlier, multiple measures of psychopathy were used for both the
adult and adolescent samples. Specifically, we used (a) adult- and adolescent forms of the PCL,
which explicitly assesses criminal behavior, and (b) adult- and adolescent self-report measures of
psychopathy (the YPI and PPI) that explicitly omit criminal behavior.
PCL. The Psychopathy Checklist – Revised (PCL-R; Hare, 2003) was used to assess
psychopathic traits in adults, and the Psychopathy Checklist: Youth Version (PCL:YV; Forth, et.
al., 2003) was used for participants under the age of 18. The PCL:YV is a downward extension
of the PCL-R with similar items. Both versions of the PCL consist of a 20-item checklist of
behaviors and characteristics thought to be emblematic of psychopathy (e.g. grandiosity, flat
affect, callousness, antisocial behavior). Ratings of each item range from 0 (not present) to 2
(definitely present), and are based on a semi-structured interview and inmate file review. Both
PCLs render a total score and four facet scores: Interpersonal, Affective, Lifestyle, and
Antisocial.

Prior to completing any PCL ratings, research personnel (n = 17) completed 8 hours of
training. This included reviewing and scoring 5 practice cases as well as observing and
discussing two live interviews. To protect against rater drift, research personnel attended monthly
meetings to discuss scoring issues, and rated 3 review cases during data collection. Inter-rater
reliability as indexed by the intra-class correlation (ICC). An ICC of .40-.75 is considered
"adequate" and above .75 is "good" (Parkerson, Broadhead, & Tse, 1993). For total scores, good levels of reliability were observed for the PCL-R \((ICC = .91)\) and PCL:YV \((ICC = .81)\). At the factor level, ICCs for the Interpersonal, Affective, Lifestyle, and Antisocial facets were .78, .84, .69, and .83 for the PCL-R, and for the .71, .47, .73, and .75 PCL:YV, respectively.

**PPI-SF.** Adult participants also completed the Psychopathic Personality Inventory-Short Form (PPI-SF; Lilienfeld, 1990, as cited in Lilienfeld & Hess, 2001), a self-report measure of psychopathy containing 56 items on a 4-point Likert scale. Exploratory factor analyses of the short form (Smith, Edens, & Vaughn, 2011) reveals a two-factor structure similar to the factor structure of the full PPI (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003; Malterer, Lilienfeld, Neumann, & Newman, 2009), including Fearless Dominance (FD) and Self-Centered Impulsivity (SCI) with Coldheartedness (CH) as a potential third factor (Edens & McDermott, 2010; Lilienfeld & Widows, 2005). Internal consistency for the two factors of the PPI-SF has been demonstrated in both community and incarcerated samples (FD \(\alpha = .62 - .83\), SCI \(\alpha = .78\); Smith et al., 2011). Cronbach’s alphas for the two factors for the current study are .62 and .83 (FD and SCI factors respectively) and .70 for Coldheartedness.

**YPI.** Adolescents completed the Youth Psychopathic Traits Inventory (Andershed, Kerr, Stattin, & Levander, 2002), a 50 item self-report measure of psychopathy for youths ages 12 and older. Each item is scored on a 4-point Likert scale. Prior factor analytic research suggests these items map onto three factors: Interpersonal, Affective, and Lifestyle (Andershed et al., 2002). Validity of the YPI is suggested by the significant correlations with measures of conduct problems (Andershed, Hodgins, & Tengstrom, 2007) and the PCL:YV among community samples (Cauffman, Kimonis, Dmitrieva, & Monahan, 2009). In keeping with past research (where \(\alpha = .66-.93\); Andershed et al., 2002) the YPI manifested good internal consistency in the
present study ($\alpha=.94$ for the YPI total and $\alpha=.90, .68, \text{ and } .84$ for the Interpersonal, Affective, and Lifestyle scales, respectively).

**Anxiety**

For adults, anxiety was assessed with the 20 items from the trait (TAI) subscale of the State-Trait Anxiety Inventory (Spielberger, 1983). Trait anxiety assesses how a participant generally feels and has been shown to have a strong association with psychopathy (Hicks, Markon, Patrick, Krueger, & Newman, 2004). Previous research suggests that the TAI has high internal consistency ($\alpha=.90$ in the present study) and adequate convergent and divergent validity with other measures of anxiety (Barnes, Harp, & Jung, 2002; Stanley, Beck, & Zebb, 1996).

For adolescents, anxiety was assessed using the 37 item self-report Revised Children’s Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985). The RCMAS is internally consistent ($\alpha=.85$ in the present sample), manifests good test-retest reliability ($r=.63$; Reynolds, 1981), and is highly correlated with other measures of anxiety ($r=.88$; Muris, Merckelbach, Ollendick, King, & Bogie, 2002).

**Response Modulation**

Performance on the Picture-Word interference task (PW; see Golinkoff & Rosinski, 1976; Rosinski, Golinkoff, & Kukish, 1975) was used to assess RM. The task consists of four 8” x 11” stimulus cards with 20 equal sized cells. The first two cards are a warm-up exercise, where participants name what they see in each cell as quickly as possible. Card 1 contains the printed name of an object or an animal in each cell (e.g. pot, cup, and bear) and card 2 contains single line drawings of objects or animals in each cell. The third and fourth cards contain lined drawings with distractor stimuli where participants must name only the lined drawings. The distractor stimuli are superimposed words (e.g. hen, gun, seal) on card 3, and superimposed nonsensical stings of letters (e.g. cag, lup) on card 4. The nonsensical condition manipulates the strength of the interference of the distractor stimulus because nonsensical words have no
meaning for the subjects to process or inhibit alternative responses (Golinkoff & Rosinski, 1976; Rosinski et al., 1975).

Response times and errors were recorded for each stimulus card. (To reduce the influence of outliers, response times greater than three standard deviations away from the group mean were reduced to the value at three standard deviations). RM--or semantic interference--scores were calculated by subtracting the response time on card 4 (i.e., non-word distractors) from the response time on card 3 (i.e., incongruent word distractors; in keeping with Hiatt et al., 2004; Vitale et al., 2005). Higher RM scores (i.e., faster response times on card 4 than 3) indicate greater semantic interference. Low and negative RM scores (i.e., faster response times on card 3 than 4) indicate lesser semantic interference and RM deficits. As shown later, semantic interference effects were observed on this task in both our adult and adolescent samples. These types of semantic interference effects seem to reflect selective attention and response suppression processes (e.g., de Zubicaray, Wilson, McMahon, & Muthiah, 2001).

**Vocabulary & Intelligence**

There is evidence that semantic interference effects in picture-word tasks do not depend on reading skill (Piai, Roelofs, & Roete, 2014) or reading automaticity (MacLeod, 1991). Nevertheless, because adolescent and adult groups could differ in such factors, we measured reading-relevant skills (vocabulary) and general abilities (intelligence) as potential covariates to allow for a conservative tests of our hypotheses. Specifically, we administered the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999), which estimates general intellectual ability based on two subtests (Vocabulary and Matrix Reasoning). The WASI is strongly associated with full measures of IQ, learning disability diagnoses, and traumatic brain injury (Wechsler, 1999).

**Results**

The aims of the present study were to (a) assess how RM relates to global psychopathy indices (i.e., psychopathy/low anxiety) examined in past research, (b) assess the association
between RM and specific psychopathic and antisocial features, and (c) explore the consistency of these relationships across adults and adolescents. These aims were addressed using hierarchical logistic regression and bivariate and partial correlational analyses.

**Preliminary Analyses**

**Interference manipulation check.** Before addressing the aims, we first conducted a manipulation check on the PW task—and found that it created a semantic interference effect in both samples. The effect of card type on reaction time was analyzed using a within group repeated measures ANOVA. As shown in Table 2, there was a significant difference in reaction time between the incongruent-word distractor card (Card 3) and the non-word distractor card (Card 4) for both the adult [Wilks’ Lambda = .40, $F(1, 83) = 124.38, p<.001$, multivariate partial eta squared = .60] and adolescent samples [Wilks’ Lambda = .55, $F(1, 97) = 80.77, p<.001$, multivariate partial eta squared = .45]. There was no significant difference in RM (i.e., semantic interference effects) between the adult and adolescent samples, $t(180) = 0.60, ns$.

**Descriptives and bivariate associations.** The descriptive statistics and bivariate associations in Tables 3 and 4 make two preliminary points. First, although scales within each measure of psychopathy often were moderately-strongly correlated, there were more modest associations across measures, indicating that they assess only partially overlapping constructs. Second, RM was not significantly associated with vocabulary and intelligence scores in either sample—in fact, adolescents and adults obtained scores indicating similar levels of abilities. For this reason, WASI scores were not included, when examining the relation between RM and psychopathy.

**Aim 1: Assess the Relation Between Response Modulation and Global Psychopathy Indices Used in Past Research**

Early studies conducted with an adult and an adolescent sample suggested that RM deficits on a picture-word task were more characteristic of a high PCL/low anxiety group than a low PCL/low anxiety group (Hiatt et al., 2004; Vitale et al., 2005). To contextualize our main
aims and finding, we first conducted analyses designed to replicate early suggestions that RM deficits are characteristic of classic psychopathy.

First, we conducted extreme group analyses with both the adult- and adolescent- samples. Specifically, we used a 2 (high- versus low-PCL) X 2 (high- versus low-anxious) ANOVA for each age group. The ANOVAs did not reveal a significant effect for RM deficits in adolescents, \( F(3, 51) = .141, p = .94 \), nor adults, \( F(3, 44) = .524, p = .67 \).

Second, to rule out the possibility that these null effects were a function of issues involving extreme group analysis (Lilienfeld, 1998), we directly tested the interaction. Specifically, we conducted a series of hierarchical regressions in which the main effects of PCL Total scores and anxiety were entered at step 1 and the two-way interaction was entered at step 2. There were no significant interactions between psychopathy and anxiety in predicting PW performance for the PCL-R in adolescents (\( \Delta R^2 = .01, \Delta F[1, 92] = 1.32, p = .25 \)) nor adults (\( \Delta R^2 = .01, \Delta F[1, 80] = 0.29, p = .59 \)). Similarly, no such interactions between psychopathy and anxiety were observed for self-report psychopathy measures in either age group.

**Aim 2: Calculate the Association between Response Modulation and Specific Constellations of Psychopathic and Antisocial Features**

Bivariate correlations between RM and specific features of psychopathy among adults are shown in Table 3. The PCL-R Affective facet and (at a trend level) the PPI Coldheartedness
subscale weakly predicted RM deficits ($r = -0.21$ to $-0.23$). Because subscales within psychopathy measures are often intercorrelated (partly because of shared method), we computed semi-partial correlations to assess the independent relationship between RM and each psychopathy subscale. As shown in Table 5, the PCL-R Affective facet and PPI Coldheartedness (CH) (again) predicted low semantic interference, when controlling for their association with other psychopathy subscales. Together, these results indicate that—among adults—affective features of psychopathy (but not general social deviance) weakly predict RM deficits.

**Aim 3: Compare the Relationship between Response Modulation and Psychopathic Traits across Adults and Adolescents**

To permit comparisons with the adult sample, we conducted bivariate correlations to determine the association between psychopathy and RM among adolescents. As shown in Table 4, the PCL:YV Antisocial facet moderately predicted greater RM. This suggests that antisocial behavior (not affective features specific to psychopathy) predicts RM among youth—i.e., increased semantic interference (not deficits).

As shown in Table 5, this finding held when controlling for the effect of the other subscales: The PCL:YV Antisocial facet remained significantly predictive of increased RM, and a similar trend-level finding emerged for the YPI Lifestyle subscale. The only finding that was partially consistent with those for adults was that the YPI Interpersonal subscale displayed a modest, trend-level independent association with low interference ($\text{semi-partial } r = -0.17$).

**Discussion**

According to the RM hypothesis, psychopathy reflects deficits in response modulation (RM), or the ability to attend to relevant contextual information while engaged in a goal directed response (Newman, 1998; Patterson & Newman, 1993). This study is the first to assess whether multiple measures of psychopathy (i.e. PCL- and self-report) predict performance on an RM task, based on a matched sample of adolescent and adult offenders. Because adolescents have
relatively immature systems of cognitive control and RM, we wanted to explore whether the psychopathy-RM association varied across developmental samples. Our main findings may be organized into two points. First, we did not replicate past findings that global psychopathy (i.e., high psychopathy/low anxiety) relates to RM deficits. For example, none of the psychopathy measures interacted with anxiety to predict RM performance for either adults or adolescents. Second, the relationship between psychopathy and RM was inconsistent across developmental samples. For adults, scales that assessed affective deficits predicted deficits in RM, i.e. low semantic interference. In contrast, for adolescents, scales indexing antisocial behavior and/or disinhibition predicted enhanced RM, i.e. high semantic interference. This is consistent with developmental concerns about the generalizability of psychopathy measures (and/or the RM hypothesis) from adults to adolescents.

**Limitations**

Before unpacking these findings, we present the study’s limitations to contextualize the results. First, although our adult and adolescent groups were matched across key variables (e.g., psychopathy, intelligence, demographics), group differences other than age may have influenced the results, so they must be replicated in a longitudinal study.

Second, there was a delay between administration of the psychopathy measures (completed at baseline, when data were most complete) and the RM task (completed at the one-year follow-up). This delay allowed us to assess whether psychopathy was a risk factor for RM deficits (i.e., whether psychopathy preceded and increased the likelihood of RM deficits) – but may have attenuated relationships. To rule out this possibility, we examined psychopathy and RM assessments from the same interview (at one year) and found a similar (and not stronger) pattern of results.

Third, the stages of information processing involved in interference during the PW task (encoding, response selection, or both) are unclear (e.g., Dell’Acqua, Job, Peressotti, & Pascali, 2007; de Zubicaray et al., 2001; Schnur & Martin, 2011; van Maanen, van Rijn, & Borst, 2009).
This limits the ability of the task to shed light on hypotheses that RM deficits occur at different stages for specific psychopathic traits versus social deviance or disinhibition (Baskin-Sommers & Newman, 2013). Nevertheless, our focus is on comparing the relation between RM deficits (at whatever stage they occur a task that is held constant) and psychopathic features across adults and adolescents.

Fourth, given sample size limitations, we were unable to directly test whether age moderated the relation between psychopathy and RM. The present findings must be replicated in future research that directly tests for moderation – ideally, using multiple measures of response modulation and multiple measures of psychopathy.

**Global Indices of Psychopathy Did Not Predict Response Modulation**

We were unable to replicate the results of two prior studies that -- based on extreme group analyses -- revealed an association between global indices of psychopathy (i.e., high psychopathy + low anxiety) and RM deficits (operationalized with the picture-word-stroop). One study was conducted with adults (Hiatt et al., 2004); the other was conducted with adolescents (Vitale et al., 2005). In the current study, neither extreme group- nor dimensional-analyses indicated that psychopathy and anxiety interacted to predict reduced interference on the PW task. This was true for both the adult- and adolescent- matched samples. This failure to replicate earlier effects could reflect a problem with the RM hypothesis itself (see Smith et al., 2014 for variability in psychopathy-RM findings), sampling differences, and/or a failure to account for the multidimensional nature of psychopathy in analyses.

**Different Features of Psychopathy Predict RM, for Adults vs. Adolescents**

*Affective and interpersonal traits specific to psychopathy.* In keeping with the last interpretation (that it may be important to attend to specific trait constellations), we found that -- among adults -- affective features of psychopathy independently predicted RM deficits. This finding is consistent with the spirit of Newman's hypothesis, in that specific psychopathic traits (rather than general social deviance) predicted RM deficits. The consistency of this relationship
across psychopathy measures is noteworthy. The PCL-R Affective facet and PPI Coldheartedness scale both assess affective features of psychopathy, but are only weakly correlated ($r = .24$).

PPI Coldheartedness reflects a lack of imagination, sentiment, and reactivity to the distress of others (Benning et al., 2003), whereas PCL-R Affective facet represents a deficient affective experience, callousness, and failure to accept responsibility (Hare et al., 1990). The similarity of findings across measures suggests that shared features of a lack of emotional reactivity predict RM deficits, when operationalized as low semantic interference.

For adolescents, affective features of psychopathy did not significantly predict RM deficits. Of the four scales that assess affective and interpersonal features of psychopathy, one related to RM deficits at a trend level: the YPI Interpersonal scale. This scale assesses dishonest charm and manipulation, which are consistent with classic conceptions of psychopathy (Cleckley, 1976; Skeem & Cooke, 2010). Still, the PCL:YV Interpersonal scale (which also assesses such features) did not predict RM deficits.

**General social deviance.** Among adults in this study, indices of social deviance did not predict RM deficits. This finding is consistent with the results of some past studies of adults (Sadeh & Verona, 2008), but not others (Heritage & Benning, 2013; Molto et al., 2007). In contrast with findings for adults, social deviance was associated with RM for adolescents—in fact, social deviance predicted greater semantic interference effects among youth. Specifically, the PCL:YV Antisocial facet (which taps poor anger control and criminal behavior) moderately predicted longer response times on the distractor task; and the YPI Lifestyle scale (which assesses impulsiveness, thrill-seeking and irresponsibility) manifested a trend-level association in the same direction. Both of these psychopathy subscales are moderately associated with temperance, an element of psychosocial maturity that captures the extent to which young people are able to control their impulses and suppress aggression (Skeem
& Cauffman, 2003). It is possible that the greater semantic interference observed among youth with higher social deviance scores is partially indicative of immature cognitive control. **Conclusions**

Effect sizes obtained in past research range from moderate to large correlations consistent with the RM hypothesis to correlations in the opposite direction (Smith et al., 2014). Although group comparisons are relatively uncommon, this variability underscores the need to hold method factors as constant as possible, when comparing groups. In the present study, we used multiple indices of psychopathy and a uniform measure of response modulation to compare the performance of a matched sample of adolescents and adults.

Our results suggest that psychopathic traits relate differently to RM across development. Affective traits predicted less semantic interference among adult offenders, whereas disinhibition and antisocial behavior predicted greater semantic interference in a matched sample of adolescent offenders. This raises questions about the generalizability of psychopathy measures and/or the RM hypothesis across developmental groups. Broadly speaking, although measures of psychopathy relate to many features similarly across groups of adolescents and adults, there are important exceptions like anxiety (which relates more strongly to psychopathy measures for young people; for a review, see Skeem et al., 2014).

Future research is needed to directly test the possibility that developmental immaturity confounds the association between psychopathic and antisocial features on one hand, and RM on the other. Longitudinal research that follows young people through the transition to adulthood is sparse, but necessary to provide definitive answers to questions about whether and how measures of psychopathy assess the same construct during adolescence as adulthood.
References


Table 1

**Adult and Adolescent Sample Comparison**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Adult</th>
<th>Adolescent</th>
<th>Effect Size</th>
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<tr>
<td></td>
<td>( n = 84 )</td>
<td>( n = 98 )</td>
<td></td>
</tr>
<tr>
<td>WASI IQ estimate(^b)</td>
<td>88.34 (12.66)</td>
<td>87.94 (13.62)</td>
<td>.03</td>
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<tr>
<td>PCL psychopathy estimate</td>
<td>16.10 (4.42)</td>
<td>16.21 (4.07)</td>
<td>-.02</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
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<td>.13</td>
</tr>
<tr>
<td>African American</td>
<td>53.6</td>
<td>36.7</td>
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<tr>
<td>Caucasian</td>
<td>29.8</td>
<td>37.8</td>
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<tr>
<td>Hispanic/Latino</td>
<td>8.3</td>
<td>13.3</td>
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</tr>
<tr>
<td>Index offense type(^a) (%)</td>
<td></td>
<td>(.27^*)</td>
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</tr>
<tr>
<td>Procedural/Technical</td>
<td>6.6</td>
<td>37.6</td>
<td>(\Phi^2)</td>
</tr>
<tr>
<td>Violent</td>
<td>73.7</td>
<td>28.0</td>
<td>(\Phi^2)</td>
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<tr>
<td>Property</td>
<td>3.6</td>
<td>14.0</td>
<td>(\Phi^2)</td>
</tr>
<tr>
<td>Drug</td>
<td>15.8</td>
<td>12.9</td>
<td>(\Phi^2)</td>
</tr>
</tbody>
</table>

Notes. Standard deviations are in parentheses. WASI = Wechsler Abbreviated Scale of Intelligence. PCL= Psychopathy Checklist. \(^a\) \(\Phi^2\) reported for chi-square analyses. \(^b\) Cohen’s \(d\) reported for \(t\)-test analyses. \(\Phi^2\) reported for \(t\)-test analyses. \(\Phi^2\) reported for \(t\)-test analyses. \(\Phi^2\) reported for \(t\)-test analyses. \(\Phi^2\) reported for \(t\)-test analyses.

Table 2

**Adult vs. Adolescent Performance on the Picture-Word Task**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Adult ( M (SD) )</th>
<th>Adolescent ( M (SD) )</th>
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<tbody>
<tr>
<td>Response Time Card 1</td>
<td>14.72 (10.44)</td>
<td>13.24 (6.47)</td>
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<td>Errors Card 1</td>
<td>0.20 (1.17)</td>
<td>0.25 (0.97)</td>
</tr>
<tr>
<td>Response Time Card 2</td>
<td>21.41 (9.52)</td>
<td>20.43 (6.68)</td>
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<tr>
<td>Errors Card 2</td>
<td>0.67 (0.98)</td>
<td>1.19 (1.05)</td>
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<tr>
<td>Response Time Card 3</td>
<td>33.67 (26.48)</td>
<td>29.21 (14.55)</td>
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<tr>
<td>Errors Card 3</td>
<td>1.04 (1.24)</td>
<td>0.91 (1.17)</td>
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<tr>
<td>Response Time Card 4</td>
<td>26.54 (23.12)</td>
<td>22.63 (12.40)</td>
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<td>Errors Card 4</td>
<td>0.26 (0.70)</td>
<td>0.32 (0.53)</td>
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<tr>
<td>Calculated PW Interference</td>
<td>7.13 (5.86)</td>
<td>6.56 (6.81)</td>
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</table>

Notes. Means are reported for time in seconds.
Table 3
*Distributions of and Correlations among PW Interference, Psychopathy, and Anxiety for Adults*

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<td>2. PCL-R Total</td>
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<td>3. PCL-R Interpersonal</td>
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<td>4. PCL-R Affective</td>
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<td>.51**</td>
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<td>5. PCL-R Lifestyle</td>
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<td>.25*</td>
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<td>6. PCL-R Antisocial</td>
<td>.05</td>
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<td>.20†</td>
<td>.27*</td>
<td>.39**</td>
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<td>7. PPI Total</td>
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<td>.20†</td>
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<td>.25*</td>
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<td>.34**</td>
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<td>9. PPI-SCI</td>
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<td>10. PPI-CH</td>
<td>-.21†</td>
<td>.20†</td>
<td>.10</td>
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<td>.18†</td>
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<td>11. Anxiety</td>
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<td>-.04</td>
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<td>.09</td>
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<td>-.41**</td>
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<td>12. WASI</td>
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<td>.11</td>
<td>.05</td>
<td>.19†</td>
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| Mean (SD) | 7.13 (5.86) | 16.10 (4.42) | 4.54 (2.24) | 4.79 (1.85) | 6.82 (1.84) | 6.23 (1.89) | 133.57 (10.88) | 57.92 (7.13) | 61.12 (9.42) | 14.50 (3.78) | 40.45 (9.67) | 88.59 (12.60) |

*Note.* PW = Picture-Word task; PCL-R = Psychopathy Checklist – Revised; PPI = Psychopathic Personality Inventory-Short Form; FD = Fearless Dominance; SCI = Self-Centered Impulsivity; CH = Coldheartedness

†p<.10. * p<.05. ** p<.01.
### Table 4
*Distributions of and Correlations among PW Interference, Psychopathy, and Anxiety for Adolescents*

<table>
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<td>2. PCL:YV Total</td>
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<td>4. PCL:YV Affective</td>
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<td>0.76**</td>
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<td>5. PCL:YV Lifestyle</td>
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<td>0.37**</td>
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<td>0.32**</td>
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<td>0.01</td>
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<table>
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<td>6.56</td>
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<td>(SD)</td>
<td>(6.81)</td>
<td>(4.07)</td>
<td>(2.05)</td>
<td>(1.87)</td>
<td>(1.60)</td>
<td>(1.70)</td>
<td>(25.21)</td>
<td>(12.80)</td>
<td>(8.17)</td>
<td>(8.40)</td>
<td>(6.66)</td>
<td>(13.13)</td>
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*Note.* PW = Picture-Word task; PCL:YV = Psychopathy Checklist – Youth Version; YPI = Youth Psychopathic Traits Inventory; Anxiety = Revised Children’s Manifest Anxiety Scale Total score.

* *p* <.05. ** *p* <.01.
Table 5

*Semi-Partial Correlations Between PW Interference and Psychopathy*

<table>
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<th>Adults (n=84)</th>
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<td>PCL-R</td>
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<td>.05</td>
</tr>
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<td>Affective</td>
<td>-.25*</td>
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<tr>
<td>Lifestyle</td>
<td>.04</td>
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<tr>
<td>Antisocial</td>
<td>.10</td>
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<tr>
<td>PPI</td>
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<td>Fearless Dominance</td>
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<td>Self Centered Impulsivity</td>
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<td>Coldheartedness</td>
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<th>Adolescents (n=98)</th>
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<td>Affective</td>
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<td>Lifestyle</td>
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</table>

*Note.* Semi-partial correlations were corrected for the subscales of the same instrument. PW = Picture-Word task; PCL-R = Psychopathy Checklist Revised; PCL:YV = Psychopathy Checklist-Youth Version; PPI = Psychopathic Personality Inventory-Short Form; YPI = Youth Psychopathic Traits Inventory. †p<.10. *p<.05. **p<.01.
Endnotes
Because the adult sample had a slightly greater proportion of African Americans than the youth sample, we sub-divided the sample into non-Caucasian and Caucasian group to explore whether observed age-related differences were partially attributable to racial differences. Differences between the adult and adolescent samples remained, independent of race. For example, within Caucasian subsamples, (a) antisocial features were positively associated with greater interference for adolescents ($r = .52$ for PCL:YV Antisocial) but not adults ($r = -.06$ for PCL-R Antisocial), and (b) affective features were inversely associated with interference for adults ($r = -.49$ for PCL-R Affective) but not adolescents ($r = -.02$ for PCL:YV Affective).