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Success in School for Justice-Involved Girls: Do Specific Aspects of Developmental Immaturity Matter?

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Abstract

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 decision making and independent functioning components of DI, verbal intelligence, and academic achievement within this population. Using data from 60 girls in residential juvenile justice facilities, multiple regression analyses indicated that verbal IQ moderated the relationship between the DI construct of decision making and academic achievement. Self-reported school attendance and number of previous arrests did not significantly mediate the relationship between DI and academic achievement. These results may indicate that the decision-making factor of DI may be particularly important, and, if results are replicated, future intervention efforts could focus more on improving this skill within this juvenile justice population. Additionally, the overall importance of the full DI construct is an important area of future study.

Keywords

developmental immaturity; academic achievement; juvenile justice; gender

Youth in juvenile justice settings struggle with school. Compared with their non-justice-involved peers, justice-involved youth 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 below grade level (Foley, 2001). They are often years below 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 related to delinquency, behavior problems, violence, and

crime (Sedlak & McPherson, 2010), which may partially explain the relationships between delinquency and suspensions, expulsions, and school drop out.

In addition to their high risk for school failure, educational difficulties, and premature academic termination (Coalition for Juvenile Justice, 2001; Foley, 2001; Sedlak & McPherson, 2010), youth involved in the juvenile justice system often fail to receive adequate education while in school. Many justice-involved youth are from neighborhoods with limited resources, including poor-quality schools (Case & Katz, 1991; Kling, Ludwig, & Katz, 2005). Additionally, when youth enter juvenile justice facilities, the education provided may not meet youths' needs; 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 fact that fewer than a third of eligible youth return to school after release from a juvenile justice facility, and few of those graduate; in fact, approximately 90% of youth with a history of juvenile justice placement drop out before graduation (Coffey & Gemignani, 1994; Keeley, 2006; Neild & Balfanz, 2006).

Given the established link between delinquency and poor academic outcomes, more research is needed examining academic achievement in justice-involved populations. Better understanding the correlates of academic achievement among justice-involved youth may establish a foundation for interventions to improve academic achievement and, in turn, enhance other long-term (e.g., employment, desistence from offending) outcomes for youth with histories of justice system involvement.

How to Explain Academic Achievement Difficulties Among Juvenile Justice-Involved Youth?

Researchers and policy advocates have long recognized the low levels of academic achievement among youth in the juvenile justice system, emphasizing that disruptive behavior, mental health issues, and learning disabilities can interfere with learning and school success (e.g., Brown, Riley, Walrath, Leaf, & Valdez, 2008; Cavendish, 2013; Leone & Weinberg, 2010). To explain the relationship between delinquency and academic difficulties, these professionals have highlighted the roles of individually based behaviors and challenges. However, little attention has been paid to the role of normal characteristics of adolescent development in academic success. Immature developmental abilities—such as difficulties resisting peer influence, delaying gratification, and focusing attention—may interfere with school success. Understanding how these characteristics of developmental immaturity relate to academic achievement could be critical for intervention development and may be particularly important to examine among youth in the juvenile justice system—a group of adolescents with extraordinary academic difficulties.

Developmental immaturity

Although there has been little focus on the specific role of developmental characteristics in juvenile justice-involved youths' academic achievement, researchers have examined adolescents' developmental maturity—or immaturity—of judgment and decision making

more broadly with both general and juvenile justice populations. Developmental immaturity (DI) is characterized by less mature abilities in the areas of decision making, independent functioning, emotion regulation, and general cognitive processing (Kemp, Goldstein, Zelle, Rharbite, & Golden, 2011). These four components of DI describe ways in which adolescents—as a group—tend to differ from adults.

Regarding the first factor of DI, youth demonstrate decision-making deficits relative to adults. Adolescents tend to overemphasize short-term outcomes of behavior and underemphasize long-term consequences (Steinberg et al., 2009). They tend to overvalue and be driven by potential rewards associated with behavior rather than modifying their behavior based on potential risks. Their incomplete neural development (Blakemore & Choudhury, 2006) results in greater difficulties delaying gratification, inhibiting responses, and controlling impulses (Steinberg et al., 2009).

The independent functioning component of DI is also characterized by differences between adolescents and adults, including reduced capacities for self-reliance and less developed self-concepts (Kemp et al., 2011). In other words, youth with immature self-reliance abilities display greater difficulties acting independently of peers and adults in their lives, they rely more heavily on the opinions and praise of others, and they demonstrate reduced capacities to communicate effectively about and to cope autonomously with problems (Beckert, 2007). Youth with immature self-concepts demonstrate greater difficulties setting realistic goals or expectations, gaining insight into their own strengths and weaknesses, and developing independent values (Kemp et al., 2011).

Although the cognitive processing aspect of DI seems likely to relate strongly 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. Additionally, at the time data collection began, inclusion of emotion regulation was limited by the absence of good measures of this construct for use with a juvenile justice population. Therefore, the present study focused solely on decision making and independent functioning as starting points for examining the relationship between DI and academic achievement.

Taken together, the four factors of DI may relate to a wide range of decision-making abilities, including those decision-making skills (e.g., delayed gratification, impulse control) needed to achieve academically. 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 even IQ (Duckworth & Seligman, 2005).

Verbal IQ

Although there is reason to expect links between DI characteristics and academic achievement, these relationships cannot be adequately examined among justice-involved youth without also considering the role of intelligence—and particularly verbal intelligence. A body of research has identified a relationship between delinquency and lower IQ scores (Bove, Goldstein, Appleton, & Thomson, 2003; Grisso et al., 2003; Lynam, Moffitt, & Stouthamer-Loeber, 1993), with verbal IQ deficits particularly pronounced (Bove et al.,

2003; Viljoen & Roesch, 2005). Therefore, in seeking to understand the relationships between development immaturity components and academic achievement among justice-involved youth, this study considers the role of *verbal IQ*.

DI, Verbal IQ, and Academic Achievement

To our knowledge, no studies have examined, simultaneously, the relationships among DI, verbal IQ, and academic achievement among justice-involved youth. Breaking this complex set of relationships into simpler associations, however, we already reviewed several studies (e.g., Best, Miller, & Naglieri, 2011; Duckworth & Seligman, 2005) that identified relationships between specific DI characteristics (e.g., executive functioning and self-discipline) and academic achievement. In combination with the theoretical foundation for the roles of decision making, independent functioning, emotion regulation, and general cognitive processing in academic success, these studies support the importance of examining the relationship between the DI factors and academic achievement.

Turning our attention to IQ, few studies have examined the relationships between DI (or psychosocial maturity) and verbal IQ. We identified one study that examined the relationship between DI and IQ, conducted with a clinical sample of youth, and it produced non-significant results (Goodman, 1995). However, this study was ahead of its time, preceding more formalized and statistically-derived conceptualizations of DI (Kemp et al., 2011). In Goodman's study, DI was conceptualized as a combination of social disinhibition, articulation problems, clumsiness, overactivity, restlessness, and fidgetiness. When examining the narrower concept of psychosocial maturity, maturity correlated positively with IQ (Galambos, MacDonald, Naphtali, Cohen, & de Frias, 2005) and academic achievement (Berzonsky & Kuk, 2005) in a community sample, providing an additional basis for examining this relationship within a juvenile justice sample.

Further, we identified no published studies of the relationship between verbal IQ and academic achievement among juvenile justice-involved youth. Drawing on extensive research from other populations, however, verbal IQ is associated with academic achievement (e.g., Watkins, Lei, & Canivez, 2007; Rohde & Thompson, 2007) but the two are not synonymous. In addition to IQ (Mayes, Calhoun, Bixler, & Zimmerman, 2009), academic achievement has been linked with factors such as parenting, attentional difficulties, socioeconomic status (SES), and genetics (Barriga et al., 2002; Steinberg, Elmen, & Mounts, 1989; Tucker-Drob & Harden, 2012); nevertheless, much of the variability in academic functioning is still unexplained among justice-involved youth and some of it may be accounted for by characteristics of developmental immaturity.

Despite some initial suggestion from these studies of relationships between maturity and academic achievement, maturity and verbal IQ, and verbal IQ and academic achievement, to date, no study has examined developmental maturity, verbal IQ, and academic achievement simultaneously. Further, across studies examining developmental maturity, researchers conceptualized and operationalized the construct differently. None of these conceptualizations seem closely related to Kemp's (2011) empirically derived four-factor model of DI. Thus, research was needed to examine the relationships among the empirically derived DI components, verbal IQ, and academic achievement among juvenile justice-

involved youth—with attention to justice-involved girls, an often overlooked and understudied group (American Bar Association & National Bar Association, 2001; Zahn, Hawkins, Chiancone, & Whitworth, 2009) that also has pronounced academic difficulties (e.g., Bove et al., 2003; Ellickson, Bui, Bell, & McGuigan, 1998).

Academic Achievement Among Justice-Involved Girls

Because of 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 even more likely than delinquent boys to have low verbal IQ scores and achievement-related difficulties (Bove et al., 2003; Ellickson, Bui, Bell, & McGuigan, 1998; Fejes-Mendoza, 1995; Rumberger, 1995), 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, an understanding of the relationships among DI, academic achievement, and verbal IQ may identify risk and 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—those young women involved in the deepest end of the system. Because the relationship between DI and academic achievement may not be direct, it is important to examine other variables (i.e., school attendance and arrest history) that may play roles in this relationship.

Academic success among justice-involved girls may implicate all four aspects of DI, but decision-making abilities and independent functioning are the developmental focus of this study. 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. Independent functioning is necessary to resist peer influence, which is particularly important because academic achievement can be influenced by peer performance (Giordano, Phelps, Manning, & Longmore, 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).

Because of the strong, established relationship between verbal IQ and academic achievement (Rohde & Thompson, 2007), we sought to examine whether verbal IQ moderated the relationship between DI and academic achievement, believing that the benefits of mature decision making and independent functioning on academic achievement might depend on whether justice-involved girls had sufficient verbal intelligence to educationally benefit from their maturity. See Figure 1 for the proposed moderation model. Although it would have been ideal to examine verbal, non-verbal, and full scale IQ as moderators of the relationships between DI components and academic achievement, only verbal IQ scores were available and, as reviewed above, extant research supported the relative strength of verbal IQ over non-verbal IQ in juvenile justice youths' capacities in several areas (e.g., Colwell et al., 2005; LaVigne, 2011). We also sought to examine two common realities in the lives of many justice-involved girls—poor school attendance and arrest—and evaluate whether they were partially responsible for relationships between the two DI components and academic

achievement. We expected that immature decision making would lead to poorer school attendance and a higher number of previous arrests, as youth with less developed decision-making skills demonstrate greater difficulty appropriately weighing long-term consequences of behaviors (Steinberg et al., 2009)—behaviors that might include both truancy and illegal actions. We also expected independent functioning to impact both school attendance and number of previous arrests, because youth who are able to make autonomous decisions should be better able to resist peer pressure (Steinberg & Monahan, 2007), including pressure to skip school or repeatedly engage in illegal behavior. In turn, we expected school attendance and number of previous arrests to each be associated with poorer academic achievement. If youth are repeatedly absent, they have fewer opportunities to learn. If youth are repeatedly arrested, they are more likely to have spent time in juvenile detention or post-adjudication facilities, both of which tend to provide inadequate access to quality educational programming (Gagnon, Barber, Van Loan, & Leone, 2009). See Figure 2 for the proposed mediation model.

Aims and Hypotheses

The primary purposes of this study were to examine the relationships between two DI components and academic achievement among female youth in residential juvenile justice facilities and to evaluate the role of verbal IQ in these relationships. The secondary purpose was to identify potential mediators of the pathways between two DI components and academic achievement. We hypothesized that youth with greater maturity in decision making and independent functioning would demonstrate greater academic achievement and that the relationships between these two DI constructs and academic achievement would depend on verbal IQ scores. Specifically, we expected stronger relationships between the DI constructs and academic achievement for girls with higher verbal IQ scores than for girls with lower verbal IQ scores. Additionally, we hypothesized that self-reported school attendance and number of previous arrests would mediate the relationship between each of the two DI components and academic achievement.

Methods

This study involved secondary analyses of data from a randomized control trial (RCT) of the Juvenile Justice Anger Management (JJAM) Treatment for Girls (REMOVED FOR REVIEW, 2013), a manualized group intervention to alleviate anger and reduce aggression among adolescent girls in residential juvenile justice facilities. The current study uses the pre-test data from the RCT, data that were collected prior to assignment to intervention condition.

Participants

Participants were 60 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 and 68.85% identified as non-Hispanic. Reasons for placement varied

widely, including technical violations of probation and charges such as shoplifting, assault, robbery, and murder.

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 a designated facility for at least 90 days (i.e., sufficient time to participate). Youth were ineligible if they had a severe developmental or intellectual disability or active psychosis; no youth met these exclusion criteria. Although 75 youth enrolled in the study, five youth did not complete the pre-test assessment because of early release from the facility ($N = 3$) or refusal ($N = 2$), and 10 participants did not complete the reading and listening comprehension subtests used to evaluate this study's hypotheses.

Procedure

Clinical staff members at each juvenile justice facility screened for eligibility and approached each eligible youth to describe the study and ask whether she was interested in meeting with a researcher 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. Youth assent was required for all youth. 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 (for greater detail about the consent process, see REMOVED FOR REVIEW, 2013). Trained research assistants administered assessments in quiet rooms at each facility, and assessments required approximately four hours to complete. This study was approved by REMOVED FOR REVIEW's Institutional Review Board.

Measures

The assessment battery included testing across a wide range of domains (e.g., anger, aggression, mental health, peer relationships). Demographic, DI, verbal IQ, 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 for the year prior to arrest, and information related to lifetime previous arrests.

Developmental Immaturity—Multiple instruments were used to address the independent functioning and decision making 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 underlying factors.

Consideration of Future Consequences Scale (CFC) (Strathman, Gleicher, Boninger, & Edwards, 1994). The CFC measures the degree to which individuals consider possible future consequences of their actions before acting and, if they do, how they weigh future consequences with immediate consequences of their actions. It uses a 1 (“extremely uncharacteristic”) to 5 (“extremely characteristic”) scale and 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 to 60, and higher scores indicate greater consideration of future consequences. The CFC was used as a measure of decision making because it captures youths' abilities to appropriately weigh the potential risks and rewards, as well as the possible short- and long-term consequences, of behaviors before making decisions. According to Strathman et al. (1994), the CFC has established convergent, predictive, and incremental validity and good reliability; Cronbach's alpha coefficients ranged from .80-.86, and test-retest reliability coefficients ranged from .72-.76. In the current study, the Cronbach's alpha coefficient was .54.

Weinberger Adjustment Inventory (WAI) (Weinberger & Schwartz, 1990). The WAI assesses socio-emotional adjustment, including self-experience of distress and self-restraint. The WAI consists of 30 items scored on a 5-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 and impulse control subscales were used for this study as measures of decision making because they measure the ability to consider consequences, delay gratification, and inhibit impulses when making decisions. Higher scores represent better adjustment. The WAI has also demonstrated convergent, discriminant, concurrent, and predictive validity (Weinberger, 1997; Wentzel, Weinberger, Ford, & Feldman, 1990). The restraint scale has good internal consistency, with Cronbach's alpha coefficients ranging from .72 to .91, and adequate test-retest reliability, with a correlation of .76 (Weinberger, 1997). In the present study, the Cronbach's alpha coefficient for the impulse control subscale was .81; the Cronbach's alpha coefficient for the consideration of others subscale was .83.

Psychosocial Maturity Inventory (PSM Form D) (Greenberger & Bond, 1976). The PSM has nine subscales measuring individual, interpersonal, and social adequacy; 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 on a scale from 1 ("strongly agree") to 4 ("strongly disagree"). These subscales were used to measure independent functioning because they capture both the self-concept and self-reliance components of the construct. 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 Cronbach's alpha coefficients ranging from .73-.82 (Greenberger, Josselson, Knerr, & Knerr, 1975) and excellent concurrent and divergent validity (Cauffman & Steinberg, 2001; Greenberger et al., 1975). In the current study, Cronbach's alpha coefficients were .72 for the self-reliance subscale, .78 for the identity subscale, and .78 for the work subscale.

Intelligence and Academic Achievement—Wechsler Abbreviated Scale of Intelligence (WASI) (Wechsler, 1999). The vocabulary and similarities subtests of the WASI were administered to yield a verbal intelligence (VIQ) score. To limit the length of the assessment battery, only verbal subtests were administered to youth, as verbal abilities were expected to more closely relate to the variables of interest in the study than performance abilities. 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).

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. Because only two of the four DI constructs were included in the present study, we decided against creating an overall index of DI and, instead, decided to present each of the two available components of DI separately. 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). Independent functioning was measured using the self-reliance, work, and identity subscales of the Psychosocial Maturity Inventory (PSM).

A series of multiple regression equations were calculated to evaluate whether verbal IQ moderated the relationships between the two DI constructs and academic achievement. In cases in which no significant interactions were observed, a series of regression equations were used to evaluate whether DI was associated with academic achievement, controlling for verbal IQ; this secondary analysis approach was used given the strong established relationship between verbal IQ and academic achievement (e.g., Rohde & Thompson, 2007) and the primary aim of examining the relationships between the two DI constructs and academic achievement while accounting for verbal IQ. In each regression analysis, one measure of academic achievement (i.e., reading comprehension or listening comprehension) was regressed on one measure of DI, controlling for VIQ. Assumptions (i.e., homoscedasticity, normality, normally distributed error term, uncorrelated predictor variables) 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, respectively. Effect sizes associated with individual predictor variables (including product terms) within regression equations were calculated using the formula, $f^2 = (R^2_{\text{full model}} - R^2_{\text{model without product term}}) / (1 - R^2_{\text{full model}})$, and interpreted using Cohen's (1992) conventions for small, medium, and large effect size values of f^2 : .02, .15, and .35. Effect sizes for ANOVAs were evaluated using Field's (2005) conventions of small, medium, and large: .01, .06, and .14.

Parallel mediation analyses were conducted using a nonparametric bootstrapping approach (Preacher & Hayes's [2004] SPSS bootstrapping macro, using 10,000 re-samples) to evaluate whether self-reported poor attendance and self-reported number of previous arrests mediated the relationship between each DI construct and 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, we were examining an underexplored area of research, and power for the primary hypotheses was already limited by sample size. At the risk of inflating Type I error, we sought to maximize the chances of detecting meaningful relationships. Thus, the level of conservativeness of a Bonferroni correction did not appear warranted given the exploratory nature of the analyses, the difficulty of balancing appropriate corrections and power, and the importance of detecting existing effects (Bender & Lange, 2001). Nevertheless, the lack of alpha correction calls for caution when interpreting results.

Results

Participants' VIQ ($M = 84.67$, $SD = 11.67$, range: 57-110), reading comprehension ($M = 86.95$, $SD = 9.50$, range: 69-114), and listening comprehension ($M = 75.85$, $SD = 11.10$, range: 53-99) scores fell in the below average and borderline ranges using the normative data provided in the WASI and WIAT manuals, indicating that girls in the sample were performing below grade level and below non-justice-involved peers. VIQ correlated significantly with reading comprehension ($r = .74$, $p < .001$) and listening comprehension ($r = .66$, $p < .001$). Reading and listening comprehension scores also correlated strongly ($r = .61$, $p < .001$).

Moderation Analyses: Developmental Immaturity and VIQ on Academic Achievement

Prior to data analysis, one outlier was identified in reading comprehension scores, a standard score of 129, and was removed from analyses; this single data point had disproportionate statistical influence (for example, for the regression of reading comprehension on CFC, VIQ, and the interaction between CFC and VIQ, Cook's $D = 1.22$) over the rest of the data and, if included, would have skewed statistical results by failing to accurately represent the relationships among the many other data points. Although two variables (reading comprehension and PSM self-reliance) exhibited minor negative skew or kurtosis and may have reduced efficiency of analyses, the deviations from normality should not have biased results. All other assumptions were met.

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 decision making measure and VIQ. The relationship between CFC scores and reading comprehension was moderated by VIQ, $b_{CFC} = .37$, $SE(b)_{CFC} = .14$, $p_{CFC} = .01$; $b_{VIQ} = .58$, $SE(b)_{VIQ} = .07$, $p_{VIQ} < .001$; $b_{CFC \times VIQ} = -.02$, $SE(b)_{CFC \times VIQ} = .01$, $p_{CFC \times VIQ} = .04$; $R^2 = .61$ (large effect size), 95% CI of R^2 [.47, .75]. The relationship between consideration of future consequences of behavior and reading comprehension

scores was stronger for those youth with the lowest VIQ 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 3.

A series of post-hoc, one-way between-subjects ANOVAs were conducted to further evaluate the interaction and determine whether reading comprehension differed by VIQ category (<80, 80-89, 90) at each CFC level (low = more than .05 SDs below the normative mean, medium = those within .5 SDs of the normative mean, high = more than .5 SDs above the normative mean; each CFC group contained one-third of the youth in the sample). Significant differences in reading comprehension by VIQ category were observed with youth with low, $F(2,19) = 17.26, p < .001, \eta^2 = .65$, 90% CI of η^2 [.35, .75], and medium, $(F(2,20) = 5.67, p = .01, \eta^2 = .36$, 90% CI of η^2 [.06, .53], CFC scores, but not for youth with high, $F(2,21) = 2.82, p = .24, \eta^2 = .21$, 90% CI of η^2 [.00, .39], CFC scores (all effect sizes large).

Verbal IQ did not significantly moderate the relationship between WAI impulse control and reading comprehension or between WAI consideration of others and reading comprehension, $ps = .22$ and $.99$; R^2 values = .55 and .58 (both large). See Table 1 for full results. 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, $ps = .07$ and $.56$; range of $R^2 = .55$ and $.57$ (both large). See Table 2 for full results.

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 decision making measure and VIQ. The relationships between scores on the three decision making measures and listening comprehension were not significantly moderated by VIQ, $ps = .08$ -.42; range of $R^2 = .45$ -.49 (all large). See Table 1 for full results. The simpler relationships between each of the three measures and listening comprehension were then examined, controlling for VIQ; results were not significant, $ps = .11$ -.73; range of $R^2 = .44$ -.46 (all large). See Table 2 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 independent functioning and VIQ. None of these analyses was significant, $ps = .06$ -.20; range of $R^2 = .56$ -.64 (all large). See Table 1 for full results. The simpler relationship between each subscale of the PSM and reading comprehension was then examined, controlling for VIQ; the work subscale significantly predicted reading comprehension, $b_{\text{Work}} = 5.39, SE(b)_{\text{Work}} = 1.64, p_{\text{Work}} < .001$; $b_{\text{VIQ}} = .53, SE(b)_{\text{VIQ}} = .07, p_{\text{VIQ}} < .001$; $R^2 = .62$; 95% CI of R^2 [.48, .76]; $R^2_{\text{Adj.}} = .60$ (large). No significant relationship was found between either the self-reliance or identity subscale and reading comprehension, $ps = .09$ and $.38$; $R^2 = .55$ and $.57$ (both large). See Table 2 for full results.

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 independent functioning measure and VIQ. None of these analyses were significant, $ps = .69-.87$; range of $R^2 = .44-.49$ (all large). See Table 1 for full results. The simpler relationship between each subscale of the PSM and listening comprehension was then examined, controlling for VIQ; both the self-reliance and the identity subscales independently predicted listening comprehension, $b_{\text{Identity}} = 4.37$, $SE(b)_{\text{Identity}} = 1.91$, $p_{\text{Identity}} = .03$; $b_{\text{VIQ}} = .56$, $SE(b)_{\text{VIQ}} = .10$, $p_{\text{VIQ}} < .001$; $R^2 = .48$; 95% CI of R^2 [.31, .65]; $R^2_{\text{Adj.}} = .47$ (large) $b_{\text{Self-Reliance}} = 4.74$, $SE(b)_{\text{Self-Reliance}} = 2.11$, $p_{\text{Self-Reliance}} = .03$; $b_{\text{VIQ}} = .53$, $SE(b)_{\text{VIQ}} = .10$, $p_{\text{VIQ}} < .001$; $R^2 = .48$; 95% CI of R^2 [.31, .65]; $R^2_{\text{Adj.}} = .46$ (large). A significant relationship was not observed between the work subscale and listening comprehension when controlling for VIQ, $p = .54$; $R^2 = .44$ (large). See Table 2 for full results.

Mediation Analyses: Self-Reported and Number of Previous Arrests

Only data from those participants ($n = 58$) who reported school attendance during the past year and lifetime number of arrests were included in the mediation analyses. Reported number of days missed in the previous year ranged from 0 to 190 ($M = 77.00$; $SD = 70.00$), with 13.8% of participants reporting no absences in the past calendar year. Reported number of previous lifetime arrests ranged from 0-6 ($M = 1.97$; $SD = 1.74$).

Reading ($r = -.06$, $p = .66$) and listening ($r = -.13$, $p = .37$) comprehension scores did not correlate significantly with self-reported school attendance. Self-reported arrest history correlated significantly with reading ($r = .30$, $p = .02$) and listening comprehension ($r = .32$, $p = .01$), such that a greater number of arrests correlated with greater academic achievement. 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 Table 3).

Discussion

The current study examined the relationships among the decision making and independent functioning components of DI, verbal IQ, and academic achievement, as well as the ability of school attendance and arrest history to explain the relationships between DI and academic achievement.

Moderation Analyses: Developmental Immaturity and VIQ on Academic Achievement

Consistent with hypotheses, the relationship between decision-making skills and reading comprehension depended on verbal IQ. However, the observed finding was in the opposite direction than predicted. Although, as expected, more mature decision-making skills were associated with better reading comprehension, the strength of the relationship between decision making and reading comprehension was stronger for girls with *lower* verbal IQ scores rather than for girls with higher scores. We initially believed that the ability to consider future consequences and delay gratification would improve academic behavior—

such as studying and homework completion—but that these behaviors would be reflected in reading and listening comprehension skills only if youth had sufficient intelligence to achieve academically. However, results suggest that, perhaps, more intelligent youth in female juvenile justice facilities—those with verbal IQ scores within the average range for same-aged peers—demonstrate comparable (i.e., average) reading comprehension regardless of their decision making abilities. For those with lower verbal IQ scores who experience greater academic challenges, their abilities to weigh future consequences, delay gratification, and work towards future goals may make a much bigger difference in their reading comprehension.

Beyond this simple explanation, the observed interaction suggests more complicated relationships that should be interpreted within the context of girls' juvenile justice involvement. It is well established that low intelligence scores are a risk factor for juvenile justice involvement (Lynam et al., 1993), and youth adjudicated delinquent typically display low IQ scores (Bove et al., 2003; McGloin, Pratt, & Maahs, 2004). Although many educators hold low expectations of justice-involved youth (Anthony, 2014; Gagnon, Barber, Van Loan, & Leone, 2009; Reed & Wexler, 2014), more mature decision-making abilities were associated with better reading comprehension skills—particularly for girls with low verbal IQ, the group for whom teachers and administrators may have already abandoned hope of school success. Results of this study suggest that if these girls can delay short-term gratification for longer-term gains by repeatedly choosing to study and engage in school, their mature decision making can be reflected in the development of academic skills.

Attention is also needed for justice-involved girls with verbal IQ scores that place them in the average range for the general population—and, therefore, substantially above most juvenile justice-involved girls. This group of female youth may be experiencing other difficulties (Goldstein, Olubadewo, Redding, & Lexcen, 2005; Quinn, Osher, Poirier, Rutherford, & Leone, 2005) that placed them at risk for both entry into the juvenile justice system and for academic underachievement. Although this group of girls with average intelligence demonstrated fairly average reading and listening comprehension abilities, it is likely they are still underachieving in school given the high rates of school failure, truancy, drop out, suspensions, and expulsions among justice-involved youth (Coalition for Juvenile Justice, 2001; Foley, 2001; Sedlak & McPherson, 2010); it is rare that higher IQ girls who are successful in school are adjudicated delinquent and placed in residential facilities (Portnoy, Chen, & Raine, 2013). Justice-involved girls of average intelligence may have their academic success limited by distractibility associated with post-traumatic stress symptoms, attention-deficit/hyperactivity disorder, learning disabilities, other mental health difficulties, or psychosocial immaturity/DI, all characteristics present at elevated rates among youth in the juvenile justice system (Quinn et al., 2005; Teplin, Abram, McClelland, Dulcan, & Mericle, 2002). These other challenges may decrease the role of decision-making ability in influencing school success among higher IQ justice-involved girls, even if they can demonstrate adequate achievement in discrete, but important academic skills.

This study suggests that future research into the decision making of female youth in residential juvenile justice facilities is warranted. Though many decision-making interventions are ineffective (Klein, 1997), interventions in some areas (e.g., problem

solving) are empirically supported (e.g., Bonete, Calero, & Fernandez-Parra, 2014; Durlak, Weissberg, Dymnicki, Taylor, & Schelling, 2011; Gee & Agras, 2014). 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 (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 results of the present study are replicated and expanded in larger scale research, it may be worthwhile to develop interventions to improve academically related decision making in adolescence, particularly given the stronger relationship between mature decision making and academic achievement among girls with the lowest verbal IQ scores.

Overall, independent functioning was unrelated to academic achievement. Although one might be tempted to conclude that greater independence and stronger identities do not make girls in residential juvenile justice placements more likely to focus on schoolwork, the relatively small sample, along with decreased efficiency as a result of the minor violations of normality, may have masked effects.

Though the two constructs of DI did not robustly predict academic achievement, we found strong relationships between verbal IQ and academic achievement among female youth in residential juvenile justice placements. Historically, intelligence has been viewed as a stable construct not amenable to intervention, but more recently, research has revealed the potential of intervention programs to increase intelligence (Buschkuehl & Jaeggi, 2010). For girls in the juvenile justice system, whose generally lower IQ scores may be partially due to insufficient schooling, lack of educational resources, and mental health issues, it is possible that interventions to improve verbal IQ may be particularly effective.

Mediation Analyses: Self-Reported School Attendance and Number of Previous Arrests

The finding that neither self-reported school attendance nor number of previous arrests mediated the relationship between either of the DI constructs and reading or listening comprehension is somewhat surprising given the established link between juvenile delinquency and poor academic achievement (Foley, 2001). It seemed likely that underdeveloped decision making (i.e., lack of consideration of future consequences and ability to delay gratification) and independent functioning skills (i.e., susceptibility to peer pressure) would influence girls' decisions to skip school—and 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 girls than does DI—including peer group (Henry & Huizinga, 2007), 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—girls in post-adjudication facilities for at least three months. For girls in longer-term post-adjudication facilities, they must attend school daily, and there are rarely opportunities to miss class. As a result, those girls in post-adjudication facilities that have been arrested more times may have attended school more often. Additionally, schools in juvenile justice facilities, ideally, are 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 girls more than the educational programming provided in standard public schools.

Limitations and Future Research

Results should be interpreted within the context of study limitations. We initially sought to evaluate the emotion regulation component of DI, but at the time of data collection, the lack of availability of good emotion regulation measures made it impossible to include in the present study. Additionally, the inability to examine the general cognitive processing component of DI represents a substantial limitation, especially given the likely strong relationships among general cognitive processing abilities, verbal IQ, and academic achievement. Future research should examine the relationships among verbal IQ, academic achievement, and DI as a broader construct that includes general cognitive processing and emotion regulation and should also examine these relationships with a broader conceptualization of intelligence (including a measure of full-scale IQ). Emotion regulation should be measured with recently developed questionnaires, such as the Emotion Regulation Questionnaire for Children and Adolescents (ERQ-CA; Gullone & Taffe, 2012). General cognitive processing should be measured with neuropsychological measures to assess processing speed, memory, impulse control, and attentional abilities. Attempts should also be made to examine DI as an integrated, single construct, which could include observational measures, such as peer or adult reports of DI.

Although the limited sample size may have decreased the ability to detect significance for small to medium effects, large effect sizes were observed with the full regression models, which included verbal IQ. The effect sizes for the interaction terms were small, which may indicate that most of the variability in academic achievement was explained by verbal IQ, not by developmental immaturity. That a single DI construct was significantly associated with academic achievement could suggest a false positive result given the high Type I error rate associated with the large number analyses. Future studies should recruit larger samples to produce sufficient power to adequately examine the effects of both individual predictor variables and interaction terms. The small sample size in this study was insufficient to conduct path analyses (Wolf, Herrington, Clark, & Miller, 2013), but future research should examine the relationships among these variables through model testing using path analysis.

The lower than expected Cronbach's alpha coefficient for this study represents a limitation, though it may be due to the CFC consisting of two factors, a development which has gained

support in recent years (Joireman, Balliet, Sprott, Spangenberg, & Schultz, 2008; Petrocelli, 2003; Rappange, Brouwer, & Van Exel, 2009). Despite Strathman and colleagues' (1994) finding of a single factor, a number of studies more recently have supported the delineation of the CFC into CFC-Immediate and CFC-Future factors (Joireman et al., 2008; Joireman, Shaffer, Balliet, & Strathman, 2012; Rappange et al., 2009). The present study used the full CFC because of the early stage development of the two-factor model, previous approaches to examining the consideration of future consequences (e.g., Joireman, 1999; Sirois, 2004; Toepoel, 2010), and the importance of capturing decision making broadly given study hypotheses; however, future research should both evaluate the internal consistency and factor structure of this scale with justice-involved girls and examine whether individual items or clusters of items (e.g., the emerging CFC-Immediate and -Future factors) account for the relationship between consideration of future consequences and academic achievement. Despite the caution offered about the observed alpha value, it is important to note that Cronbach's alpha has been criticized as an inappropriate measure of reliability, particularly for scales with a small number of items (Green & Yang, 2009). Accordingly, future research with larger sample sizes than ours should examine internal consistency with this population using structural equation modeling (Green & Yang, 2009).

Additionally, the self-report nature of the DI measures, and of school attendance and number of previous arrests, warrants mention. Though similar research with at-risk youth has used 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. This study collected data on school attendance in the past year due to concerns about decreased accuracy of self-report data for longer time periods, but it is possible that longer-term school attendance would have stronger relationships with both DI and academic achievement. Nevertheless, given the importance of truancy in this population, we determined that it was better to include the self-report data than to omit the issue entirely. There also is some suggestion in the literature that 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 across demographic groups (Knight, Little, Losoya, & Mulvey, 2004; Thornberry & Krohn, 2000). Future research should supplement with official records to measure school attendance and number of previous arrests, rather than relying entirely on self-report data, and should capture lifetime school attendance in order to identify chronic truancy issues. 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.

Conclusion

Despite these limitations, to our knowledge, this study was the first to examine the relationships among components of DI, verbal IQ, and academic achievement among justice-involved girls. The finding that verbal IQ moderated the relationship between decision making and academic achievement, if replicated, may have important implications for identifying risk and protective factors for academic achievement among justice-involved girls, 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) may also improve academic achievement among these girls. These relationships also should be examined for justice-involved boys, who may exhibit different relationships among DI, verbal IQ, and academic achievement.

In addition to further examining the role of DI in predicting academic achievement, research should explore other variables that may explain academic achievement better than does DI for justice-involved youth. A number of factors have been identified that explain 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, Field, & Diego, 2001), SES (Tucker-Drob & Harden, 2012), cultural background (Yu & Patterson, 2010), and neighborhood factors (Bowen, Bowen, & Ware, 2002). The interactions among several important variables may explain some of the variability in academic achievement among justice-involved girls, and it may explain more of the heterogeneity in academic skills than does DI.

Given the unexpected positive relationship between academic achievement and number of previous arrests, it is important to examine whether there are ways in which schools in residential juvenile justice facilities meet the needs of youth *better* than do traditional schools, despite the documented shortcomings of education in some facilities (Musgrove & Yudin, 2014). The degree to which residential juvenile justice facilities meet youths' needs also may differ between boys and girls in the juvenile justice system, as the two groups have different patterns of academic achievement (e.g., Bove et al., 2003).

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Figure 1.
Theoretical model illustrating the proposed relationship between Developmental Immaturity and academic achievement, moderated by verbal IQ.

Figure 2.

Self-reported school attendance and number of previous arrests as proposed mediators in the pathway from each Developmental Immaturity component (decision making, independent functioning) to each measure of academic achievement (reading comprehension, listening comprehension).

Figure 3.
The interaction between Consideration of Future Consequences scores and Verbal IQ on reading comprehension scores.

Table 1

Non-significant interactions between scores on the Developmental Immaturity measures and Verbal IQ in predicting reading comprehension and listening comprehension. Listening comprehension statistics are in italics.

Developmental Immaturity Measure	<i>b_{DI}</i>	<i>SEb_{DI}</i>	<i>p_{DI}</i>	<i>b_{VIQ}</i>	<i>SEb_{VIQ}</i>	<i>p_{VIQ}</i>	<i>b_{DI×VIQ}</i>	<i>SEb_{DI×VIQ}</i>	<i>p_{DI×VIQ}</i>	<i>R²</i>	95% CI of <i>R²</i>	<i>f²_{DI×VIQ}</i>
Decision Making												
CFC ¹	-.02	.19	.90	.65	.10	< .001	-.01	.02	.41	.45	[.28, .62]	.05
WAI ² Impulse Control	1.82	.98	.07	.62	.07	< .001	-.11	.09	.22	.58	[.43, .73]	.07
WAI Consideration of Others	.54	1.29	.68	.63	.09	< .001	-.21	.12	.08	.47	[.30, .64]	.06
	.60	1.04	.57	.62	.08	< .001	.001	.09	.99	.55	[.39, .71]	< .001
	-2.11	1.33	.12	.60	.10	< .001	.09	.11	.42	.49	[.32, .66]	.06
Independent Functioning												
PSM ³ Self-Reliance	1.83	1.70	.29	.56	.08	< .001	.17	.13	.20	.56	[.41, .71]	.07
	4.61	2.15	.04	.54	.10	< .001	-.07	.16	.69	.48	[.31, .65]	< .001
PSM Work	4.93	1.62	.004	.54	.07	< .001	.23	.12	.06	.64	[.51, .77]	.06
	1.48	2.36	.53	.61	.10	< .001	-.03	.17	.87	.44	[.27, .61]	< .001
PSM Identity	3.31	1.56	.04	.55	.08	< .001	.15	.10	.14	.58	[.43, .73]	.02
	4.18	2.02	.04	.57	.10	< .001	-.04	.13	.75	.49	[.32, .66]	.02

¹ Consideration of Future Consequences scale

² Weinberger Adjustment Inventory

³ Psychosocial Maturity Inventory

Table 2

Non-significant relationships between scores on the Developmental Immaturity measures and reading comprehension and listening comprehension, controlling for Verbal IQ. Listening comprehension statistics are in italics.

Developmental Immaturity Measure	<i>b_{DI}</i>	<i>SEb_{DI}</i>	<i>p_{DI}</i>	<i>b_{VIQ}</i>	<i>SEb_{VIQ}</i>	<i>p_{VIQ}</i>	<i>R²</i>	95% CI of <i>R²</i>	<i>R²_{Adj}</i>
Decision Making									
CFC ⁴	-.06	.19	.73	.64	.10	<.001	.44	[.26, .62]	.42
WAI ⁵ Impulse Control	1.85	.99	.07	.63	.07	<.001	.57	[.42, .72]	.55
WAI Consideration of Others	.60	1.32	.65	.64	.10	<.001	.44	[.26, .62]	.42
	.60	1.03	.56	.62	.08	<.001	.55	[.39, .71]	.53
	-2.12	1.31	.11	.57	.10	<.001	.46	[.29, .63]	.44
Independent Functioning									
PSM ⁶ Self-Reliance	1.49	1.69	.38	.57	.08	<.001	.55	[.39, .71]	.53
PSM Identity	2.61	1.50	.09	.56	.08	<.001	.57	[.42, .72]	.55
PSM Work	1.43	2.31	.54	.61	.10	<.001	.44	[.26, .62]	.42

⁴Consideration of Future Consequences scale

⁵Weinberger Adjustment Inventory

⁶Psychosocial Maturity Inventory

Table 3

Mediation effects of the relationships between Developmental Immaturity measures and reading and comprehension, 95% confidence intervals. Listening comprehension statistics in italics.

Predictor: Developmental Immaturity Measure	Proposed Mediators 1 and 2: School Attendance and Previous Arrests	Proposed Mediator 1: School Attendance	Proposed Mediator 2: Previous Arrests	Proposed Mediator 1: School Attendance	Proposed Mediator 2: Previous Arrests
Decision Making					
CFC ⁷	[-0.29, 0.15]	[-0.04, 0.10]	[-0.31, 0.12]	[-0.28, 0.19]	[-0.28, 0.14]
WAI ⁸ Consideration of Others	[-2.90, 0.18]	[-1.01, 0.26]	[-2.83, 0.13]	[-2.47, 0.15]	[-2.42, 0.10]
WAI Impulse Control	[-3.37, 0.17]	[-1.01, 0.24]	[-3.47, 0.06]	[-3.34, 0.15]	[-2.94, 0.03]
Independent Functioning					
PSM ⁹ Self-Reliance	[-0.50, 3.10]	[-0.60, 1.11]	[-0.21, 3.03]	[-0.53, 2.81]	[-0.23, 2.74]
PSM Work	[-0.60, 3.44]	[-1.43, 0.55]	[-0.15, 3.54]	[-0.34, 3.97]	[-0.13, 3.21]
PSM Identity	[-1.78, 2.80]	[-2.88, 0.61]	[-0.19, 3.32]	[-1.47, 2.98]	[-0.12, 3.02]

* Significant when the confidence interval does not include 0

⁷ Consideration of Future Consequences scale

⁸ Weinberger Adjustment Inventory

⁹ Psychosocial Maturity Inventory