The Relationships between Academic Achievement and the Independent Functioning, Emotion Regulation, and Decision Making Components of Developmental Immaturity among Adolescent Girls in Residential Juvenile Justice Facilities

A Thesis Submitted to the Faculty of Drexel University

By Emily Hannah Haney-Caron in partial fulfillment of the requirements for the degree of Master of Science in Clinical Psychology

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Dedications

To the people in my life who reminded me that this process, though difficult, was not actually insurmountable. You know who you are.
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Abstract
The Relationships between Academic Achievement and the Independent Functioning, Emotion Regulation, and Decision Making Components of Developmental Immaturity among Adolescent Girls in Residential Juvenile Justice Facilities

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Developmental immaturity (DI) may help explain some of the variability in aspects of academic achievement among girls in the juvenile justice system, a population with high rates of truancy, dropout, and school failure. This study examined the relationships among the independent functioning, emotion regulation, and decision making components of DI, verbal intelligence (VIQ), and academic achievement among girls in residential juvenile justice facilities. Additionally, this study examined self-reported school attendance and number of previous arrests as possible mediators of the relationship between DI and academic achievement. Multiple regression analyses indicated that the DI construct of decision making moderated the relationship between VIQ and academic achievement. Research and policy implications for understanding predictors of academic success in this population are discussed, as are practical implications related to intervention efforts that incorporate the identified risk and protective factors.
CHAPTER 1: BACKGROUND

Youth in juvenile justice settings struggle with school. Compared with their non-justice-involved peers, they are more likely to drop out (Coalition for Juvenile Justice, 2001), to have been expelled or suspended before entering custody (Sedlak & McPherson, 2010), and to perform behind grade level (Foley, 2001). They are often years behind grade-level on standardized tests of academic achievement, leading to frequent course failures and repeated grade retention (Foley, 2001). Additionally, educational difficulties and weak commitment to school are risk factors for delinquency, behavior problems, violence, and crime (Sedlak & McPherson, 2010), which may partially explain the relationships between delinquency and suspensions, expulsions, and school drop-out rates.

A strong empirical basis underlies the relationship between school attendance or drop-out and delinquency, but less attention has been paid to the relationship between academic abilities and delinquency. Delinquent involvement appears to be associated with lower intelligence (IQ) scores, independent of socioeconomic status (SES), race, and method of measuring delinquency (Moffitt & Silva, 1988). On average, delinquent youth score eight IQ points lower than their non-delinquent counterparts from similar SES groups and schools (Lynam, Moffitt, & Stouthamer-Loeber, 1993), and studies have reported a range of average IQ scores from 78-86 for detained youth (Bove, Goldstein, Appleton, & Thomson, 2003; Grisso et al., 2003; Viljoen & Roesch, 2005), with particular deficits in Verbal IQ (VIQ) (Bove et al., 2003; Viljoen & Roesch, 2005). Additionally, intelligence is regarded as a protective factor against delinquency (White,
Moffitt, & Silva, 1989). Although this relationship exists, the reasons for it are unclear, and little is known about how VIQ and delinquency are related to academic achievement.

VIQ may be especially important in understanding the links among delinquency, IQ, and academic achievement. Delinquency is more strongly correlated to VIQ than to Performance IQ (PIQ), and youth engaged in delinquent behavior tend to score much lower on tests of VIQ than PIQ (Lynam et al., 1993). Theories of the protective effects of IQ suggest that low VIQ, in particular, may be linked to poor self-control and irresponsible behavior, aspects of immaturity that may be particularly relevant among delinquent youth (White et al., 1989). Additionally, in justice-involved populations, VIQ is linked to functional abilities, such as understanding of Miranda rights, whereas PIQ is not (Colwell et al., 2005). Finally, deficits in language processing are well established among juvenile justice populations, and these deficits have been identified as uniquely important to the understanding of juvenile delinquency (LaVigne, 2011). Therefore, this study examines VIQ and its relationship to Developmental Immaturity and academic achievement.

1.1 Delinquency, Intelligence, and Academic Achievement

Research has been conducted on the relationships between delinquency and academic achievement, delinquency and IQ, and IQ and academic achievement in non-delinquent samples. To our knowledge, no studies have examined the relationship between IQ and academic achievement among justice-involved youth, let alone the relationships among IQ, academic achievement, and delinquency. Clearly, academic achievement is associated with IQ, but, even among non-delinquent samples, the two are not synonymous. Some of the variability in academic achievement can be explained by
executive functioning (Best, Miller, & Naglieri, 2011), attentional difficulties (Barriga et al., 2002), social connections and romantic relationships (Giordano, Phelps, Manning, & Longmore, 2008), parenting (Steinberg, Elmen, & Mounts, 1989), substance use (Sanders, Field, & Diego, 2001), physical activity and obesity (Kantomaa et al., 2013), low birth weight (Litt et al., 2012), and folate intake (Nilsson, Yngve, Böttiger, Hurtig-Wennlöf, & Sjöström, 2011). Additionally, there seems to be a genetic component to academic achievement; however, the genetic effect may interact with SES, and students from higher SES groups may have more opportunities to develop intellectual abilities when genetically primed to do so (Tucker - Drob & Harden, 2012). Additionally, the influence of such factors as peer influence, SES, and parenting style may depend on cultural background (Yu & Patterson, 2010). Although many factors have been identified, much of this variability in academic functioning has been unexplored among delinquent youth, a group at particularly high risk for school failure and academic difficulties (Coalition for Juvenile Justice, 2001; Foley, 2001; Sedlak & McPherson, 2010).

A number of factors also are associated with the relationship between delinquency and IQ, including familial factors (Offord & Poushinsky, 1981), race and social class (Ward & Tittle, 1994), attitudes towards school (Ward & Tittle, 1994), effort (Lynam et al., 1993), and behavioral impulsivity (Lynam et al., 1993). For instance, low IQ may indirectly increase risk for delinquency by increasing susceptibility to deviant peer pressure and decreasing the development of self-control (McGloin, Pratt, & Maahs, 2004). Although most youth in the juvenile justice system have below average VIQ scores (Bove et al., 2003; Grisso et al., 2003; Viljoen & Roesch, 2005) and exhibit below
average school performance (Foley, 2001), there are pronounced individual differences and, likely, a variety of explanatory variables.

Compounding the links among delinquency, VIQ, and academic achievement, youth involved in the juvenile justice system often fail to receive adequate schooling. Many justice-involved youth are from neighborhoods with limited resources, including poor quality schools (Case & Katz, 1991; Kling, Ludwig, & Katz, 2005). Indeed, there is some indication that students from “failing” schools may be more likely to engage in delinquent behaviors, placing these youth at risk for entering the justice system (Smith, 2000). Once youth enter juvenile justice facilities, the education provided may not meet youths’ needs. States have demonstrated great difficulty implementing adequate education and special education services within residential juvenile correctional facilities; 11 states were sued between 1993 and 2006 for failing to meet educational standards in juvenile justice settings (Platt, Casey, & Faessel, 2006). The failure of schools in serving justice-involved youth is illustrated further by the small proportion of youth returning to school after release from juvenile justice facilities—the majority do not return to any educational academic program after release, and less than 2% return to school and graduate (Coffey & Gemignani, 1994). Even for those youth who continue to attend school, the transition from a neighborhood school to detention to a post-adjudication facility and then back to a neighborhood or alternative school disrupts the schooling and learning processes, as youth must begin anew at each location with new teachers and different curricula. School quality and continuity, then, may be additional links between delinquency and poor academic achievement.
Given the variety of factors related to academic achievement and the established link between delinquency and poor academic outcomes, academic achievement in justice-involved populations should be examined. VIQ also should be considered in such an evaluation to assess whether below average VIQ scores of justice-involved youth may account for their low academic achievement. For youth with high levels of delinquency and low VIQ scores, academic achievement may be particularly low. Therefore, it is important to examine the relationship between VIQ and academic achievement among justice-involved youth. However, this relationship may be influenced by developmental immaturity, as well.

1.2 Developmental Immaturity

DI is characterized by incomplete development of abilities in independent functioning, emotional regulation, decision making, and general cognitive processing (Kemp, 2010). Independent functioning includes self-reliance and self-concept (Kemp, 2010). Emotion regulation describes the abilities to identify, express, and manage positive and negative emotions, both one’s own and those of others (Kemp, 2010). Decision making involves recognition of short- and long-term consequences, ability to delay gratification, response inhibition, and impulse control, skills which are related to executive functioning (Kemp, 2010). General cognitive processing also is related to executive functioning and involves processing speed, memory, and attention, as well as the ability to learn from teaching (Kemp, 2010).

Psychosocial maturity is a construct related to DI, and it has received more research attention. The construct of psychosocial maturity was conceived in 1974 in an attempt to broaden the conceptualization of development beyond the narrow area of
cognitive functioning (Greenberger & Sørensen, 1974). The psychosocial maturity construct has evolved and is now conceptualized as maturity of judgment, which has three components: perspective, temperance, and responsibility (Elizabeth Cauffman & Steinberg, 1995). Perspective encompasses the ability to see another’s point of view, conduct a cost-benefit analysis, and consider both the short- and long-term consequences of a decision. Temperance involves sensation seeking, impulsivity, and the ability to manage positive and negative emotional states. Responsibility involves the ability to function autonomously and the development of an independent identity (Elizabeth Cauffman & Steinberg, 1995). These three psychosocial maturity components are subsumed within the four-factor model of DI. Specifically, perspective and temperance are accounted for by the decision making and emotion regulation factors of DI, and responsibility is captured by the independent functioning factor of DI. However, the emotion regulation aspect of DI is broader than the emotional aspects of psychosocial maturity, and the general cognitive processing component of DI was not addressed directly within the construct of psychosocial maturity. Psychosocial maturity emphasized maturity of judgment, and DI captures a wider range of development that may be relevant to a wider range of decision making, as well as to academic achievement and school performance.

Although the cognitive processing aspect of DI seems likely to strongly relate to VIQ and to academic achievement, cognitive processing information was not collected in this study, as data collection began before the four-factor model of DI was identified. As a result, this study will examine the other three factors of DI, which broadly capture psychosocial maturity and emotion regulation. The omission of the cognitive processing
factor represents a limitation of the present study and an important target for future research.

1.3 Developmental Immaturity and Academic Achievement

Although aspects of DI, particularly psychosocial maturity, have typically been considered within legal decision-making contexts (E. Cauffman & Steinberg, 2001; Colwell et al., 2005; Kruh & Grisso, 2012), the four DI factors may relate to a wide range of decision-making abilities, including those decision-making skills (e.g., delaying gratification, impulse control) needed to achieve academically. In terms of the relationship between DI and academic achievement, executive functioning, which is part of the decision making and cognitive functioning aspects of DI, has been most closely examined. Executive functioning is related to a wide range of academic abilities, and aspects of executive functioning (e.g., set-shifting, inhibition, attentional control, graphomotor speed and ability) correlate with academic achievement at a broad level, and with more specific performance in the areas of math achievement, reading level, and ability to complete complex tasks (Best, Miller, & Naglieri, 2011; Clark, Pritchard, & Woodward, 2010; Lan, Legare, Ponitz, Li, & Morrison, 2011; Mayes, Calhoun, Bixler, & Zimmerman, 2009). Executive functioning in girls ages 6-12 predicted academic achievement five years later (Miller & Hinshaw, 2010). The impact of undeveloped executive functioning on academic achievement may be compounded by other challenges faced by youth, including ADHD (Biederman et al., 2004), a diagnosis affecting 21% of detained female youth (Teplin et al., 2006), and depression (Favre et al., 2008), which affects 29% of detained girls (Fazel, Doll, & Långström, 2008). Overall, despite the large number of other factors also associated with academic achievement, the influence of
executive functioning on academic achievement is strong throughout childhood and adolescence, suggesting that the general cognitive processing component and aspects of the decision making component of DI may be especially relevant to academic achievement. The relationship between decision making and academic achievement is also supported by research showing that self-discipline (which is captured by the decision making factor of DI) is a better predictor of academic achievement than is IQ (Duckworth & Seligman, 2005).

The relationship between DI and IQ has not been well studied, and, to our knowledge, there have been no studies evaluating the relationship between DI and academic achievement. Only one study examined the relationship between DI and IQ, producing non-significant results (Goodman, 1995). However, the authors conceptualized DI as a combination of social disinhibition, articulation problems, clumsiness, overactivity, restlessness, and fidgetiness (Goodman, 1995). The construct they measured seems unrelated to the statistically derived four-factor model of DI, generated more recently. Consequently, the relationship between DI and academic achievement has yet to be examined using a modern conceptualization of this broad developmental construct.

When looking at the narrower concept of psychosocial maturity, maturity correlated positively with IQ (Galambos, MacDonald, Naphtali, Cohen, & de Frias, 2005) and academic achievement (Berzonsky & Kuk, 2005) among community samples. Despite some initial suggestion by these studies of relationships between maturity and IQ and between maturity and academic achievement, each study conceptualized and operationalized psychosocial maturity differently. For instance, one study viewed it as a
combination of subjective age, problem behavior, self-reliance, identity, and work orientation (Galambos, MacDonald, Naphtali, Cohen, & de Frias, 2005), another as academic autonomy, educational purpose, and social skills (Berzonsky & Kuk, 2005), and the third as efficacy, perseverance, planfulness, responsibility, individualism, and cooperativeness (Inkeles & Leiderman, 1998). None of these conceptualizations seem closely related to Kemp’s (2010) empirically derived four-factor model of DI. Additionally, to date, no study has included both academic achievement and IQ when examining the relationships with maturity.

Thus, a study addressing the relationship between academic achievement and DI should: 1) include the empirically-derived factors of DI, and 2) include IQ (most importantly, VIQ) as a control and/or moderating variable. Additionally, the relationship between DI and academic achievement may not be direct, so it is important to account for other variables (e.g., school attendance) that may play roles in this relationship.

1.4 The Current Study

DI may play an especially strong role in academic achievement among youth in juvenile justice placements. Academic success among justice-involved youth may implicate all four aspects of DI. Independent functioning is necessary to resist peer influence, which is particularly important because academic achievement can be influenced by peer performance (Giordano et al., 2008). In a juvenile justice facility, youth are confined with peers who may be less likely to value homework or academic success (Ward & Tittle, 1994). Decision making is critical for school success because succeeding in school requires delaying short-term gratification to attain longer-term gains and resisting behaviors that might interfere with educational opportunities. Among a
population that tends to struggle with school (Foley, 2001; Sedlak & McPherson, 2010), emotion regulation may be particularly important for managing the frequent negative emotions associated with poor school performance. Thus, this study will explore the relationships between three of the four DI factors and academic achievement among a sample of adolescent girls in residential, juvenile justice facilities.

Research on justice-involved youth has largely focused on boys, as boys account for nearly three-quarters of delinquency cases (Sickmund, Sladky, & Kang, 2013). However, arrests of girls have been on the rise for at least two decades, and girls make up an increasing proportion of justice-involved youth (Wu, June 2010). Additionally, academic performance is an important area for study, as female juvenile offenders generally report having failed at least one grade in school (Fejes-Mendoza, 1995). Girls in juvenile justice settings may be particularly at risk for poor academic functioning for several reasons, including their lower VIQ scores relative to delinquent boys (Bove et al., 2003); their increased risk of school drop out, even when controlling for a wide range of factors (e.g., attitudes, behavior, educational aspirations, academic performance, levels of drug use; Ellickson, Bui, Bell, & McGuigan, 1998; Rumberger, 1995); and the relationship between attachment to school and delinquency severity among girls but not boys (Anderson, Holmes, & Ostresh, 1999). Notably, girls tend to be placed in residential juvenile justice facilities at younger ages than do boys (Foley, 2001), which may mean that the impact of their delinquency and incarceration on their academic success may be greater. Conversely, girls’ school success is a protective factor for most types of crimes, and school connectedness is particularly protective for girls who have experienced physical assault (S. R. Hawkins, Graham, Williams, & Zahn, 2009), a trauma affecting
35–49% of female justice-involved youth (Abram et al., 2004; Ariga et al., 2008; Dixon, Howie, & Starling, 2005). Given the paucity of research with juvenile justice-involved girls (American Bar Association & National Bar Association, 2001; Zahn, Hawkins, Chiancone, & Whitworth, 2009) and indications from extant research that delinquent girls may be at even greater risk than delinquent boys for low VIQ and achievement-related difficulties, the current study focuses exclusively on girls who have been adjudicated delinquent and placed in residential facilities.

Given the high rates of school difficulties and the long-term negative outcomes associated with these problems among justice-involved girls, understanding the relationship between DI and academic achievement is important, and VIQ must be taken into account. An understanding of these relationships may identify risk/protective factors for poor academic achievement and inform the development of strategies for preventing poor academic performance and school drop out among female youth in residential juvenile justice facilities.

### 1.5 Hypotheses

1. VIQ scores will be positively associated with academic achievement.

2. VIQ and each developmental immaturity construct (i.e., independent functioning, emotional regulation, decision making) will interact to predict academic achievement. Specifically, the relationship between developmental immaturity and academic achievement will be stronger for individuals with higher VIQ scores than for individuals with lower VIQ scores.

3. If no interaction is present, it is expected that each developmental immaturity construct will be negatively associated with academic achievement, while
controlling for VIQ. In other words, greater maturity on each of the three DI factors will be associated with greater academic achievement.

a. Additionally, it is predicted that decision making will be more strongly correlated with academic achievement than will independent functioning or emotion regulation.

4. Self-reported poor attendance and number of previous arrests will mediate the relationship between each developmental immaturity construct and academic achievement. See Figure 1.

CHAPTER 2: METHODS

This study involves secondary analyses of pre-test data from a randomized control trial of the Juvenile Justice Anger Management (JJAM) Treatment for Girls (Goldstein et al., 2013), a manualized group intervention to alleviate anger and reduce aggression among adolescent girls in residential juvenile justice facilities.

2.1 Participants

Participants were 61 female youth who had been placed in one of three residential, juvenile justice facilities, two in New Jersey and one in Pennsylvania. Participants ranged in age from 14 to 19 years \((M = 16.95, SD = 1.33)\) and self-identified as Black or African American (59.02%), bi- or multi-racial (27.86%), White (9.84%), and Asian (3.33%); 31.15% identified as Hispanic.

For participation eligibility, youth needed to be between the ages of 12 and 19, be able to communicate in English, express interest in participating, and be placed at the facility for at least 90 days (i.e., to complete the RCT); if less that age 18, they needed a
parent/legal guardian with the authority to provide consent. Youth were excluded if they had a severe developmental or intellectual disability or active psychosis. Although 75 youth enrolled in the study via guardian/participant consent and youth assent, five youth did not complete the pre-test assessment because of either early release from the facility (N = 3) or refusal (N = 2), and 9 participants did not complete the reading and listening comprehension subtests used to evaluate this study’s hypotheses.

2.2 Procedures

Clinical staff members at each juvenile justice facility determined eligibility and approached each eligible youth to describe the study and ask whether she was interested in meeting with a research to hear more about the study. Participant consent was acquired from youth age 18 or older, and parental/guardian consent was sought for youth under age 18. Researchers made a “good faith effort” (i.e., five phone calls over three days) to contact parents/guardians for permission to enroll their children in the study. Youth assent was required for all youth, and the assent process was conducted in the presence of a facility-based participant advocate (e.g., social worker, youth advocate) when the parent/guardian consent requirement was waived because the designated adult could not be reached. Trained research assistants administered assessments in quiet rooms at each facility, and pre-test assessments required approximately four hours to complete. This study was approved by the University Internal Review Board.
2.3 Measures

The pre-test assessment battery included assessments across a wide range of domains (e.g., anger, aggression, mental health, peer relationships). Demographic, DI, VIQ, and academic achievement data are included in the present study.

Demographic Data. A demographic questionnaire was used to obtain information about age, race, ethnicity, self-reported school attendance rates prior to arrest, and information related to previous arrests.

Developmental Immaturity. Instruments were provided to address multiple facets of the DI construct. Notably, the four factor model of DI was identified several years into data collection, and, therefore, measures do not map directly onto each of the four underlying factors.

Cognitive Emotion Regulation Questionnaire (CERQ) (Garnefski, Kraaij, & Spinhoven, 2001). The CERQ was used to measure emotion regulation. It assesses nine coping strategies used in response to negative experiences: self-blame, acceptance, rumination, positive refocusing, refocus on planning, positive reappraisal, putting into perspective, catastrophizing, and blaming others. Participants answer, using a scale from one (“almost never”) to 5 (“almost always”), questions about how often the individual responds to negative events in different ways (e.g., “I think about how I can best cope with the situation”). Scores for each of the nine scales range from 4 to 20, and higher scores indicate greater reliance on the strategy. The CERQ has adequate internal consistency, with Chronbach’s alphas ranging from .68-.87, and adequate test-retest reliability, with coefficients ranging from .40-.65 (Garnefski & Kraaij, 2007; Garnefski et al., 2001)
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Consideration of Future Consequences Scale (CFC) (Strathman, Gleicher, Boninger, & Edwards, 1994). The CFC measures the degree, on a scale of one (“extremely uncharacteristic”) to five (“extremely characteristic”), to which individuals consider possible future consequences of their actions before acting and, if so, how they weigh future consequences with immediate consequences of their actions. It includes 12 items, such as, “My convenience is a big factor in the decisions I make or the actions I take.” Total scores can range from 12-60, and higher scores indicate greater consideration of future consequences. The CFC has good reliability; Chronbach’s alphas ranged from .80-.86, and test-retest reliability coefficients ranged from .72-.76. The CFC also has established convergent, predictive, and incremental validity (Strathman et al., 1994).

Weinberger Adjustment Inventory (WAI) (Weinberger & Schwartz, 1990). The WAI assesses socio-emotional adjustment, including self-experience of distress and self-restraint; for the purposes of this study, only the consideration of others, impulse control, and suppression of aggression subscales of the self-restraint scale were used. The WAI consists of 30 items scored on a five-point scale with which participants indicate the truth of each item for him/her (e.g., “Before I do something, I think about how it will affect the people around me”). The consideration of others, impulse control, and suppression of aggression subscales were used for this study. Higher scores represent better adjustment. The restraint scale has good internal consistency, with Chronbach’s alphas ranging from .72 to .91, and adequate test-retest reliability, with a correlation of .76 (Weinberger, 1997). The WAI also has demonstrated convergent, discriminant, concurrent, and predictive validity (Weinberger, 1997; Wentzel, Weinberger, Ford, & Feldman, 1990).
Psychosocial Maturity Inventory (PSM Form D) (Greenberger & Bond, 1976). The PSM has nine subscales measuring individual adequacy, interpersonal adequacy, and social adequacy, but for the purposes of this study, only the individual adequacy scale was used. It consists of self-reliance, identity, and work orientation subscales. The individual adequacy scale contains 30 items (e.g., “I change the way I feel and act so often that I sometimes wonder who the ‘real’ me is” [reverse coded]), which are answered using a scale ranging from 1 (“strongly agree”) to 4 (“strongly disagree”). Scores on each subscale range from 10 to 40, and higher scores indicate greater psychosocial maturity. The three relevant subscales have good internal consistency, with Chronbach alphas ranging from .73-.82 (Greenberger, Josselson, Knerr, & Knerr, 1975). The PSM also has excellent concurrent and divergent validity (E. Cauffman & Steinberg, 2001; Greenberger et al., 1975).

Intelligence and Academic Achievement

Wechsler Abbreviated Scale of Intelligence (WASI) (Wechsler, 1999). The vocabulary and similarities subtests of the WASI were administered; these subtests combine to yield a VIQ score. To limit the length of the assessment battery, only verbal subtests were administered to youth, as verbal abilities were expected to be more closely related than performance abilities to the variables of interest in the study. The WASI has well-established reliability and validity and is used extensively in clinical and research settings (Wechsler, 1999).

Wechsler Individual Achievement Test, Second Edition (WIAT) (Psychological Corporation, 2001). The reading and listening comprehension subtests of the WIAT were
administered. The WIAT has established reliability and validity, and is used extensively in clinical and research settings (Psychological Corporation, 2001).

2.4 Method of Analysis

The four-factor model of DI is relatively new, and much of the existing research on DI has examined only one of the four factors. Although measurement of the entire DI construct would be ideal, the four-factor construct of DI was identified several years into data collection; therefore, the full model was not assessed in the current study, and only three of the four DI constructs were included. As a result, we decided against creating an overall index of DI and, instead, decided to present each of the three available components of DI separately. Independent functioning was measured using the self-reliance, work, and identity subscales of the Psychosocial Maturity Inventory (PSM). Decision making was measured using the Consideration of Future Consequences Scale (CFC) as well as the consideration of others and impulse control subscales of the Weinberger Adjustment Inventory (WAI). Emotion regulation was measured using the Cognitive Emotion Regulation Questionnaire (CERQ) and the suppression of aggression subscale of the WAI.

Intelligence was measured using the vocabulary and similarities subtests of the WASI, which yielded VIQ scores. Targeted aspects of academic achievement were measured using the listening and reading comprehension subtests of the WIAT.

A series of multiple regression equations were calculated to evaluate whether VIQ moderated the relationships between the three available DI constructs and academic achievement. Data were centered prior to calculating product terms for use in examining the proposed interaction effects. In cases in which no significant interactions were
observed, a series of regression equations were used to evaluate whether DI was
negatively associated with academic achievement. In each regression analysis, one
measure of academic achievement (i.e., reading comprehension, listening
comprehension) was regressed on one measure of DI, controlling for VIQ. Assumptions
were evaluated prior to running analyses. Effect sizes for regression models were
evaluated using Cohen’s (1992) small, medium, and large conventions for $R^2$
values: .01, .09, and .25. Effect sizes associated with individual predictor variables
(including product terms) within regression equations were calculated using the formula,
$$f^2 = \frac{R^2_{\text{full model}} - R^2_{\text{model without product term}}}{1 - R^2_{\text{full model}}},$$
and interpreted using Cohen’s (1992) conventions for small, medium, and large effect size values of $f^2$: .02, .15, and .35.

Parallel mediation analyses were conducted using a nonparametric bootstrapping
approach to mediation (Hayes’s (2004) SPSS bootstrapping macro, using 10,000 re-
samples) which was used to evaluate whether self-reported poor attendance and self-
reported number of previous arrests mediated the relationship between each DI construct
and either reading or listening comprehension.

An a priori power analysis was conducted for the multiple regression analyses. A
sample size of 60 with an alpha level of .05 produced a power of .75 to detect a medium
effect size ($r = .3$) for the interaction between a single DI measure and a measure of
academic achievement, when the estimated effect sizes associated with the individual
predictor variables were also medium in size. There was a power of .66 to detect a
medium effect size for the interaction term even when the estimated effect size values of
the individual predictor variables were small ($r = .1$). The available sample size of 60
produced sufficient power for the mediation analyses, as bootstrapping can produce meaningful results even with samples as small as 25 participants (Rucker, Preacher, Tormala, & Petty, 2001).

Although we considered lowering alpha using a Bonferroni correction, hypotheses in this study were developed a priori and, therefore, that level of conservativeness was not warranted. Additionally, because this is the first study of its kind, it was important to ensure we would not miss meaningful relationships. Also, this study was already underpowered, and a Bonferroni correction would further reduce power. Although this lack of Bonferroni correction prevented Type II error, it calls for caution in the interpretation of results. Despite this general approach to analysis, because the CERQ includes nine scales, each of which needed to be analyzed separately, regression analyses examining the CERQ were conducted using an $\alpha$ level of .01 to account for the many analyses and the lack of specific predictions about the individual CERQ scales.

**CHAPTER 3: RESULTS**

Participants’ VIQ, reading comprehension, and listening comprehension scores fell in the below average range. Mean VIQ and reading comprehension scores were approximately one standard deviation below the population average, and mean listening comprehension scores were approximately more than 1.5 standard deviations below the population average, indicating that girls in the sample were performing below grade level and below non-justice involved peers. See Table 1.
VIQ correlated significantly with reading comprehension ($r = .74, p < .01$) and listening comprehension ($r = .66, p < .01$). Reading and listening comprehension scores were also strongly correlated ($r = .61, p < .01$).

3.1 Developmental Immaturity, Academic Achievement, and VIQ

Prior to data analysis, one outlier was identified in reading comprehension scores, a score of 129, and was removed from analyses, as it appeared to disproportionately influence statistics of the relationships between variables. Assumptions (i.e., homoscedasticity, normally distributed error term, uncorrelated predictor variables) were evaluated prior to analyses. Reading comprehension scores exhibited a minor positive skew, and the CERQ positive refocusing, CERQ positive reappraisal, and PSM self-reliance scales all exhibited minor negative skew. Further evaluation of normality revealed that several analyses produced residuals with significant kurtosis and/or skew values. This deviation from normality may have reduced efficiency of analyses, but should not have biased results. Thus, assumptions were sufficiently met to proceed with planned analyses, and the impact of the minor deviation from normality will be reviewed in the discussion section.

**Decision Making**

**Reading comprehension.** Three regression analyses were run in which reading comprehension scaled scores on the WIAT were regressed on each measure of decision making (WAI consideration of others, WAI impulse control, and CFC total), VIQ, and the interaction between the measure of decision making and VIQ. The relationship between reading comprehension and CFC scores was moderated by VIQ. $b_{CFC} = .37$, $SE(b)_{CFC} = .14, p_{CFC} = .01$; $b_{VIQ} = .58$, $SE(b)_{VIQ} = .07, p_{VIQ} < .01$; $b_{CFCxVIQ} = -.02$, $SE(b)_{CFCxVIQ} = .06, p_{CFCxVIQ} = .32$. 


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SE(b)_{CFCxVIQ} = .01, p_{CFCxVIQ} = .04; R^2 = .61 (large effect size). The relationship between reading comprehension scores and consideration of future consequences of behavior was stronger for those youth with the lowest IQ scores (i.e., the lowest performing one-third of the sample) than for youth who performed at or above average for the sample. See Figure 2.

A series of post-hoc one-way between-subjects ANOVAs were conducted to further evaluate the interaction and determine whether reading comprehension differed by IQ category (<80, 80-89, ≥90) at each CFC level (low = more than .05 SDs below the normative mean, medium = those within .5 SDs below and above the normative mean, high = more than .5 SDs above the mean; each CFC group contained one-third of youth in the sample). Significant differences in reading comprehension by VIQ were observed with youth with low (F(2,19) = 17.26, p < .01, η^2 = .68) and medium (F(2,20) = 5.67, p = .01, η^2 = .40) CFC scores, but not for youth with high (F(2,21) = 2.82, p = .24, η^2 = .24) CFC scores.\(^1\)

VIQ did not significantly moderate the relationship between WAI impulse control and reading comprehension, b_{Impulse Control} = 1.82, SE(b)_{Impulse Control} = .98, p_{Impulse Control} = .07; b_{VIQ} = .62, SE(b)_{VIQ} = .07, p_{VIQ} < .01; b_{ICxVIQ} = -.11, SE(b)_{ICxVIQ} = .09, p_{ICxVIQ} = .22; R^2 = .58 (large), f^2_{ICxVIQ} = .07 or between WAI consideration of others and reading comprehension, b_{Consideration of Others} = .60, SE(b)_{Consideration of Others} = 1.04, p_{Consideration of Others} = .57; b_{VIQ} = .62, SE(b)_{VIQ} = .08, p_{VIQ} < .01; b_{COxVIQ} = .001, SE(b)_{COxVIQ} = .09, p_{COxVIQ} = .99; R^2 = .55 (large), f^2_{COxVIQ} = .00.

\(^1\) Each of these effect sizes is large using Field’s (2005) conventions of small, medium, and large: .01, .06, and .14.
Two multiple regression equations were then calculated in which reading comprehension was regressed on each of the WAI subscales of impulse control and consideration of others, controlling for VIQ; significant results were not observed, $b_{\text{Impulse Control}} = 1.85$, SE($b_{\text{Impulse Control}}$) = .99, $p_{\text{Impulse Control}} = .07$; $b_{\text{VIQ}} = .63$, SE($b_{\text{VIQ}}$) = .07, $p_{\text{VIQ}} < .01$; $R^2 = .57$; $R^2_{\text{Adj}} = .55$ (large); $b_{\text{Consideration of Others}} = .60$, SE($b_{\text{Consideration of Others}}$) = 1.03, $p_{\text{Consideration of Others}} = .56$; $b_{\text{VIQ}} = .62$, SE($b_{\text{VIQ}}$) = .08, $p_{\text{VIQ}} < .01$; $R^2 = .55$; $R^2_{\text{Adj}} = .53$ (large).

**Listening comprehension.** Listening comprehension on the WIAT was regressed on each measure of decision making (the CFC, WAI consideration of others, and WAI impulse control), VIQ, and the interaction between the measure of decision making and VIQ. The relationships between scores on the three decision making measures and listening comprehension scores were not moderated by VIQ, $b_{\text{CFC} \times \text{VIQ}} = -.01$, SE($b_{\text{CFC} \times \text{VIQ}}$) = .02, $p_{\text{CFC} \times \text{VIQ}} = .41$; $R^2 = .45$ (large), $f^2_{\text{CFC} \times \text{VIQ}} = .05$. $b_{\text{Impulse Control}} = .54$, SE($b_{\text{Impulse Control}}$) = 1.29, $p_{\text{Impulse Control}} = .68$; $b_{\text{VIQ}} = .63$, SE($b_{\text{VIQ}}$) = .09, $p_{\text{VIQ}} < .01$; $b_{\text{IC} \times \text{VIQ}} = -.21$, SE($b_{\text{IC} \times \text{VIQ}}$) = .12, $p_{\text{IC} \times \text{VIQ}} = .08$; $R^2 = .47$ (large), $f^2_{\text{IC} \times \text{VIQ}} = .06$. $b_{\text{Consideration of Others}} = -2.11$, SE($b_{\text{Consideration of Others}}$) = 1.33, $p_{\text{Consideration of Others}} = .12$; $b_{\text{VIQ}} = .60$, SE($b_{\text{VIQ}}$) = .10, $p_{\text{VIQ}} < .01$; $b_{\text{CO} \times \text{VIQ}} = .09$, SE($b_{\text{CO} \times \text{VIQ}}$) = .11, $p_{\text{CO} \times \text{VIQ}} = .42$; $R^2 = .49$ (large), $f^2_{\text{CO} \times \text{VIQ}} = .06$. The simpler relationships between each of the three measures and listening comprehension were then examined, controlling for IQ; results were not significant, $b_{\text{CFC}} = -.06$, SE($b_{\text{CFC}}$) = .19, $p_{\text{CFC}} = .73$; $b_{\text{VIQ}} = .64$, SE($b_{\text{VIQ}}$) = .10, $p_{\text{VIQ}} < .01$; $R^2 = .44$; $R^2_{\text{Adj}} = .42$ (large). $b_{\text{Impulse Control}} = .60$, SE($b_{\text{Impulse Control}}$) = 1.32, $p_{\text{Impulse Control}} = .65$; $b_{\text{VIQ}} = .64$, SE($b_{\text{VIQ}}$) = .10, $p_{\text{VIQ}} < .01$; $R^2 = .44$; $R^2_{\text{Adj}} = .42$ (large); $b_{\text{Consideration of Others}} = -2.12$, SE($b_{\text{Consideration of Others}}$) = 1.31, $p_{\text{Consideration of Others}} = .11$; $b_{\text{VIQ}} = .57$, SE($b_{\text{VIQ}}$) = .10, $p_{\text{VIQ}} < .01$; $R^2 = .46$; $R^2_{\text{Adj}} = .44$ (large).
Emotion Regulation

Reading comprehension. Reading comprehension on the WIAT was regressed on each measure of emotion regulation (WAI suppression of aggression; nine CERQ scales), VIQ, and the interaction between the measure of emotion regulation and VIQ. The relationship between WAI suppression of aggression and reading comprehension scores was not moderated by VIQ, $b_{SA} = 1.73$, SE($b_{SA}$) = .79, $p_{SA} = .03$; $b_{VIQ} = .59$, SE($b_{VIQ}$) = .07, $p_{VIQ} < .01$; $b_{SAxVIQ} = -.13$, SE($b_{SAxVIQ}$) = .08, $p_{SAxVIQ} = .10$; $R^2 = .60$ (large), $f^2_{SAxVIQ} = .05$. The simpler relationship between WAI suppression of aggression and reading comprehension was then examined, and suppression of aggression significantly predicted reading comprehension scores, controlling for IQ, $b_{SA} = 1.64$, SE($b_{SA}$) = .80, $p_{SA} = .04$; $b_{VIQ} = .59$, SE($b_{VIQ}$) = .07, $p_{VIQ} < .01$; $R^2 = .58$; $R^2_{Adj.} = .56$ (large).

There was no significant interaction between scores on any of the nine CERQ scales and VIQ in predicting reading comprehension, ($p$s = .02-.95; range of $R^2 = .55$-.59 (all large). See Table 2 for full results. The simpler relationships between each CERQ subscale score and reading comprehension were then examined, controlling for VIQ; no significant relationships were found, ($p$s = .05-.83; range of $R^2_{Adj.} = .55$-.59 (all large). See Table 3 for full results.

Listening comprehension. Listening comprehension on the WIAT was regressed on each measure of emotion regulation (WAI suppression of aggression; nine CERQ scales), VIQ, and the interaction between the measure of emotion regulation and VIQ. The relationship between WAI suppression of aggression scores and listening comprehension was not significantly moderated by VIQ. $b_{SA} = 1.09$, SE($b_{SA}$) = 1.05, $p_{SA} = .30$; $b_{VIQ} = .61$, SE($b_{VIQ}$) = .09, $p_{VIQ} < .01$; $b_{SAxVIQ} = -.17$, SE($b_{SAxVIQ}$) = .10, $p_{SAxVIQ} = .10$. See Table 2 for full results.
.09; \( R^2 = .47 \) (large), \( f^2_{SAxVIQ} = .04 \). The simpler relationship between WAI suppression of aggression and listening comprehension was then examined, controlling for VIQ; results were not significant, \( b_{SA} = .98, SE(b)_{SA} = 1.06, p_{SA} = .36; b_{VIQ} = .62, SE(b)_{VIQ} = .09, p_{VIQ} < .01; R^2 = .45; R^2_{Adj.} = .43 \) (large).

There was no significant interaction between scores on any of the nine CERQ scales and VIQ in predicting listening comprehension, \( (p_s = .18-.99; \text{range of } R^2 = .44-.46 \) (all large). See Table 4 for full results. The simpler relationships between each CERQ subscale score and listening comprehension were then examined, controlling for VIQ; no significant relationships were found, \( p_s = .36-.95; \text{range of } R^2_{Adj.} = .42-.43 \) (all large). See Table 5 for full results.

**Independent Functioning**

**Reading comprehension.** Reading comprehension on the WIAT was regressed on each measure of independent functioning (PSM self-reliance, work, and identity subscales), VIQ, and the interaction between the measure of emotion regulation and VIQ. None of these analyses was significant, \( b_{Self-Reliance} = 1.83, SE(b)_{Self-Reliance} = 1.70, p_{Self-Reliance} = .29; b_{VIQ} = .56, SE(b)_{VIQ} = .08, p_{VIQ} < .01; b_{SRxVIQ} = .17, SE(b)_{SRxVIQ} = .13, p_{SRxVIQ} = .20; R^2 = .56 \) (large), \( f^2_{SRxVIQ} = .07. b_{Work} = 4.93, SE(b)_{Work} = 1.62, p_{Work} < .01; b_{VIQ} = .54, SE(b)_{VIQ} = .07, p_{VIQ} < .01; b_{WORKxVIQ} = .23, SE(b)_{WORKxVIQ} = .12, p_{WORKxVIQ} = .06; R^2 = .64 \) (large), \( f^2_{WORKxVIQ} = .06. b_{Identity} = 3.31, SE(b)_{Identity} = 1.56, p_{Identity} = .04; b_{VIQ} = .55, SE(b)_{VIQ} = .08, p_{VIQ} < .01; b_{IDENTITYxVIQ} = .15, SE(b)_{IDENTITYxVIQ} = .10, p_{IDENTITYxVIQ} = .14; R^2 = .58 \) (large), \( f^2_{IDENTITYxVIQ} = .02. \)

The simpler relationship between each subscale of the PSM and reading comprehension was then examined, controlling for VIQ, and the work subscale
found. \( b_{\text{work}} = 5.39, \ SE(b)_{\text{work}} = 1.64, p_{\text{work}} < .01; b_{\text{VIQ}} = .53, \ SE(b)_{\text{VIQ}} = .07, p_{\text{VIQ}} < .01; R^2 = .62; R^2_{\text{Adj.}} = .60 \) (large). No significant relationship was found between either the self-reliance or identity subscale and reading comprehension, \( b_{\text{Self-Reliance}} = 1.49, \ SE(b)_{\text{Self-Reliance}} = 1.69, p_{\text{Self-Reliance}} = .38; b_{\text{VIQ}} = .57, \ SE(b)_{\text{VIQ}} = .08, p_{\text{VIQ}} < .01; R^2 = .55; R^2_{\text{Adj.}} = .53 \) (large). \( b_{\text{Identity}} = 2.61, \ SE(b)_{\text{Identity}} = 1.50, p_{\text{Identity}} = .09; b_{\text{VIQ}} = .56, \ SE(b)_{\text{VIQ}} = .08, p_{\text{VIQ}} < .01; R^2 = .57; R^2_{\text{Adj.}} = .55 \) (large).

**Listening comprehension.** Listening comprehension on the WIAT was regressed on each measure of independent functioning (PSM self-reliance, work, and identity subscales), VIQ, and the interaction between the measure of emotion regulation and VIQ. None of these analyses were significant. \( b_{\text{Self-Reliance}} = 4.61, \ SE(b)_{\text{Self-Reliance}} = 2.15, p_{\text{Self-Reliance}} = .04; b_{\text{VIQ}} = .54, \ SE(b)_{\text{VIQ}} = .10, p_{\text{VIQ}} < .01; b_{\text{SRxVIQ}} = -.07, \ SE(b)_{\text{SRxVIQ}} = .16, p_{\text{SRxVIQ}} = .69; R^2 = .48 \) (large), \( \hat{p}_{\text{SRxVIQ}} = .00. b_{\text{Work}} = 1.48, \ SE(b)_{\text{Work}} = 2.36, p_{\text{Work}} = .53; b_{\text{VIQ}} = .61, \ SE(b)_{\text{VIQ}} = .10, p_{\text{VIQ}} < .01; b_{\text{WORKxVIQ}} = -.03, \ SE(b)_{\text{WORKxVIQ}} = .17, p_{\text{WORKxVIQ}} = .87; R^2 = .44 \) (large), \( \hat{p}_{\text{WORKxVIQ}} = .00. b_{\text{Identity}} = 4.18, \ SE(b)_{\text{Identity}} = 2.02, p_{\text{Identity}} = .04; b_{\text{VIQ}} = .57, \ SE(b)_{\text{VIQ}} = .10, p_{\text{VIQ}} < .01; b_{\text{IDENTITYxVIQ}} = -.04, \ SE(b)_{\text{IDENTITYxVIQ}} = .13, p_{\text{IDENTITYxVIQ}} = .75; R^2 = .49 \) (large), \( \hat{p}_{\text{IDENTITYxVIQ}} = .02. \)

The simpler relationship between each subscale of the PSM and listening comprehension was then examined, controlling for VIQ, and both the self-reliance and the identity subscales independently predicted listening comprehension, \( b_{\text{Identity}} = 4.37, \ SE(b)_{\text{Identity}} = 1.91, p_{\text{Identity}} = .03; b_{\text{VIQ}} = .56, \ SE(b)_{\text{VIQ}} = .10, p_{\text{VIQ}} < .01; R^2 = .48; R^2_{\text{Adj.}} = .47 \) (large) \( b_{\text{Self-Reliance}} = 4.74, \ SE(b)_{\text{Self-Reliance}} = 2.11, p_{\text{Self-Reliance}} = .03; b_{\text{VIQ}} = .53, \ SE(b)_{\text{VIQ}} = .10, p_{\text{VIQ}} < .01; R^2 = .48; R^2_{\text{Adj.}} = .46 \) (large). No significant relationship was found between the work subscale and listening comprehension when controlling for IQ,
\[ b_{\text{Work}} = 1.43, \ SE(b)_{\text{Work}} = 2.31, \ p_{\text{Work}} = .54; \ b_{\text{VIQ}} = .61, \ SE(b)_{\text{VIQ}} = .10, \ p_{\text{VIQ}} < .01; \ R^2 = .44; \ R^2_{\text{Adj.}} = .42 \text{ (large)}. \]

### 3.2 Self-Reported Poor School Attendance and Number of Previous Arrests

Because not all participants reported school attendance and previous arrest information, 58 participants were included in the mediation analyses. Among the participants who reported school attendance, days missed ranged from 0 to 190 \( (M = 77.00; SD = 70.00) \). Only 13.8\% of these participants reported not having missed any days of school. Number of previous arrests ranged from 0-6 \( (M = 1.97; SD = 1.74) \). Self-reported arrest history correlated significantly with reading comprehension \( (r = .30, p = .02) \) and listening comprehension \( (r = .32, p = .01) \). Reading \( (r = -.06, p = .66) \) and listening \( (r = -.13, p < .37) \) comprehension scores did not correlate significantly with self-reported school attendance. For all analyses examining whether self-reported school attendance and number of previous arrests mediated the relationship between a measure of DI and a measure of academic achievement, the 95\% bias corrected and accelerated confidence intervals were estimated to include zero, indicating no significant mediation effects (see Tables 6 and 7).

### CHAPTER 4: DISCUSSION

The current study examined the relationships among DI, VIQ, and academic achievement. The strength of the relationship between VIQ and academic achievement depended on decision making skills. Among girls with the least developed decision-making abilities (specifically in terms of ability to think about future consequences), verbal intelligence was strongly related to academic achievement, and girls with higher
verbal intelligence had the highest achievement levels. However, for girls with better-developed decision-making abilities, there was much less of a relationship between verbal intelligence and academic achievement.

This interaction suggests complicated relationships that must be interpreted within the context of youths’ juvenile justice-involvement. It is well established that low intelligence scores are a risk-factor for juvenile justice involvement (Lynam et al., 1993), and delinquent youth typically display low IQ scores (Bove et al., 2003; McGloin et al., 2004). Therefore, it is unsurprising that among typical juvenile-justice involved youth—those with low IQ scores—more mature decision-making abilities were associated with better academic skills. Success in school requires frequent decisions to study and engage in school, decisions that implicate delaying short-term gratification for longer-term gains. In contrast, it is rare that higher IQ youth who are successful in school are adjudicated delinquent and placed in residential facilities (Portnoy et al., 2013). When they are, these youth may have other problems, such as trauma histories, serious mental health difficulties, and, perhaps, immaturity of judgment, particularly as it relates to decision making. Similarly, justice-involved youth with IQ scores that place them in the average range for the general population (and, therefore, substantially higher than is typical among juvenile justice-involved youth) may be experiencing other difficulties that may lead them to exhibit lower levels of academic achievement. Such difficulties may include distractibility associated with post-traumatic stress symptoms, attention deficit hyperactivity disorder, learning disabilities, or psychosocial immaturity/DI, all characteristics present at elevated rates among youth in the juvenile justice system (Quinn, Osher, Poirier, Rutherford, & Leone, 2005; Teplin, Abram, McClelland, Dulcan,
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& Mericle, 2002). With that said, only one DI construct was significantly associated with academic achievement, which could suggest a false positive result given the high Type I error rate associated with so many analyses.

Taken as a whole, DI did not appear to play a substantial role in the relationship between VIQ and academic achievement. If this lack of significance is not due to Type II error, these findings may indicate that DI is not a useful construct for predicting or explaining academic achievement in justice-involved youth. Instead, the decision making factor of DI may be more appropriate to consider on its own, rather than using the construct of DI as a whole. Additionally, though DI did not significantly predict academic achievement, we found an unsurprisingly strong relationship between VIQ and academic achievement, and VIQ was significant in predicting reading and listening comprehension in every regression analysis controlling for VIQ. Therefore, attempts to improve academic achievement may more appropriately focus on improving cognitive development among at-risk youth.

Additionally, it is necessary to consider other important factors that might moderate the relationship between VIQ and academic achievement among justice-involved youth. A number of factors have been identified as explaining variability in academic achievement among non-justice-involved youth, including attentional difficulties (Barriga et al., 2002), social connections and romantic relationships (Giordano et al., 2008), parenting (Steinberg et al., 1989), substance use (Sanders et al., 2001), SES (Tucker - Drob & Harden, 2012), cultural background (Yu & Patterson, 2010), and neighborhood factors (Bowen, Bowen, & Ware, 2002). These same factors—particularly those factors that may be susceptible to intervention, such as attentional
difficulties and substance use—should be explored with justice-involved youth, as well. The interactions between several important variables may explain some of the variability in academic achievement among justice-involved youth and it may explain more of the heterogeneity in academic skills than does DI.

Although potentially due to insufficient power, the failure of independent functioning and emotion regulation to moderate the relationship between VIQ and academic achievement could suggest that greater independence, stronger identities, and emotional maturity do not make girls in residential juvenile justice placements more likely to focus on schoolwork. This is in contrast to research showing that, for non-justice involved youth, emotion regulation is related to academic achievement (Gumora & Arsenio, 2002), which may suggest that different factors are associated with academic achievement for justice involved youth than for youth in the general population. However, it is important to recognize that decreased efficiency as a result of violations of the normality assumption may mask any true effects that exist for the measures of independent functioning or for the measures of emotion regulation, and it may have compounded already insufficient power.

The finding that neither the number of previous arrests nor self-reported school attendance significantly mediated the relationship between any of the DI measures and either measure of academic achievement is somewhat surprising given the established link between juvenile delinquency and poor academic achievement (Foley, 2001). It seemed likely that underdeveloped decision making, emotion regulation, and independent functioning skills would influence youth decisions to skip school—such that lack of consideration of future consequences and ability to delay gratification, inability to
tolerate distressing feelings of school, and susceptibility to peer pressure would increase the likelihood of school absence—and that these absences, in turn, would interfere with academic achievement. Given the established relationship between school attendance and academic achievement, it may be that other important factors better account for failure to attend school by justice-involved youth than does DI—including family or parenting factors, learning disabilities (Murray, Goldstein, Nourse, & Edgar, 2000), school factors such as curriculum difficulty and teacher quality (Phillips, 1997), and even school building condition (Durán-Narucki, 2008).

Similarly, we expected to find that less mature decision making would result in illegal behavior (reflected in arrest history), which would, subsequently, interfere with schooling and academic achievement. Given previous research establishing the relationship between illegal behavior and poor academic achievement (Foley, 2001), the positive relationship we found between number of previous arrests and both reading and listening comprehension was unexpected. It is possible that this finding is related to the specific population targeted in this study—youth in post-adjudication facilities for at least three months. For youth in longer-term post-adjudication facilities, they must attend school daily, and there are rarely opportunities to miss class. As a result, those youth in post-adjudication facilities that have been arrested more times may have attended school more often. Additionally, schools in juvenile justice facilities should be tailored to the needs of adjudicated youth, needs that often include attentional issues (Teplin et al., 2006), learning disabilities (Quinn et al., 2005), and reading and listening comprehension abilities below grade level (Foley, 2001). Perhaps, such directed educational
programming may benefit these youth more than the educational programming provided in standard public schools.

Despite these findings, the self-report nature of number of previous arrests and school attendance represents a significant limitation, and inconsistencies or inaccuracies in this self-report data also may partially explain this deviation from anticipated results. Though similar research with at-risk youth commonly uses self-report measures of school attendance (Henry & Huizinga, 2007), to our knowledge there is no research on the accuracy of such self-report attendance data. Ultimately, given the lack of research on the accuracy of self-reported school attendance, there is no way to estimate the validity of this self-report data. School attendance may be consistently under- or over-reported, or could be inconsistently under- or over-reported based on other important characteristics, including DI. There is some suggestion in the literature that African American youth may underreport offense history (D. F. Hawkins, Laub, Lauritsen, & Cothern, 2000), and youth may be less likely to accurately report less serious offenses (Kazemian & Farrington, 2005). However, other research has concluded that the validity of self-report of offense history is sufficiently valid to be used in research (Thornberry & Krohn, 2000).

4.1 Limitations

Results should be interpreted within the context of study limitations. The inability to examine the general cognitive processing component of DI represents a significant limitation, especially given the likely strong relationships among general cognitive processing, IQ, and academic achievement. Additionally, the self-report nature of not only the DI measures, but also of number of previous arrests and school attendance, may decrease the meaningfulness of the results. However, given the importance of truancy in
this population, we determined that it was better to include the self-report measure than to omit the issue entirely. Finally, although the limited sample size may have decreased the ability to detect significance for small to medium effects, the large observed effect sizes were associated with the full regression models. The effect sizes for the interaction terms were small, which may indicate that most of the variability in academic achievement was explained by VIQ, not by developmental immaturity. Future studies should recruit larger samples to produce sufficient power to adequately examine the effects of both individual predictor variables and interaction terms.

4.2 Future Research

Nonetheless, to our knowledge, this study was the first to examine the relationships among DI, VIQ, and academic achievement among justice-involved youth. The finding that decision making moderated the relationship between VIQ and academic achievement, if replicated, may have important implications for identifying risk and protective factors for academic achievement among a particularly high-risk group. Results also may inform the development of strategies for preventing poor academic performance and school drop out among justice-involved female youth. For example, if future research supports the role of decision making ability in academic achievement, a focus on interventions to improve decision making (see Baron & Brown, 2012 for a review) may also improve academic achievement among these youth.

Theories of adolescent decision making and decision-making interventions are beyond the scope of the present article (see Fischhoff, 2008). Certainly, many decision-making interventions have been shown to be ineffective (Klein, 1997), and approaches to improving decision making need to continue to be refined. However, In non-academic
contexts, there is evidence that adolescent decision making can be improved by interventions providing decision-relevant information, helping adolescents identify situations in which various decisions can be made, and using cognitive rehearsal of advantageous decisions (e.g., Downs et al., 2004). Additionally, research suggests that asking individuals to predict how their decisions may impact their future outcomes can change their immediate decision-making processes (Wolf et al., 2009). If the results of the present study are replicated, it may be appropriate to devote resources to developing interventions to improve academically-related decision making in adolescence.

Future research should examine the relationships among VIQ, academic achievement, and DI as a broader construct that includes general cognitive processing. Measuring general cognitive processing should include neuropsychological measures to assess processing speed, memory, impulse control, and attentional abilities. Attempts should also be made to examine DI as a complete construct, which could include observational measures such as peer or adult reports of developmental immaturity. Additionally, future research should use official records to measure number of previous arrests and school attendance, rather than relying on self-report data, at least until research is available offering a clear indication of the validity of self-report data in these contexts. Furthermore, research should examine other potential mediators of the relationship between DI and academic achievement, including probation violations and time spent in residential juvenile justice facilities.
List of References


Table 1. VIQ scores on the WASI and Reading Comprehension and Listening Comprehension scores on the WIAT.

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Range</th>
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<tr>
<td>Verbal IQ</td>
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<td>11.67</td>
<td>57-110</td>
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<td>Reading Comprehension</td>
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<td>9.50</td>
<td>69-114</td>
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<tr>
<td>Listening Comprehension</td>
<td>75.85</td>
<td>11.10</td>
<td>53-99</td>
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Table 2. Interactions between scores on the nine CERQ scales and VIQ in predicting reading comprehension.

<table>
<thead>
<tr>
<th>CERQ scale</th>
<th>$b_{CERQ}$</th>
<th>$SE_{b_{CERQ}}$</th>
<th>$p_{CERQ}$</th>
<th>$b_{VIQ}$</th>
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<th>$p_{VIQ}$</th>
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<th>$SE_{b_{CERQ\times VIQ}}$</th>
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<th>$f^2_{CERQ\times VIQ}$</th>
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<td>.09</td>
<td>.56</td>
<td>.62</td>
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<td>&lt;.01</td>
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Table 3. Relationships between scores on the nine CERQ scales and reading comprehension, controlling for VIQ.

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<tr>
<th>CERQ scale</th>
<th>$b_{CERQ}$</th>
<th>$SE_{b_{CERQ}}$</th>
<th>$p_{CERQ}$</th>
<th>$b_{VIQ}$</th>
<th>$SE_{b_{VIQ}}$</th>
<th>$p_{VIQ}$</th>
<th>$R^2$</th>
<th>$R^2_{Adj}$</th>
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<tbody>
<tr>
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<td>.58</td>
<td>.07</td>
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<td>.58</td>
<td>.56</td>
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<td>.08</td>
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Table 4. Interactions between scores on the nine CERQ scales and VIQ in predicting listening comprehension.

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<th>CERQ scale</th>
<th>$b_{CERQ}$</th>
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<th>$p_{CERQ}$</th>
<th>$b_{VIQ}$</th>
<th>$SE_{b_{VIQ}}$</th>
<th>$p_{VIQ}$</th>
<th>$b_{CERQ\times VIQ}$</th>
<th>$SE_{b_{CERQ\times VIQ}}$</th>
<th>$p_{CERQ\times VIQ}$</th>
<th>$R^2$</th>
<th>$f^2_{CERQ\times VIQ}$</th>
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<td>.62</td>
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<td>-.003</td>
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Table 5. Relationships between scores on the nine CERQ scales and listening comprehension, controlling for VIQ.
Table 6. Analyses of mediation effects of the relationships between DI measures and reading comprehension, 95% confidence intervals.

<table>
<thead>
<tr>
<th>Predictor: DI Measure</th>
<th>Proposed Mediators 1 and 2: School Attendance and Previous Arrests</th>
<th>Proposed Mediator 1: School Attendance</th>
<th>Proposed Mediator 2: Previous Arrests</th>
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<td><strong>Decision Making</strong></td>
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<tr>
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<tr>
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<td>[-2.90, 0.18]</td>
<td>[-1.01, 0.26]</td>
<td>[-2.83, 0.13]</td>
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<tr>
<td><strong>Emotion Regulation</strong></td>
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</tr>
<tr>
<td>WAI Suppression of Aggression</td>
<td>[-1.39, 0.77]</td>
<td>[-0.58, 0.80]</td>
<td>[-1.42, 0.41]</td>
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<td>[-0.08, 0.14]</td>
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<td>[-0.09, 0.04]</td>
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<tr>
<td>CERQ Rumination</td>
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<td>[-0.09, 0.02]</td>
<td>[-0.13, 0.09]</td>
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<tr>
<td>CERQ Positive Reframing</td>
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<td>[-0.09, 0.08]</td>
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<tr>
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<td>[-0.07, 0.02]</td>
<td>[-0.08, 0.12]</td>
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<tr>
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<td>[-0.07, 0.02]</td>
<td>[-0.11, 0.11]</td>
</tr>
<tr>
<td>CERQ Putting into Perspective</td>
<td>[-0.13, 0.11]</td>
<td>[-0.07, 0.06]</td>
<td>[-0.13, 0.08]</td>
</tr>
<tr>
<td>CERQ Catastrophizing</td>
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<td>[-0.07, 0.06]</td>
<td>[-0.09, 0.14]</td>
</tr>
<tr>
<td>CERQ Blaming Others</td>
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<td>[-0.03, 0.08]</td>
<td>[-0.03, 0.34]</td>
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<tr>
<td><strong>Independent Functioning</strong></td>
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<tr>
<td>PSM Self-Reliance</td>
<td>[-0.50, 3.10]</td>
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Table 6 (continued)

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</table>

*Significant when the Confidence Interval does not include 0
Table 7. Analyses of mediation effects of the relationship between DI measures and listening comprehension, 95% confidence intervals.

<table>
<thead>
<tr>
<th>Predictor: DI Measure</th>
<th>Proposed Mediators 1 and 2: School Attendance and Previous Arrests</th>
<th>Proposed Mediator 1: School Attendance</th>
<th>Proposed Mediator 2: Previous Arrests</th>
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<td>Decision Making</td>
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<tr>
<td>CFC</td>
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<td>[-0.04, 0.17]</td>
<td>[-0.28, 0.14]</td>
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<tr>
<td>WAI Consideration of Others</td>
<td>[-2.47, 0.15]</td>
<td>[-1.07, 0.17]</td>
<td>[-2.42, 0.10]</td>
</tr>
<tr>
<td>WAI Impulse Control</td>
<td>[-3.34, 0.15]</td>
<td>[-1.48, 0.26]</td>
<td>[-2.94, 0.03]</td>
</tr>
<tr>
<td>Emotion Regulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WAI Suppression of Aggression</td>
<td>[-1.10, 1.21]</td>
<td>[-0.31, 1.35]</td>
<td>[-1.19, 0.48]</td>
</tr>
<tr>
<td>CERQ Self-Blame</td>
<td>[-0.11, 0.11]</td>
<td>[-0.09, 0.02]</td>
<td>[-0.09, 0.11]</td>
</tr>
<tr>
<td>CERQ Acceptance</td>
<td>[-0.16, 0.07]</td>
<td>[-0.14, 0.01]</td>
<td>[-0.12, 0.07]</td>
</tr>
<tr>
<td>CERQ Rumination</td>
<td>[-0.15, 0.10]</td>
<td>[-0.13, 0.02]</td>
<td>[-0.13, 0.10]</td>
</tr>
<tr>
<td>CERQ Positive Reframing</td>
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<td>[-0.02, 0.07]</td>
<td>[-0.09, 0.08]</td>
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<tr>
<td>CERQ Refocusing</td>
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<tr>
<td>CERQ Putting into Perspective</td>
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<td>[-0.13, 0.08]</td>
</tr>
<tr>
<td>CERQ Catastrophizing</td>
<td>[-0.13, 0.10]</td>
<td>[-0.15, 0.02]</td>
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<tr>
<td>CERQ Blaming Others</td>
<td>[-0.04, 0.29]</td>
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<tr>
<td>Independent Functioning</td>
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<tr>
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Table 7 (continued)

<table>
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<th>PSM Identity</th>
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<td></td>
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<td>[-0.12, 3.02]</td>
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</tbody>
</table>

*Significant when the Confidence Interval does not include 0
Figure 1. Self-reported school attendance and number of previous arrests as proposed mediators between each DI measure and each measure of academic achievement.

Figure 2. The interaction between CFC scores and VIQ in predicting reading comprehension scores.