Journal of Abnormal Child Psychology, Vol. 33, No. 4, August 2005, pp. 461–470 (© 2005)
DOI: 10.1007/s10802-005-5727-X

Deficient Behavioral Inhibition and Anomalous Selective Attention in a Community Sample of Adolescents with Psychopathic Traits and Low-Anxiety Traits

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Received May 5, 2003; revision received January 5, 2004; accepted July 12, 2004

Socialization is the important process by which individuals learn and then effectively apply the rules of appropriate societal behavior. Response modulation is a psychobiological process theorized to aid in socialization by allowing individuals to utilize contextual information to modify ongoing behavior appropriately. Using Hare's (1991) Psychopathy Checklist and the Welsh (1956) anxiety scale, researchers have identified a relatively specific form of a response modulation deficit in low-anxious, Caucasian psychopaths. Preliminary evidence suggests that the Antisocial Process Screening Device (APSD; Frick & Hare, 2001) may be used to identify children with a similar vulnerability. Using a representative community sample of 308 16-year-olds from the Child Development Project (Dodge, Bates, & Pettit, 1990), we tested and corroborated the hypotheses that participants with relatively low anxiety and high APSD scores would display poorer passive avoidance learning and less interference on a spatially separated, picture-word Stroop task than controls. Consistent with hypotheses, the expected group differences in picture-word Stroop interference were found with male and female participants, whereas predicted differences in passive avoidance were specific to male participants. To the extent that response modulation deficits contributing to poor socialization among psychopathic adult offenders also characterize a subgroup of adolescents with mild conduct problems, clarification of the developmental processes that moderate the expression of this vulnerability could inform early interventions.

KEY WORDS: response modulation; psychopathy; adolescents; socialization.

Developmental approaches to juvenile delinquency, conduct disorder, criminality, and psychopathy commonly emphasize the mediating construct of socialization (Eysenck, 1967; Lykken, 1995; Mednick & Christiansen, 1977; Trasler, 1978). Socialization involves the partially independent processes of learning a society's accepted rules for appropriate conduct and using this information to conform one's behavior to these rules. Accordingly, failures of socialization that result in stable antisocial adjustment are commonly attributed to one or both of these processes.

Consistent with this emphasis on learning and using rules to regulate one's behavior, laboratory-based investigations of the processes hampering appropriate socialization emphasize passive avoidance learning. Passive avoidance involves the inhibition of behavior that would otherwise result in punishment. Supporting the importance of passive avoidance learning for socialization, passive avoidance deficits are a reliable correlate of psychopathy (e.g., Lykken, 1957; Newman & Kosson, 1986; Schmauk, 1970), conduct disorder/juvenile

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delinquency (Hartung, Milich, Lynam, & Martin, 2002; Moses, Ratliff, & Ratliff, 1979; Newman, Widom, & Nathan, 1985), and other syndromes characterized by poorly regulated, socially inappropriate behavior (e.g., Hartung et al., 2002; Hochhausen, Lorenz, & Newman, 2002; McCarthy, Kroll, & Smith, 2001).

Given the consistent association between passive avoidance learning and clinical syndromes characterized by poorly socialized, disinhibited behavior, clarification of the psychobiological processes that underlie these associations is likely to have important clinical implications. In this regard, Nigg (2000) has proposed that such inhibitory deficits may reflect dysfunction in myriad systems, including dysfunctional executive inhibitory processes, motivational inhibitory processes, or automatic attentional inhibitory processes.

Paralleling Nigg's (2000) proposal, our laboratory has attempted to distinguish diverse pathways that may undermine passive avoidance and adaptive self-regulation with a primary emphasis on the automatic attentional processing of psychopathic individuals (see MacCoon, Wallace, & Newman, 2004; Newman, 1998; Newman & Wallace, 1993, Newman & Lorenz, 2003). In particular, Newman and colleagues (Newman, 1998; Newman & Lorenz, 2003) have proposed that the passive avoidance and other self-regulatory deficits of psychopathic individuals may reflect a deficiency in using automatic attentional processes to initiate self-regulation—a problem which they refer to as poor response modulation. Response modulation involves the relatively automatic shift of attention from the execution of a dominant response to relevant secondary and/or contextual cues that might be used to modify the ongoing response (Newman, 1998; Patterson & Newman, 1993). Response modulation, therefore, most closely parallels Nigg's (2000) conceptualization of automatic inhibitory processes, and failures of response modulation are proposed to result in disinhibited behaviors, including passive avoidance deficits.

In order to assess the differential association between response modulation deficits (i.e., automatic inhibitory processes) and the syndrome of adult psychopathy, Newman and colleagues have employed laboratory paradigms designed to minimize the involvement of other inhibitory processes (i.e., executive inhibitory processes and motivational inhibitory processes). One such paradigm is the picture-word Stroop task (Golinkoff & Rosinski, 1976; Rosinski, Golinkoff, & Kukish, 1975). In this task, participants are asked to name a series of line drawings with incongruent words superimposed over them (e.g., picture of pig with the word COW superimposed). Although the incongruent words reliably elicit significant interference in normal controls, low-anxious psychopathic offenders demonstrate significantly less interference (i.e., better performance) than controls on such tasks (Hiatt, Schmitt, & Newman, 2004; Newman, Schmitt, & Voss, 1997).

Such findings are not easily attributed to deficiencies in motivational or executive inhibitory processes. Although participants are paid for completing the task, the PW task involves no tangible rewards or punishments. Thus, the effects of motivational processes should be minimal. Moreover, participants are instructed to ignore the superimposed words. Therefore, a deficit in executive inhibitory processes would be expected to increase a person's vulnerability to distracting information and result in greater rather than less interference. Conversely, consistent with the proposal that low-anxious, psychopathic individuals are characterized by response modulation deficits, the performance exhibited by these individuals on the PW task suggests a failure of automatic inhibitory processes.

An emphasis on parsing the heterogeneity of inhibitory processes associated with disinhibited behavior problems requires a similar focus on parsing the heterogeneity of disinhibited groups (Brinkley, Newman, Widiger, & Lynam, 2004). For instance, research suggests that the association between psychopathy and deficient response modulation is relatively specific to a subgroup of Caucasian psychopathic offenders with low levels of anxiety as assessed by the Welsh Anxiety Scale. Research with African American samples has failed to yield significant group differences on the passive avoidance or picture-word tasks (Kosson, Smith, & Newman, 1990; Newman & Schmitt, 1998; Newman et al., 1997; Thornquist & Zuckerman, 1995) and comparisons involving high-anxious psychopathic and nonpsychopathic offenders have also yielded non-significant results (Newman & Schmitt, 1998; Newman, Howland, Patterson, & Nichols, 1990; Newman et al., 1997). Thus, although response modulation deficits may be relevant to the disinhibited behavior of low-anxious, Caucasian psychopathic individuals, they do not appear to be central to the disinhibited behavior of these other groups.

The purpose of the current study is to test the hypothesis that response modulation deficits are associated with psychopathic characteristics in a community sample of low-anxious, 16-year-old, Caucasian males and females participating in a multi-site longitudinal study of disruptive behavior problems. Specifically, we predict that low-anxious, Caucasian male participants with relatively higher levels of psychopathic traits assessed by the Antisocial Process Screening Device (Frick & Hare, 2001) will commit more passive avoidance errors on a go/no go passive avoidance task than low-anxious, Caucasian

male participants reporting relatively fewer psychopathic traits. Further, consistent with the proposal that response modulation reflects the functioning of automatic attention inhibitory processes, we predict that Caucasian male participants with relatively higher levels of psychopathic traits will display significantly less interference than controls on the picture-word task. Support for these hypotheses would serve to extend the response modulation model from adult populations to an adolescent population and from incarcerated psychopathic offenders to a community sample of individuals exhibiting less severe disinhibited behavior problems.

Predictions for female participants are more complex. Prior research with adolescents suggests that gender moderates the relation between Conduct Disorder and measures of disinhibition like the passive avoidance task (e.g., Hartung et al., 2002; Moffitt, Caspi, Rutter, & Silva, 2001) with girls failing to show abnormal passive avoidance performance. Further, recent research with adult female offenders shows that, although psychopathic women exhibit predicted attentional abnormalities on picture-word Stroop tasks (Vitale, Brinkley, Hiatt, & Newman, 2005), they perform normally on passive avoidance tasks (Vitale, MacCoon, & Newman, 2005; Vitale & Newman, 2001). This pattern of results raises the possibility that psychopathic females may be characterized by the same response modulation deficits found in psychopathic males, but that psychopathic women may be better able to regulate their disinhibited behavior in certain situations (Verona & Vitale, in press; Vitale & Newman, 2001). Consistent with this proposal, we predict that low-anxious Caucasian female participants with relatively higher levels of psychopathic traits will show less interference on the picture-word task than low-anxious Caucasian female participants reporting relatively fewer psychopathic traits; However, no significant group differences are predicted for the passive avoidance task.

METHOD

Participants

Participants in this study were drawn from a sample of adolescents participating in the Child Development Project (CDP), a longitudinal, multi-site study of the development of child and adolescent adjustment (Dodge, Bates, & Pettit, 1990). Families were originally recruited from three cities (Nashville and Knoxville, TN, and Bloomington, IN) during kindergarten preregistration in 1987 and 1988.

Two recruitment steps were taken to increase the inclusion of high risk families and children. First, recruitment took place at a wide range of school districts differing in the percent of students receiving free or reduced-price lunch, ethnic composition, and projected rate of school drop out. Second, 15% of the slots were reserved for those registering late. About 75% of parents agreed to participate. The participants were demographically diverse, with approximately one-fourth of the Nashville subsample living in federally subsidized housing and much of the Bloomington and Knoxville subsamples coming from working class backgrounds. Although the original sample was moderate risk and was representative of the three communities, the sample included a substantial number of high risk subjects. Data collection began the summer before the participants entered kindergarten (at around age 5), and follow-up collection has been conducted on a yearly basis.

The original CDP sample included 585 children (52% male, 48% female; 81% European American, 17% African American, and 2% other ethnic groups; 26% living in single parent households). The samples were representative of their communities in socioeconomic status (Hollingshead (1979), 4-factor score of SES averaged 39.4); and 26% of the families were classified in the lowest two of the five Hollingshead classes (Pettit, Laird, Dodge, Bates, & Criss, 2001).

During the winter of collection year 12 (at around age 16), 395 participants completed laboratory procedures (53% male, 47% female; 83% European American; Hollingshead 4-factor score averaged 40.0, 23% in the lowest two Hollingshead classes). One major cause for non-participation in the laboratory procedures was the lengthy distances some people had to travel to the lab. When procedures relied only on telephone interview or mailed questionnaires, participation was approximately 80%. Of this sample, 329 remained after eliminating non-European American participants from the sample (53% male, 47% female). In this subsample, the average Hollingshead 4-factor score was 42.9, with 16% of participants classified in the lowest 2 classes of the Hollingshead index.

Participants in the current study were 164 Caucasian male and 144 Caucasian female 16-year olds.[7] APSD groups were formed using median splits. Among males, this resulted in 83 high-APSD (Mean APSD(SD) = 16.39(3.28)) and 84 low-APSD participants (Mean APSD(SD) = 8.04(2.52)). Among females, this resulted

[7]Additional participants were excluded from analyses if (a) they did complete all of the measures being used in this study (e.g., the APSD, the Welsh Anxiety Scale) or (b) their performance on the laboratory tasks was more than 2.5 standard deviations from the mean (i.e., they were outliers). Under these criteria, 308 participants were included in the study.

in 73 high-APSD (Mean APSD(SD) = 12.00(4.22)) and 71 low-APSD (Mean APSD(SD) = 7.70(3.78)) participants. Low anxious groups were formed using a median split on the WAS, resulting in 26 low-anxious, high-APSD males and 21 low-anxious, high-APSD females.

T-test comparisons were conducted to test for differences between this subsample and the larger CDP sample in year 1 (age five) socioeconomic status, externalizing behavior problems, and internalizing behavior problems. There were no significant differences in externalizing or internalizing behavior. There was a significant difference between the groups in year 1 SES, $t(468) = -3.03$, $p < .05$. Participants from the larger sample had lower SES ($M = 39.59$, $SD = 12.82$) than participants from this subsample ($M = 43.32$, $SD = 12.79$).

Measures

Psychopathy Trait Assessment

The Antisocial Process Screening Device (APSD; Frick & Hare, 2001) was used to divide participants into those characterized by relatively higher rates of psychopathic characteristics (high-APSD) and those characterized by relatively lower rates of psychopathic characteristics (low-APSD). The APSD is a 20-item rating scale that can be used as a self-report measure as well as a teacher and parent report measure. In the current study, participants completed the self-report form of the APSD. Items on the APSD tap interpersonal (e.g., superficial charm, lack of empathy), emotional (e.g., shallow affect), and behavioral (e.g., reckless antisocial behaviors, impulsivity) characteristics. Each item is rated on a 3-point scale (0 = "not true at all" to 2 = "definitely true"). In this sample, the internal consistency for the APSD was alpha = .77 for males and alpha = .74 for females. Median splits on the APSD were used to divide participants into high- and low-APSD groups. The medians were 11.00 for males and 9.00 for females.

The Welsh Anxiety Scale (WAS; Welsh, 1956)

Following Newman and colleagues (e.g., Hiatt et al., 2004; Newman et al., 1985; Newman et al., 1997), the WAS was used as the measure of anxiety. The WAS is a 39-item true/false questionnaire, derived from the MMPI, that measures anxiety and negative affect. Gray (1991) has suggested that the construct assessed by the WAS is a combination of neuroticism and introversion. In this sample, the internal consistency of the WAS was alpha = .90 for males and females. Median splits on the WAS were used to divide participants into high- and low-anxious groups. The medians were 7.00 for males and 9.00 for females

The correlations between APSD and WAS scores in this sample were $r(169) = .46$, $p < .05$, for males and $r(158) = .53$, $p < .05$, for females. Although PCL-R scores in adult offenders are generally independent of anxiety (Schmitt & Newman, 1999), significant positive associations between the PCL-R and the WAS have been observed in males (Kosson, Suchy, Mayer, & Libby, 2002), adult females (Vitale, Smith, Brinkley, & Newman, 2002), and are relatively common in studies that use self-report measures of psychopathy (see Brinkley, Schmitt, Smith, & Newman, 2001).

Intelligence

IQ was estimated based on the WISC Block Design and WISC Vocabulary subtests (as described by Sattler, 1990), as part of an interview during year 9 follow-up, when the youths were approximately 13-years old.

Externalizing and Internalizing Behavior Problems

The Achenbach Child Behavior Checklist (CBCL; Achenbach, 1991) was used to assess externalizing and internalizing behaviors at age 5 (CDP year 1) and at age 16. Externalizing behaviors include aggressive, disruptive, or delinquent behaviors, and internalizing behaviors include withdrawn, anxious, somatic, or depressed behaviors. Mothers indicated if the problem behaviors listed on the CBCL were observed by them "often" (2), "sometimes" (1), or "not at all" (0). The externalizing behavior scale includes 33 items, and the internalizing behavior scale includes 31 items. The highest possible scores on the externalizing and internalizing scales are 66 and 62, respectively. Raw scores on the CBCL are converted into T-scores.

Tasks and Stimuli

Passive Avoidance Task

The passive avoidance task was administered with a PC computer and 14-in. monitor. Responses were recorded with an 8 × 5 × 2.5 cm button box with one push button (1.5 cm) on the top surface of the box. The task was identical to the go/no-go discrimination task used by (Newman & Schmitt, 1998), with the exception that here we used quarters rather than poker chips worth 5 cents as monetary incentives. Participants were instructed to learn

by trial and error when to respond (by pressing a button) and when not to respond. Stimuli consisted of 10 two-digit numbers (03, 15, 42, 69, 74, 21, 38, 57, 84, 96) presented in nine pseudo-randomized sequences for a total of 90 test trials. Each number was presented on the monitor as white light on a dark background and measured approximately 1.8 cm high and 1.1 cm wide. The stimulus sign of the 10 stimulus numbers was counterbalanced so that the stimuli serving as S+ stimuli (i.e., go stimuli) for one half of the participants (e.g., the first 5 numbers listed above) served as S- stimuli (i.e., no-go stimuli) for the other half.

Following Newman and Schmitt (1998), participants received a reward pretreatment, during which each of the S+ stimuli was presented as in the test trials. The purpose of the pretreatment was to establish a dominant response set for reward by providing a high probability of reward for responding at the beginning of the task (see also Siegel, 1978 and Newman et al., 1990). Test trials began immediately after the five-trial pretreatment with no noticeable break. Throughout the pretreatment and test trials, each response resulted in visual, auditory, and monetary feedback. Following a correct response, the stimulus number was immediately replaced by the message "You WIN 25 cents!" Simultaneously, a high-pitched tone (400 Hz) was presented and the experimenter gave the participant a quarter. If the response was incorrect, the message "You LOSE 25 cents." appeared, a low tone (100 Hz) occurred, and the experimenter removed a quarter. No feedback was provided in the absence of a response. The stimulus duration was 2.5 s and the intertrial interval was fixed at 1 s. Participants were told that they would keep all the money they won and would begin the task with $ 2.50 in quarters. The experimenter did not provide any more information regarding the task.

Passive avoidance task performance is indexed using two measures of accuracy: the number of commission errors (i.e., responding to a previously punished stimulus) and the number of omission errors (i.e., failing to respond to a previously rewarded stimulus). Commission errors represent failures of passive avoidance and are the primary variable of interest on this task.

If the number of commission errors fell more than 2.5 standard deviations from the mean, these scores were designated as outliers and excluded from the analyses.

Picture Word Stroop Task

The PW Stroop task, a modified version of a task used by Rosinski et al. (1975) and Golinkoff and Rosinski (1976), consisted of four $8.5'' \times 11''$ cards, each with a superimposed 4×5 grid outlining 20 squares measuring $2'' \times 2''$. For all cards, stimuli were presented centrally within the 20 squares. Card 1 contained words only, Card 2 contained picture outlines only, Card 3 contained picture outlines with superimposed, incongruent words, and Card 4 contained picture outlines with superimposed, three letter trigrams (non-words). Each card contained the same set of stimuli in different orders. Cards 1, 2, 3, and 4 were presented in that order. Participants were instructed to read the words on Card 1 and name the pictures on Cards 2–4. Participants were instructed to ignore the words or letters on Cards 3 and 4, respectively.

Mistakes made on Card 2 (naming pictures) were corrected upon the card's completion in order to increase the likelihood that participants would use the proper names on the remaining two cards. No other feedback was given to the participants throughout the task.

The primary variables calculated are errors, which is the number of times a participant identifies a picture incorrectly on Card 3, and the amount of interference (in seconds) that participants experience when naming pictures in the context of incongruent words as opposed to non-words. This variable is calculated by subtracting participants' response times to Card 4 (pictures with superimposed trigrams) from their response times to Card 3 (pictures with superimposed incongruent words). Response times falling more than 2.5 standard deviations from the mean were designated as outliers and excluded from the analyses.

Procedure

During the winters of 1999 and 2000, the two cohorts of CDP participants completed a battery of procedures, including the go/no-go and PW Stroop tasks, which were conducted in small testing rooms in the three cities from which the CDP sample was originally obtained. Following the task administrations, paper and pencil measures were administered to each participant, including the APSD and WAS.

Statistical Analyses

A priori hypotheses specifying differences in the task performance of low-anxious, high-APSD participants versus low-anxious, low-APSD participants were tested using planned comparisons conducted using one-tailed *t*-tests. Overall group analyses were conducted using Analysis of Variance (ANOVA). An alpha level of .05 was used for all statistical tests.

RESULTS

Descriptive Analyses

T-test comparisons of SES between low- and high-APSD low-anxious Caucasian males and females indicated no significant differences. Among males, low-anxious, high-APSD participants did exhibit significantly more externalizing ($t(73) = -3.02$, $p < .05$), but not significantly more internalizing ($t(73) = 1.18$, $p = .24$) behavior problems at age 16 than the low-APSD groups. Among females, low-anxious, high-APSD participants did not exhibit significantly more externalizing ($t(64) = -.800$, $p = .43$) or internalizing ($t(64) = 1.56$, $p = .12$) behavior problems at age 16 than low-APSD participants. Means and standard deviations for SES, Internalizing, and Externalizing scores are presented in Table I.

To test for group differences in intelligence for males and females, we conducted 2 (high- vs. low-APSD) × 2 (high- vs. low-anxious) ANOVAs with estimated WISC IQ scores as the dependent variable. There were no significant main effects or interactions for either gender. Mean IQ scores are presented in Table II.

Passive Avoidance Task

As in prior studies (e.g., Newman & Kosson, 1986, Newman & Schmitt, 1998), we did not analyze data for the first exposures to each of the 10 stimuli (i.e., the first 10 test trials).

To analyze errors, we used a 2 (high- vs. low-APSD) × 2 (high- vs. low-anxious) × 2 (passive avoidance or omission errors) mixed-model ANOVA with APSD and WAS as the between-participant variables and type of error as the within-participant variable. Consistent with the goal of establishing a dominant "go" response set, the ANOVA revealed a significant effect for type of error for both males, $F(1, 156) = 18.05$, $p < .001$, and females, $F(1, 140) = 17.17$, $p < .001$, with participants committing more passive avoidance (i.e., go) than omission (i.e., no-go) errors (see Table II).

Consistent with prediction, planned comparisons revealed that low-anxious, high-APSD males committed significantly more passive avoidance errors than low-anxious, low-APSD males, $t(77) = -2.35$, $p < .05$, one-tailed; Cohen's $d = .55$. A similar comparison involving omission errors was not statistically significant, $t(77) = 1.40$, *ns*.

In contrast, consistent with findings for adult females, planned comparisons revealed that low-anxious, high-APSD females did not commit significantly more passive avoidance errors than low-anxious, low-APSD females, $t(69) < 1.0$, *ns*, Cohen's $d = .06$ A similar comparison involving omission errors was not statistically significant, $t(69) < 1.0$, *ns*. Means are presented in Table II.

PW Stroop Task

Prior to testing hypotheses involving Stroop interference, group differences in the number of errors were examined using a 2 (high- vs. low-APSD) × 2 (high- vs. low-anxiety) × 2 (Card 3 vs. Card 4) mixed-model ANOVA with APSD and WAS as between subject factors and Card type (i.e., Card 3 or 4) as the within subject factor. Overall, mean accuracy was high, with participants averaging less than one error across both cards. There was a significant effect for Card type for both males, $F(1, 160) = 14.84$, $p < .01$, and females, $F(1, 136) = 19.75$, $p < .05$, with participants making significantly more errors on Card 3 than on Card 4. Errors on Cards 3 and 4 were used as covariates in all subsequent analyses. There were no other significant main effects or interactions. Accuracy data for all groups are presented in Table III.

Table I. Demographic Data for Male and Female Participants

	Males				Females			
	Low-WAS		High-WAS		Low-WAS		High-WAS	
	Low APSD (*n*)	High APSD (*n*)	Low APSD (*n*)	High APSD (*n*)	Low APSD (*n*)	High APSD (*n*)	Low APSD (*n*)	High APSD (*n*)
SES	43.70 (11.96) (52)	45.65 (11.68) (26)	46.93 (13.16) (27)	42.5 (14.49) (54)	39.54 (13.13) (49)	47.33 (13.74) (20)	42.5 (11.86) (21)	42.89 (11.45) (52)
Externalizing	44.33 (8.86) (49)	50.88 (9.15) (26)	44.67 (8.05) (24)	55.15 (8.88) (52)	46.67 (7.94) (45)	48.43 (9.15) (21)	48.24 (6.33) (21)	58.31 (9.69) (51)
Internalizing	40.31 (7.95) (49)	38.08 (7.47) (26)	47.63 (9.33) (24)	51.18 (8.92) (52)	45.31 (8.70) (45)	41.86 (7.64) (21)	52.80 (8.44) (21)	54.37 (8.48) (51)
IQ	103.02 (13.92) (54)	102.55 (10.87) (25)	108.12 (15.41) (30)	104.54 (16.09) (51)	101.27 (12.37) (50)	102.05 (13.84) (21)	95.63 (12.67) (21)	99.00 (14.37) (52)

Table II. Passive Avoidance Performance for Male and Female Participants

	Males $n = 160$				Females $n = 144$			
	Low-WAS		High-WAS		Low-WAS		High-WAS	
	Low APSD ($n = 54$) *M* (*SD*)	High APSD ($n = 25$) *M* (*SD*)	Low APSD ($n = 30$) *M* (*SD*)	High APSD ($n = 51$) *M* (*SD*)	Low APSD ($n = 50$) *M* (*SD*)	High APSD ($n = 21$) *M* (*SD*)	Low APSD ($n = 21$) *M* (*SD*)	High APSD ($n = 52$) *M* (*SD*)
Commission Errors	10.52 (5.99)	14.04 (6.62)	12.17 (6.51)	13.10 (6.54)	14.04 (7.86)	13.57 (6.62)	13.38 (5.57)	15.11 (7.20)
Omission Errors	9.35 (7.19)	7.00 (6.36)	8.33 (7.20)	9.65 (6.62)	9.72 (6.87)	9.00 (7.14)	10.29 (8.70)	9.13 (6.35)

Note. Highlighted comparisons significant at $p < .05$.

Consistent with prediction, among males, the planned comparison showed significantly reduced interference among low-anxious high-APSD males relative to low-anxious, low-APSD males, $t(77) = 1.76$, $p < .05$, one-tailed; Cohen's $d = .42$. (See Table III for mean interference scores).

Consistent with prediction, among females, the planned comparison showed significantly reduced interference among low-anxious high-APSD females relative to low-anxious low-APSD females, $t(66) = 2.31$, $p < .05$, one-tailed; Cohen's $d = .54$. Means are presented in Table III.

DISCUSSION

The results of this study provide preliminary support for the generalizability of the response modulation model to a community sample of low-anxious adolescents. The results clearly replicate prior research with adult offenders which demonstrates that low-anxious psychopathic male and female offenders experience significantly less interference on the PW task than low-anxious non-psychopathic offenders (e.g. Hiatt et al., 2004; Newman et al., 1997), and that low-anxious, psychopathic males commit significantly more passive avoidance errors (e.g., Newman & Schmitt, 1998) than low-anxious non-psychopathic males. The boys in the current sample who reported having relatively low levels of anxiety and relatively higher levels of psychopathic traits displayed the same differences in comparison to boys with relatively low levels of anxiety and psychopathic traits. This combination of poor passive avoidance and reduced interference is consistent with an automatic inhibitory deficit such as that predicted by the response modulation model. Results for the female adolescent participants also replicate the pattern of results obtained with adult psychopathic

Table III. PW Stroop Performance for Male and Female Participants

	Males $n = 160$				Females $n = 144$			
	Low-WAS		High-WAS		Low-WAS		High-WAS	
	Low APSD ($n = 54$) *M* (*SD*)	High APSD ($n = 25$) *M* (*SD*)	Low APSD ($n = 30$) *M* (*SD*)	High APSD ($n = 51$) *M* (*SD*)	Low APSD ($n = 50$) *M* (*SD*)	High APSD ($n = 21$) *M* (*SD*)	Low APSD ($n = 21$) *M* (*SD*)	High APSD ($n = 52$) *M* (*SD*)
PW Stroop Errors	.24 (.07)	.42 (.10)	.43 (.10)	.39 (.07)	.36 (.09)	.71 (.14)	.64 (.13)	.37 (.09)
Card 3 Response time	18.46 (2.65)	18.38 (3.06)	20.00 (3.59)	21.24 (4.84)	19.80 (3.60)	19.64 (2.92)	21.36 (3.89)	19.87 (4.18)
Card 4 Response time	15.13 (2.36)	16.14 (2.83)	17.38 (2.96)	17.15 (3.66)	15.50 (2.55)	16.99 (3.24)	16.80 (3.90)	16.56 (3.46)
PW Stroop Interference	3.33 (2.55)	2.24 (2.64)	2.61 (3.06)	4.09 (2.88)	4.30 (2.83)	2.65 (3.29)	4.56 (3.05)	3.31 (3.26)

Note. PW Stroop interference is calculated by subtracting Card 4 response time from Card 3 response time. Highlighted comparisons significant at $p < .05$.

females. Consistent with the predictions of the response modulation model and with findings for our male sample, low-anxious, relatively high APSD females demonstrated significantly less interference on the PW task than low-anxious, low APSD females. However, no significant group differences were observed in the go/no-go, passive avoidance task. While this result is inconsistent with the predictions of the response modulation model, it parallels the results obtained with psychopathic adult females.

In conjunction with prior research (e.g., Fisher & Blair, 1998, O'Brien & Frick, 1996), the results of this study provide evidence that low-anxious adolescents with relatively elevated APSD scores 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. Thus, the results provide evidence for the existence of an information processing deficit that may increase vulnerability to poor socialization and ineffective self-regulation in a community sample of adolescents who have not yet engaged in high levels of antisocial behaviors.

Importantly, this study also illustrates that the interpersonal, affective, and impulsivity traits associated with psychopathy can be used independently of severe antisocial behavior to identify a subgroup of individuals exhibiting the response modulation deficit. As a result, the study forges new ground in the examination of psychopathy in non-offender groups and provides a potential starting point for considering how deficits in response modulation may contribute to the eventual development of the more severe behavior problems associated with psychopathy in incarcerated adult samples.

According to the response modulation model, an individual with a response modulation deficit will be less likely to reflect on his or her ongoing behavior and, thus, less likely to alter that behavior in response to environmental feedback (Newman, 1998). A response modulation deficit will also decrease an individual's ability to learn from experience by interfering with his or her encoding of the conditions and behaviors that predict negative consequences (Patterson & Newman, 1993). Depending upon the stability of the problem, such a failure to pause, reflect, and learn from corrective experience during the early stages of development would likely hamper socialization and may, in conjunction with other personal and environmental factors, increase the risk that a child will develop adult psychopathy (see MacCoon et al., 2004; Patterson & Newman, 1993).

As noted, the finding that low-anxious adolescent girls with high APSD scores show deficits on the PW Stroop task is consistent with the presence of response modulation deficits. However, their normal passive avoidance performance suggests that some of the consequences of this deficit may differ for this group. This pattern of results is consistent with findings for psychopathic adult females (Vitale et al., 2005; Vitale & Newman, 2001) and suggests that the discrepancies in the pattern of laboratory findings for males and females with response modulation deficits represents a reliable, systematic difference in the regulatory abilities of these individuals. The absence of a passive avoidance deficit among the low-anxious, relatively higher APSD females is also consistent with their failure to demonstrate significantly more externalizing behavior problems on the CBCL relative to the low-anxious, low-APSD females. Taken together, these findings highlight the need for further research to clarify apparent gender differences in self-regulation.

One possibility involves documented differences in socialization practices across gender that may encourage greater efforts at behavior regulation among girls than boys. For example, mothers of young girls rated as high in difficultness expend more effort in their interactions with their children than mothers of difficult young boys (Maccoby, Snow, & Jacklin, 1984); Girls receive more positive attention than boys when behaving in compliant ways (Kerig, Cowan, & Cowan, 1993); And mothers are more likely to respond to a daughter's moral transgressions, relative to a son's, by pointing out the negative consequences of the behavior on others (Smetana, 1989).

In summary, from a young age, girls are encouraged to consider the consequences of their actions, are reinforced for behaviors that do not impinge on the rights of others, and receive negative responses when they fail to control adequately their behavior (see also Gilligan, 1982; Keenan & Shaw, 1997). Thus, although a young female with a response modulation deficit should be at greater risk for engaging in impulsive, non-reflective behavior, existing social pressures and expectancies may increase the likelihood that she will develop and use compensatory strategies that offset this risk (see Verona & Vitale, in press).

Although these data provide preliminary evidence that the response modulation deficits observed among psychopathic adults are present among adolescents exhibiting the callous, maladaptive attitudes and disinhibited behavior indexed by the APSD, these data must be interpreted with caution. First, the number of adolescents reporting relatively lower levels of anxiety and higher levels of psychopathic traits was quite small and, thus, our significant findings are specific to a relatively small group of participants. Though relatively specific, these findings should not be construed as weak, however. The effect sizes for our planned comparisons ranged from a Cohen's d of.45 to.55 and thus qualify as medium effect sizes. In addition,

the present results replicate findings obtained with severe psychopathic offenders despite our use of a representative community sample and a median split on the ASPD, thus supporting the reliability of the findings. The fact that the predictions of the response modulation model apply to a relatively specific group of individuals is consistent with the field's current emphasis on parsing the heterogeneity of disinhibitory psychopathology (e.g., Brinkley et al., 2004; Hicks, Markon, Patrick, Krueger, & Newman, in press) and will increase our understanding of the specific processes contributing to the disinhibition of particular groups of individuals.

The second limitation involves our use of a median split on the APSD. Relative to their peers, the adolescents who obtained higher scores on the APSD possess higher levels of the emotional, interpersonal, and behavioral characteristics associated with adult psychopathy. Among low-anxious males, they also exhibited significantly greater numbers of externalizing behavior problems than their same-aged peers with lower APSD scores. Nevertheless, such individuals can not and should not be regarded as "psychopaths". Although this clearly limits our ability to draw conclusions concerning the prediction of adult psychopathy, it does not negate the fact that a processing deficit associated with adult psychopathy can be identified among adolescents who endorse callous, unemotional attitudes and who exhibit impulsive, often hostile behavior. Indeed, such findings may aid in clarifying who is at risk for developing adult psychopathy, based not upon antisocial behaviors alone, but upon complex developmental interactions involving information processing skills, personality traits, and environmental influences (Cicchetti & Richters, 1993). Moreover, as proposed by Gorenstein and Newman (1980) identification of adolescents with response modulation deficits may enable investigators to identify the social and environmental factors that interact with the deficit to influence later antisocial behavior.

The delineation of homogenous subgroups among adolescents with conduct problems enables the systematic investigation of the etiologic processes that underlie these problems and the development of theory-driven interventions to address them. However, the assessment of syndromes such as psychopathy in children and adolescents is a challenging endeavor–methodologically, theoretically, and ethically. Diagnoses of psychopathy carry with them associations of dangerous criminality, callous, remorseless attitudes, and isolation from normal emotional experiences. The traditional view that the behavioral and interpersonal problems associated with the syndrome are chronic and intractable only increases the potential dangers of labeling.

The current study, and others like it, however, offers a hopeful, alternative view. By specifying a cognitive/attentional deficit, the response modulation model moves away from categorizations like "psychopathy" as well as the associated connotation that these individuals are "evil" or "born bad". Instead, such research places emphasis on an information processing problem not unlike those associated with learning disabilities (Newman & Wallace, 1993). In doing so, the response modulation model not only offers new targets for intervention and treatment, but also works to alleviate some portion of the stigma historically attached to syndromes associated with disinhibited, antisocial behavior.

ACKNOWLEDGMENTS

This research was supported by grants MH57024, MH42498, and MH56961 awarded by the National Institute of Mental Health. The authors gratefully acknowledge the participating youths, families, teachers, and the many staff members who made this research possible.

REFERENCES

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4–18 and 1991 Profile*. Burlington, VT: University of Vermont.

Brinkley, C.A., Newman, J. P., Widiger, T. A., & Lynam, D. R. (2004). Two approaches to parsing the heterogeneity of psychopathy. *Clinical Psychology: Science & Practice*, *11,* 69–94.

Brinkley, C. A., Schmitt, W. A., Smith, S. S., & Newman, J. P. (2001). Construct validation of a self report psychopathy scale: Does Levenson's SRPS measure the same construct as Hare's PCL-R? *Personality and Individual Differences*, *31,* 1021–1038.

Cicchetti, D., & Richters, J. E. (1993). Developmental considerations in the investigation of conduct disorder. *Development & Psychopathology*, *5,* 331–344.

Dodge, K. A., Bates, J. E., & Pettit, G. S. (1990). Mechanisms in the cycle of violence. *Science*, *250,* 1678–1683.

Fisher, L., & Blair, R. J. R. (1998). Cognitive impairment and its relationship to psychopathic tendencies in children with emotional and behavioral difficulties. *Journal of Abnormal Child Psychology*, *26,* 511–519.

Eysenck, H. J. (1967). *The biological basis of personality*. Springfield, IL: Thomas.

Frick, P. J., & Hare, R. D. (2001). *The Antisocial Process Screening Device*. Toronto: Multi-Health Systems.

Gilligan, C. (1982). *In a different voice: Psychological theory and women's development*. Cambridge, MA: Harvard University Press.

Golinkoff, R. M., & Rosinski, R. R. (1976). Decoding, semantic processing, and reading comprehension skill. *Child Development*, *47,* 252–258.

Gorenstein, E. E., & Newman, J. P. (1980). Disinhibitory psychopathology: A new perspective and model for research. *Psychological Review*, *87,* 301–318.

Gray, J. A. (1991). Neural systems, emotion and personality. In J. Madden IV (Ed.), *Neurobiology of learning, emotion, and affect* (pp. 273–396). New York: Raven Press Ltd.

Hare, R. D. (1991). *Manual for the Hare Psychopathy Checklist-Revised*. Toronto, Ontario, Canada: Multi-Health Systems.

Hartung, C. M., Milich, R., Lynam, D. R., & Martin, C. A. (2002). Understanding the relations among gender, disinhibition, and disruptive behavior in adolescents. *Journal of Abnormal Psychology*, *111,* 659–664.

Hiatt, K. D., Schmitt, W. A., & Newman, J. P. (2004). Stroop tasks reveal abnormal selective attention among psychopathic offenders. *Neuropsychology*, *18,* 50–59.

Hicks, B. M., Markon, K. E., Patrick, C. J., Krueger, R. F., & Newman, J. P. (2004). *Identifying psychopathy subtypes on the basis of personality structure. Psychological Assessment*, *16*, 276–278.

Hochhausen, N. M., Lorenz, A. R., & Newman, J. P. (2002). Specifying the impulsivity of female inmates with borderline personality disorder. *Journal of Abnormal Psychology*, *111,* 495–501.

Hollingshead, A. A. (1979). *Four-factor index of social status*. Unpublished manuscript, Yale University, New Haven, CT.

Keenan, K., & Shaw, D. (1997). Developmental and social influences on young girls' early problem behavior. *Psychological Bulletin*, *121,* 95–113.

Kerig, P. K., Cowan, P. A., & Cowan, C. P. (1993). Marital quality and gender differences in parent-child interaction. *Developmental Psychology*, *29,* 931–939.

Kosson, D. S., Smith, S. S., & Newman, J. P. (1990). Evaluating the construct validity of psychopathy in Black and White male inmates: Three preliminary studies. *Journal of Abnormal Psychology*, *99,* 250–259.

Kosson, D. S., Suchy,Y., Mayer, A. R., & Libby, J. (2002). Facial affect recognition in criminal psychopaths. *Emotion*, *2,* 398–411.

Lykken, D. T. (1957). A study of anxiety in the sociopathic personality. *Journal of Abnormal Psychology*, *55,* 6–10.

Lykken, D. T. (1995). *The antisocial personalities*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Maccoby, E. E., Snow, M. E., & Jacklin, C. N. (1984). Children's dispositions and mother-child interaction at 12 and 18 months: A short-term longitudinal study. *Developmental Psychology*, *20,* 458–472.

MacCoon, D., Wallace, & Newman, J. P. (2004) Self-regulation: The context-appropriate allocation of attentional capacity to dominant and non-dominant cues. In R. F. Baumeister & K. D. Vohs, (Eds.) *Handbook of self-regulation research*. NY, NY: Guilford Press.

McCarthy, D. M., Kroll, L. S., & Smith, G. T. (2001). Integrating disinhibition and learning risk for alcohol use. *Experimental & Clinical Psychopharmacology*, *9,* 389–398.

Mednick, S. A., & Christiansen, K. O. (1977). *Biosocial bases of criminal behavior*. Oxford, England: Gardner Press.

Moffitt, T. E., Caspi, A., Rutter, M., & Silva, P. A. (2001). *Sex differences in antisocial behavior*. London: Cambridge University Press.

Moses, J.A, Ratliff, R. G., & Ratliff, A. R. (1979). Discrimination learning of delinquent boys as a function of reinforcement contingency and delinquent subtype. *Journal of Abnormal Child Psychology*, *7,* 443–453.

Newman, J. P. (1998). Psychopathic behavior: An information processing perspective. In D. J. Cooke, A. E. Forth, & R. D. Hare (Eds.), *Psychopathy: Theory, research and implications for society* (pp. 81–104). Boston: Kluwer Academic Publishers.

Newman, J. P., & Kosson, D. S. (1986). Passive avoidance learning in psychopathic and nonpsychopathic offenders. *Journal of Abnormal Psychology*, *96,* 257–263.

Newman, J. P., & Lorenz, A. R. (2003). Response modulation and emotion processing: Implications for psychopathy and other dysregulatory psychopathology. In R. J. Davidson, K. Scherer, & H. H. Goldsmith (Eds.), *Handbook of affective sciences* (pp. 1043–1067). London: Oxford University Press.

Newman, J. P., Patterson, C. M., Howland, E. W., & Nichols, S. L. (1990). Passive avoidance in psychopaths: The effects of reward. *Personality and Individual Differences*, *11,* 1101–1114.

Newman, J. P., & Schmitt, W. A. (1998). Passive avoidance in psychopathic offenders: A replication and extension. *Journal of Abnormal Psychology*, *107,* 527–532.

Newman, J. P., Schmitt, W. A., & Voss, W. (1997). Processing of contextual cues in psychopathic and nonpsychopathic offenders. *Journal of Abnormal Psychology*, *106,* 563–575.

Newman, J. P., & Wallace, J. F. (1993). Diverse pathways to deficient self-regulation: Implications for disinhibitory psychopathology in children. *Clinical Psychology Review*, *13,* 690–720.

Newman, J. P., Widom, C. S., & Nathan, S. (1985). Passive avoidance in syndromes of disinhibition: Psychopathy and extraversion. *Journal of Personality and Social Psychology*, *48,* 1316–1327.

Nigg, J. T. (2000). On inhibition/disinhibition in developmental psychopathology: Views from cognitive and personality psychology and a working inhibition taxonomy. *Psychological Bulletin, 126, 220–246. American Psychological Assn, US*

O'Brien, B. S., & Frick, P. J. (1996). Reward dominance: Associations with anxiety, conduct problems, and psychopathy in children. *Journal of Abnormal Child Psychology*, *24,* 223–240.

Patterson, C. M., & Newman, J. P. (1993). Reflectivity and learning from aversive events: Toward a psychological mechanism for the syndromes of disinhibition. *Psychological Review*, *100,* 716–736.

Pettit, G. S., Laird, R. D., Dodge, K. A., Bates, J. E., & Criss, M. M. (2001). Antecedents and behavior-problem outcomes of parental monitoring and psychological control in early adolescence. *Child Development*, *72*(2), 583–598.

Rosinski, R. R., Golinkoff, R. M., & Kukish, K. S. (1975). Automatic semantic processing in a picture-word interference task. *Child Development*, *46,* 247–253.

Sattler, J. M. (1990). *Assessment of children* (3 ed.). San Diego: Jerome M. Sattler., Publisher.

Schmauk, F. J. (1970). Punishment, arousal, and avoidance learning in sociopaths. *Journal of Abnormal Psychology*, *76,* 325–335.

Schmitt, W. A., & Newman, J. P. (1999). Are all psychopathic individuals low-anxious? *Journal of Abnormal Psychology*, *108,* 353–358.

Segarra, P., Molto, J., & Torrubia, R. (2000). Passive avoidance learning in extraverted females. *Personality and Individual Differences*, *29,* 239–254.

Siegel, R. A. (1978). Probability of punishment and suppression of behavior in psychopathic and nonpsychopathic offenders. *Journal of Abnormal Psychology*, *87,* 514–522.

Smetana, J. G. (1989). Toddlers' social interactions in the context of moral and conventional transgressions in the home. *Developmental Psychology*, *25,* 499–509.

Thornquist, M. H., & Zuckerman, M. (1995). Psychopathy, passive avoidance learning, and basic dimensions of personality. *Personality and Individual Differences*, *19,* 525–534.

Trasler, G. (1978). Relations between psychopathy and persistent criminality: Methodological and theoretical issues. In R. D. Hare & D. Schalling (Eds.), *Psychopathic behavior: Approaches to research* (pp. 273–298). New York: Wiley.

Verona, E., & Vitale, J. E. (2004). *Psychopathy in women: Prevalence, assessment, and etiology*, manuscript submitted for publication.

Vitale, J. E., Brinkley, C. A., Hiatt, K. D., & Newman, J. P. (2005). *The response modulation hypothesis and psychopathy: Evidence from psychopathic female offenders*. Manuscript submitted for publication.

Vitale, J. E., MacCoon, D. G., & Newman, J. P. (2005). *Psychopathic females: Tests of validity in three domains*. Manuscript in preparation.

Vitale, J. E., & Newman, J. P. (2001). Response perseveration in psychopathic women. *Journal of Abnormal Psychology*, *110,* 644–647.

Vitale, J. E., Smith, S. S., Brinkley, C. A., & Newman, J. P. (2002). The reliability and validity of the Psychopathy Checklist-Revised in a sample of female offenders. *Criminal Justice and Behavior*, *29,* 202–231.

Welsh, G. S. (1956). Factor dimensions A and R. In G. S. Welsh & W. G. Dahlstrom (Eds.), *Basic readings on the MMPI in psychology and medicine* (pp. 264–281). Minneapolis: University of Minnesota Press.