UNIVERSITY OF CALIFORNIA,
IRVINE

A Longitudinal Examination of the Relation between Future Expectations and Crime

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in Psychological Science

by

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Dissertation Committee:
Professor Elizabeth Cauffman, Chair
Professor Jutta Heckhausen
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2019

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ACKNOWLEDGMENTS

I am grateful for my dissertation committee, Jutta Heckhausen and Candice Odgers, and my dissertation chair, Beth Cauffman. Their advice and wisdom on this project was invaluable and I appreciate the time they took to read, critique and improve my project. Chuansheng Chen and Michael Gottfredson played an important role in my dissertation proposal, and I am so fortunate they served on my advancement committee. I truly cannot imagine completing this project without Beth Cauffman's incredible mentorship and wisdom. From my first day at UCI, she has been my top advocate, mentor, role model and friend, and I can only hope to be half the advisor, teacher and researcher that she is.

It has been a privilege working with the many students (graduate and undergraduate) and staff members in the department of Psychological Science at UCI. I would like to thank the members of the 3D Lab and the graduate students and research assistants who made this work possible. I would especially like to thank the study coordinator of the Crossroads project, Sarah Militmore, who has helped in more ways than I can count, and who has been an incredible colleague and friend. I am so fortunate to have started graduate school with Cortney Simmons, as I truly don't think I could've achieved this without her support, statistics knowledge, and sense of humor. I would also like to thank the participants in both the Crossroads and Pathways studies, who volunteered to share their thoughts and personal experiences, and without whom none of this research would be possible.

Both the Pathways to Desistance and Crossroads studies were supported by generous funders, including the Office of Juvenile Justice and Delinquency, the MacArthur Foundation, and the William T. Grant foundation, among many others. This research would not have been completed without their support.

I am grateful for the support of my family, in particular my parents, Peter and Laurie, who begrudgingly accepted my decision to move to California and helped me every step of the way. They've always encouraged me to pursue my goals, and provided the support and guidance necessary to achieve them. I am lucky to have my siblings, Kayla and Adam, to raise my spirit with when I needed it most.

I am so thankful for my husband, Michael, who has supported me throughout this entire journey. He's helped me with every project and every paper, through his tough (but necessary) critiques and unceasing emotional support. He has been my source of encouragement and strength at my darkest moments, and is a constant source of joy in my life.

Mostly, I thank God for making this accomplishment possible.

CURRICULUM VITAE

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EDUCATION

2014-2019 University of California, Irvine
Ph.D., Psychological Science
Concentrations: Developmental Psychology, Quantitative Methods, and Psychology and Law
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2016 University of California, Irvine
M.A., Social Ecology

2012 University of Maryland, College Park
B.A., Psychology, History Double Major, cum laude

HONORS, AWARDS AND GRANTS

2017- 2018 **UC Consortium on the Developmental Science of Adolescence Seed Grant**
2015-2019 **UC Irvine School of Social Ecology Graduate Student Mentoring Award**
2014 **American Psychological Association of Graduate Students/Psi Chi Junior Scientist Fellowship**
2012-2014 **National Institutes of Health Intramural Research Training Award**
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2009-2012 **University of Maryland, College of Behavioral and Social Sciences Dean's List**
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RESEARCH EXPERIENCE

2014- **Development, Disorder, and Delinquency Lab**
University of California, Irvine
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Graduate Researcher

Investigates the long-term effects of juvenile justice system involvement on adolescent developmental outcomes, accounting for contextual, emotional and psychosocial factors.
Responsible for conducting field interviews with juvenile offenders, training and supervising undergraduate research assistants, cleaning and analyzing data, and publishing and presenting findings at national conferences.

2016- **UC Irvine Center for Psychology and Law Graduate Fellowship**
Graduate Researcher

Organize speaking events pertaining to topics on psychology and law for students, faculty, and community members. Plan networking opportunities for graduate students and faculty members. Facilitate student relationships with practitioners to strengthen the application of research to community problems.

2012-2014 **Child and Family Research Section (NICHD)**
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Worked as project manager for early adolescent dyadic coding task, duties included: editing and adapting the coding manual and training other research assistants on the coding scheme.

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Created and reviewed Institutional Review Board documents for studies in the lab.

PUBLICATIONS

**Last name changed from Mahler to Knowles in 2018*

Simmons, C., Rowan Z., **Knowles, A**., Steinberg, L., Frick, P.J., & Cauffman, E. (*in press).* A Life History Approach to Understanding Juvenile Offending and Aggression. *Aggression and Violent Behavior.*.

Knowles, A., Rowan, Z., Frick, P.J., Steinberg, L., & Cauffman, E. (*in press).* Evading detection during adolescence: The role of criminal capital and psychosocial factors. *Justice Quarterly.*

Knowles, A., Rinehart, J., Frick, P.J., Steinberg, L., Cauffman, E. (*in press).* Risky sexual behavior among arrested adolescent males: The role of future expectations and impulse control. *Journal of Research on Adolescence.*

Simmons, C.S., Fine, A., **Knowles, A.**, Frick, P.J., Steinberg, L., & Cauffman, E. (*in press*). The relation between callous-unemotional traits, psychosocial maturity, and delinquent behavior among justice-involved youth. *Child Development*.

Cavanagh, C., **Mahler, A**., & Cauffman, E. (*in press*). How does juvenile offending relate to mothers' aspirations and expectations for their sons? *Journal of Research on Adolescence*.

Mahler, A., Fine, A., Frick, P. J., Steinberg, L., & Cauffman, E. (2018). Expecting the Unexpected? Expectations for Future Success Among Adolescent First-Time Offenders. *Child Development*, *89*(6), e535-551.

Mahler, A., Simmons, C., Frick, P. J., Steinberg, L., & Cauffman, E. (2017). Aspirations, expectations and delinquency: the moderating effect of impulse control. *Journal of Youth and Adolescence*, *46*(7), 1503-1514.

Fine, A., **Mahler, A**., Steinberg, L., Frick, P. J., & Cauffman, E. (2017). Individual in context: The role of impulse control on the association between the home, school, and neighborhood developmental contexts and adolescent delinquency. *Journal of Youth and Adolescence*, *46*(7), 1488-1502.

Jager, J., **Mahler, A**., An, D., Putnick, D. L., Bornstein, M. H., Lansford, J. E., ... & Deater-Deckard, K. (2016). Early adolescents' unique perspectives of maternal and paternal rejection: Examining their across-dyad generalizability and relations with adjustment 1 year later. *Journal of Youth and Adolescence*, *45*(10), 2108-2124.

Fine, A., **Mahler, A**., Simmons, C., Chen, C., Moyzis, R., & Cauffman, E. (2016). Relations between three dopaminergic system genes, school attachment, and adolescent delinquency. *Developmental Psychology*, *52*(11), 1893.

LAW REVIEWS

*Equal first-authorship

*Cauffman, E., Fine, A., **Mahler, A**., & Simmons C. (2018) How Developmental Science Influences Juvenile Justice Reform. *University of California, Irvine Law Review,* 8, 21-39.

PRESENTATIONS

Knowles, A., Rowan, Z., Frick, P.J., Steinberg, L., & Cauffman, E. (2019, March). Evading detection during adolescence: The role of criminal capital and psychosocial factors. In Simmons, C., (chair) Crime and its consequences: Examining the juvenile justice pipeline. Paper presented at the American Psychology-Law Society Conference, Portland, OR.

Knowles, A., Frick, P.J., Steinberg, L., & Cauffman, E. (2019, March). Symposium Chair, Focus on the positives: Examining positive developmental outcomes within at-risk populations. *Sexual behavior among justice-involved youth: Links to positive youth development*. Paper presented at the Society for Research in Child Development Conference, Baltimore, MD.

Cavanagh, C., **Mahler A**., Cauffman, E. (2018, April). Juvenile offending, school attitudes, and state test scores. In. Cavanagh C., (Chair) Youth at the nexus of juvenile justice and education. Paper symposium presented at the Society for Research in Adolescence Conference (SRA), Minneapolis, MN.

Mahler, A., Rinehart, J., Frick, P.J., Steinberg, L., & Cauffman, E. (2017, April). Sexual health behaviors among juvenile delinquents: Social factors predicting condom use. Poster presented at the Society for Research in Child Development Conference (SRCD), Austin, TX.

Fine, A., **Mahler, A.**, Steinberg, L., Frick, P., & Cauffman, E. (2017, April). The role of individual differences on the association between contexts and adolescent delinquency. In Cavanagh, C. (Chair) The Family context and youth antisocial behavior. Paper symposium presented at the Society for Research in Child Development Conference (SRCD), Austin, TX.

Mahler, A., Cauffman, E., Frick, P., & Steinberg, L. (2016, April). Symposium Chair, Expectations for the future and adolescent adjustment. *Expectations for future success among adolescent first-time offenders.* Paper to be presented at the Society for Research on Adolescence Biennial Meeting, Baltimore, MD.

Mahler, A. R., Yuen, C. X, Simon, H. M., Jager, J., Bornstein, M. H., & Hendricks, C. (2014, March). Links between longitudinal instability in mothers' separation anxiety and mother-child relationship quality during early and late adolescence. Poster presented at the Society for Research on Adolescence. Austin, TX.

Mahler, A. R., Jager, J., & Bornstein, M. H. (2013, May). The unique contributions of sibling and parent relationships to child adjustment. Poster presented at the National Institutes of Health Research Festival. Bethesda, MD.

Padilla, C. M., **Mahler, A. R.**, Horn, P. H., Putnick, D.L., & Bornstein, M. H. (2013, May). Maternal parenting cognitions and behavior: Similarities and discrepancies with first and second children. Poster presented at the National Institutes of Health Research Festival. Bethesda, MD.

Yuen, C. X., **Mahler, A. R.**, Jager, J., Bornstein, M. H., & Hendricks, C. (2013, April). Parenting stress and adolescent separation and detachment: The mediating role of parents' psychological control and acceptance. Poster presented at the Society for Research on Child Development. Seattle, WA.

INVITED LECTURES

2019	Intimacy and Friendship During Adolescence; Undergraduate Course
2019	Identity, Self-Conceptions and Self-Esteem During Adolescence; Undergraduate Course
2018	UC Irvine "Stats n' Snacks" Instructor: Latent Profile/Class Analysis
2018	Internalizing Disorders During Adolescence; Undergraduate Course
2017	UCI Psychology and Social Behavior Colloquium Speaker
2016	Sexuality and Romantic Relationships During Adolescence; Undergraduate Course
2015	Peer Relationships During Adolescence; Undergraduate Course

TEACHING AND MENTORSHIP

2017 **Course Developer for Online Master's Program**
Developed content and materials for a course entitled, "Violence, Anger and Psychopathology" for the UCI Master of Legal and Forensic Psychology program.

2017 **UCI Master of Legal and Forensic Psychology Teaching Assistant**
Teaching assistant for introductory "Welcome Week" short course for incoming Masters students.

2014-2016 **University of California Teaching Assistant**
Undergraduate Courses: Child Therapies, Behavioral Medicine, Adolescent Development, Child Development, Abnormal Psychology

2014- **Undergraduate Research Opportunities Program (UROP) Mentor**
Lead team of undergraduate researchers in developing, analyzing and presenting empirical research.
Helped team to secure funds, and to apply for several national conferences.

Mentored Presentations

Bailey, N.A., Carlise, E., Chiplunkar, A., Murphy, D., Knowles, A., Cauffman E.. (2018, May). *Examining the association between neighborhoods and crime: The role of future expectations and social support.* Talk to be presented at the Undergraduate Research Conference at the University of California, Irvine.

Chiplunkar, A., Bailey, N.A., Carlise, E., Murphy, D., **Knowles, A.**, Cauffman, E. (2019, May). *Examining the association between neighborhoods and crime: The role of future expectations.* Poster to be presented at the Association for Psychological Science Annual Convention, Washington, DC.

Perez, B., Tran, T, **Mahler, A**. & Cauffman, E., (2018, May). *Comparing perseverance and self-control as unique predictors of adolescent delinquency and school outcomes.* Poster presented at the Association for Psychological Science Annual Convention, San Francisco, CA.

Quezada, M., Hurado, C.., Nguyen, T., **Mahler A.**, & Cauffman, E. (2017, May). *Who gets caught? The role of parental monitoring, parental affect and peer deviance in predicting re-arrest.* Poster presented at the Association for Psychological Science Annual Convention, Boston, MA.

Monjazeb, S., Tesillo, N.F., Lasure, K., **Mahler, A**., & Cauffman, E. (2016, August). *Parental Monitoring and Risky Sexual Behavior Among Juvenile Delinquents: The Role of Depression.* Poster presented at the American Psychological Association Annual Convention, Denver, Colorado.

Tesillo, N.F., Lasure, K., **Mahler, A**., & Cauffman, E. (2016, May). *Risky Sexual Behavior among Juvenile Delinquents: The Role of Parental Monitoring, Warmth, and Hostility.* Talk presented at the Undergraduate Research Conference at the University of California, Irvine.

Lasure, K., Monjazeb, S., Tesillo, N.F., **Mahler, A**., & Cauffman, E. (2016, May). *Neighborhood Conditions and Juvenile Delinquency: The Moderating Role of Future Expectations.* Poster presented at the Association for Psychological Science Annual Convention, Chicago, IL.

Tesillo, N.F., Monjazeb, S., Lasure, K., **Mahler, A**., & Cauffman, E. (2016, April). *Examining maternal predictors of risky sexual behavior among juvenile delinquents.* Poster presented at the Western Psychological Association Annual Convention, Long Beach, CA.

Bahramian, S., Salgado R., Morrison, B.M., Tejeda, A., Jara, P., Thomas, A.G., **Mahler, A.**, Cauffman, E. (2015, May). *Examining the Influence of Social Competency on Adolescents' Resistance to Peer Influence*. Talk presented at the Undergraduate Research Conference at the University of California, Irvine.

Bahramian, S., Salgado R., Morrison, B.M., Tejeda, A., Jara, P., Thomas, A.G., **Mahler, A.**, Cauffman, E. (2015, May). *Does Participation in Extracurricular Activities Improve Adolescents' Resistance to Peer Influence? Examining the Mediating Role of Social Competency.* Poster presented at the Association for Psychological Science Annual Convention, New York, NY.

Salgado R., Morrison, B.M., Tejeda, A., Jara, P., Bahramian, S., Thomas, A.G., **Mahler, A.**, Cauffman, E. (2015, April). *Examining the Influence of Social Competency on Adolescents' Resistance to Peer Influence*. Poster presented at the Western Psychological Association conference, Las Vegas, NV.

Mentored Grant Funding

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2015-2016 Undergraduate Research Opportunities Program Grant
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STATISTICAL TRAINING

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ABSTRACT OF THE DISSERTATION

A Longitudinal Examination of the Relation between Future Expectations and Crime

By

Alissa Rose Knowles

Doctor of Philosophy in Psychological Science

University of California, Irvine, 2019

Professor Elizabeth Cauffman, Chair

Teenagers who hold optimistic expectations for their future are less likely to engage in crime and risk-taking. This dissertation examined three questions related to future expectations among two samples of adolescent males who had all been arrested (Crossroads Study, $N = 1216$; Pathways to Desistance, $N = 1170$). The Crossroads study recruited males between the ages of 13-17 who had experienced their first arrest after a low level offense (i.e., misdemeanor), and interviewed them for four additional years. The Pathways study consists of males between the ages of 14-18 who were arrested for serious felony-level offenses and were interviewed multiple times over the course of seven years.

Study one used data from Crossroads and differentiated future expectations (the perceived likelihood of achieving one's goals) from future orientation (the tendency to think about the long-term consequences of one's decisions). Results supported the analytic distinction between expectations and orientation, and identified a portion of adolescents who displayed high expectations, but low orientation. This imbalance related to crime, substance use and casual sex. Study two assessed four mechanisms (impulse control, the perceived personal and social rewards of crime, and the perceived social costs of crime) to explain the link between future expectations and offending among youth in Pathways. Only the perceived social rewards of crime was a

significant mediator, and suggested that youth with low expectations perceive more social rewards from crime, which relates to their decision to commit crime. Study three used data from Crossroads to understand the relation between estimated life expectancy and crime across development. The results revealed that youth become more optimistic about their chances for survival as they age, and also supported significant within-person associations with crime: as adolescents increase their life expectancy, they report lower levels of delinquency. The findings from the three studies underscore the importance of fostering positive expectations among adolescent males, and highlight the diversity of expectations among high-risk youth. Despite all participants experiencing at least one arrest, many continued to report positive future goals, and these goals played an important role in deterring continued risk-taking and crime.

Introduction

As children enter their teenage years, they tend to hone their abilities to think about and plan for the future. Moreover, parents, teachers, and other adults dedicate time and resources towards helping youth envision their futures and create plans to meet their expectations. Supporting the development of positive futures expectations is important, given that long-term goals motivate short-term behaviors. For example, long-term educational goals promote adolescent high school academic achievement as well as other prosocial activities (Beal and Crockett, 2010). Importantly, adolescent future expectations also carry important implications for decisions relating to risky and illegal behavior. Adolescents with a negative view of the future are more likely to behave recklessly, by engaging in crime (Iselin, Mulvey, Loughran, Chung & Schubert, 2012), substance use (Sipsma, Ickovics, Lin & Kershaw, 2012), and risky sexual behaviors (Knowles, Rinehart, Steinberg, Frick & Cauffman, 2019). Although prior research has established an association between future expectations and various forms of risk-taking, several areas remained unexplored. This dissertation builds on prior work focused on the link between future expectations and risk-taking to understand the measurement of future expectations, the mechanisms linking future expectations to crime, and whether perceived life expectancy relates to crime across development.

The three proposed studies all focus on the role of future expectations among at-risk adolescents who have all experienced an arrest. The first study focuses on the measurement of future expectations and evaluates the extent to which high future expectations relate to high future orientation (i.e., the ability to consider their future when making decisions in the present). The analyses also test whether some youth with high expectations simultaneously report low future orientation (and vice versa) and whether this mismatch is related to risky decision making,

such as crime, substance use, risky-sexual behaviors and cigarette smoking. The second study builds on the large body of research that supports a direct association between future expectations and crime. It tests whether future expectations promote the development of impulse control, the perceived costs of crime, and the perceived benefits of crime, to help account for the link between expectations and risk-taking. Finally, the third study evaluates an alternative future expectation: the role of perceived life expectancy and how these perceptions influence crime. This study evaluates the stability of life expectancy beliefs and whether changes in life expectancy account in part for adolescents' desistance from crime. Importantly, studies two and three employ analytic methods that separate between- and within-person changes. These methods allow for more precise interpretations of the study findings, and describe how individual-level changes in future expectations and life expectancy relate to changes in crime over time.

In order to best answer these questions, the three studies employ two diverse datasets that include justice-involved youth. The first dataset, Crossroads, focuses on adolescents arrested for the first time. Previous research on first-time offenders suggests that formal contact with the justice system places youth at risk for continued crime and re-arrest (Liberman, Kirk & Kim, 2014; Quinn & Van Dyke, 2004). Youth arrested even once are also more likely to drop out of high school (Sweeten, 2006) and less likely to enroll in a four-year college (Kirk & Sampson, 2013). Together the studies suggest that one's first arrest presents a crucial opportunity to intervene and shift youth towards a path of positive development. The second sample, Pathways to Desistance, includes data from youth more deeply entrenched in the juvenile and criminal justice system. Upon study enrollment, many youth had experienced multiple arrests and incarceration. In comparison to the Crossroads youth, they typically reported a more extensive criminal history and had all been arrested for a felony level offense at the baseline assessment. In

tandem, these two studies provide the opportunity to study the future goals of a diverse population of at-risk youth.

Although all youth included in the current dissertation committed a crime and were arrested, not all participants reported pessimistic beliefs about their future. As detailed in the studies to follow, despite their experiences with the justice system, the way in which these youth consider their futures plays an important role in their decision to move towards or away from crime. Both Crossroads and Pathways represent a diverse group of adolescents: some who envision and think about their goals as they enter young adulthood and others who struggle to realize and act upon their potential. The following dissertation provides an overview of the link between future expectations and risk-taking, and offers novel empirical findings that contribute to this body of literature. Moreover, all dissertation findings are discussed within the context of informing delinquency intervention and prevention by emphasizing the ways in which future expectations can be leveraged to reduce risk-taking.

Chapter 1: Future Expectations and Future Orientation

Adolescents are frequently characterized as shortsighted, a stereotype partly grounded in empirical research (Steinberg et al., 2009a; Steinberg, Cauffman, Woolard, Graham & Banich, 2009b). Indeed, compared to older age groups, adolescents demonstrate deficits in *future orientation* (FO), defined in this dissertation as an adolescent's consideration for and attention towards the future. Importantly, adolescents' future orientation represents only one component of future-motivated cognition and lacks any mention of adolescents' positive or negative evaluation of their future. Despite adolescents' orientation towards the present, adults frequently encourage adolescents to consider their future goals and expectations when making decisions. For example, a teenager who wants to attend a top ranked college needs to prioritize his or her current academic performance. Empirical evidence similarly supports the role of optimistic *future expectations* (FE) in encouraging positive outcomes such as higher educational attainment (Beal & Crockett, 2010) and better physical health (McDade et al., 2011). Higher FO and FE not only relate to positive developmental outcomes, but also fewer instances of risk-taking and illegal behavior (Stoddard, Zimmerman, Bauermeister, 2011; Iselin et al., 2012; Sipsma et al., 2012). As a result, both FO and FE carry important implications for at-risk teenagers. Future orientation and future expectations present distinct views regarding the nature and prevention of adolescent risk-taking. This distinction has been argued theoretically (Steinberg et al., 2009a, Nurmi, 1991) but seldom tested. As such, study 1 examines FO and FE as distinct elements of future-motivated cognition in relation to delinquency and risk taking.

Future expectations and future orientation: A distinction with a difference

A wide range of theories and models have focused on either FO or FE independent of one another. One prominent model of adolescent risk-taking discusses FO as one of several

psychosocial factors that help explain the preponderance of crime and risk-taking during adolescence (Steinberg & Cauffman, 1996; Cauffman & Steinberg, 2000). Although adolescents perform similarly to adults on cognitive tasks, they show deficits in maturity of judgement (Steinberg et al., 2009b). Future orientation is key to adolescents' "perspective" which focuses on an individual's ability to consider short and long-term consequences, see how one's actions affect others, and to think about one decision in the context of other relevant decisions (Steinberg & Cauffman, 1996). In this model, FO is largely based on prior measures of time perspective, which emphasize the importance of considering one's decisions in the context of the future (Zimbardo, 1990) as well as the extent to which individuals think through the consequences of their behaviors (Strathman, Gleicher, Boninger and Edwards, 1994). The latter definition is particularly pertinent to risk-taking, as adolescents are likely to focus on the immediate benefits and rewards associated with crime (Shulman, Monahan & Steinberg, 2017). This model explicitly argues that FO does not include an evaluative dimension (pg. 29; Steinberg et al., 2009a), and therefore does not consider the role of FE. Importantly, adolescents showing stronger FO engage in fewer risk behaviors (Robbins & Bryan, 2004), including crime (Monahan Steinberg, Cauffman & Mulvey, 2009)

Future expectations are also represented across theories and models distinct from FO. Studies focusing on FE stress an adolescent's positive or negative perception of his future, and tend to disregard his or her cognitive capacity to think ahead, plan, and prioritize larger long-term rewards. For example, possible selves (Markus & Nurius, 1986) represent how adolescents perceive the potential for their futures. Possible selves are measured by the selves they could become, would like to become, as well as the selves they are afraid of becoming (Markus & Nurius, 1986). Future expectations serve as a key component of the possible selves an adolescent

would like to become. Holding positive expected-selves (e.g., be a good student, get good grades) has been linked to positive outcomes such as improved school grades (Anderman, Anderman & Griesinger, 1999). Possible selves also relate to problems behaviors, for example, one study asked adolescents to list "expected selves" for the following year, during which adolescents reported on a wide variety of expectancies relating to school, crime, substance use, and more (Aloise-Young, Hennigan & Leong, 2001). The authors found that adolescents who held a higher number of positive expected-selves were less likely to engage in cigarette smoking and alcohol use (Aloise-Young et al., 2001). A study of delinquent youth measured possible selves in part by asking adolescents the extent to which a self-descriptor would likely describe him or her in the future (Oyserman and Markus, 1990). Adolescents involved in the justice system reported a greater number of expected negative selves compared to non-delinquent youth (Oyserman & Markus, 1990). Although possible selves also incorporate adolescent past- and present-selves, their expected-selves play an important role in predicting developmental outcomes.

Social Control Theory (SCT; Hirschi, 1969) similarly incorporated adolescent expectations as part of the theoretical framework. Social Control Theory presents an explanation for why individuals do not engage in crime, and stresses the importance of social bonds, such as attachment to important people including parents, teachers and friends. Hirshi (1969) discusses future expectations in relation to SCT when highlighting the importance of commitment to conventional activities or goals, such as receiving an education and securing a well-paying job. That is, optimistic expectations for conventional future goals should reduce delinquency as they represent a conventional bond to society. In support of this idea, Iselin and colleagues (2012) found that adolescent offenders with high expectations for staying out of trouble were less likely

to engage in crime, compared to youth with low expectations. In addition, adolescents expecting to have good jobs spent more time working in community jobs the following year (Iselin et al., 2012). Both possible selves and SCT exclude any discussion of adolescents' psychosocial capacity to consider the future when making decisions (i.e., future orientation).

Nurmi (1991) presented a model describing how individuals orient themselves toward the future, and included components relevant to both FO and FE. His model included three key dimensions: *motivation* (interests an individual holds for the future, how far into the future an individual's interests and goals extend), *planning* (strategizing for the pursuit of their future goals) and *evaluation* (extent to which goals are expected to be achieved). Although distinct, all three dimensions operate as part of a single process: orientation to the future (Nurmi, 1989). That is, all three dimensions operate in tandem to help adolescents consider the future when making decisions in the present. Nurmi (1989) empirically supported these three dimensions in a study that interviewed adolescent boys and girls about their hopes and aims for the future, and asked questions pertaining to planning, motivation and evaluation. Trommsdorff and colleagues (1979) presented a similar model of FO. The authors argued that FO referred to both a cognitive component (i.e., whether an individual is concerned with the future) as well as an evaluative and affective component (i.e., whether one's future is perceived as positive or negative), suggesting that FO and FE both operate to motivate behavior.

Although prior research supports both FO and FE as important predictors of adolescent outcomes, few studies have empirically tested the extent to which FO and FE are related, and whether some youth demonstrate an imbalance between these two aspects of development. Nurmi's (1989) research provides some evidence that these factors may not overlap as much as one would expect. In Nurmi's (1989) confirmatory factor analysis, the "planning" and

"evaluation" factors were not significantly correlated with one another. Expecting to achieve long-term goals does not necessarily correlate with the development of planning skills. Because research tends to focus explicitly on one factor over the other, it is also not clear whether some youth may hold optimistic expectations, but continue to disregard future consequences when engaging in risky behavior or delinquency. Steinberg and colleagues (2009) work demonstrated that some aspects of cognitive reasoning (e.g., working memory, verbal fluency) develop at different rates than facets of maturity (resistance to peer influence, future orientation, sensation seeking, etc.), creating an immaturity gap that leaves adolescents vulnerable to poor decisions. Some youth may similarly display an imbalance in FO and FE: although adolescents may expect to achieve long-term goals, they may lack the FO necessary to behave in accordance with those expectations (low FO, high FE). Alternatively, other adolescents may report high levels of FO, but not actually expect to achieve their future goals (high FO, low FE).

Present Study

Study 1 builds on prior FO and FE research to examine 1) the extent to which these factors are distinct across development (ages 13-21) and 2) whether some youth display a "mismatch" in levels of FO and FE. The first set of analyses test whether FO and FE map onto a one or two-factor confirmatory factor analysis (question 1). If FO and FE are best represented by the same underlying factor, it is unlikely youth will show a developmental mismatch. Although prior research suggests FO and FE operate as two separate factors (Nurmi, 1989), few studies have directly tested this hypothesis. Before testing the factor structure at each age, I ensure that measurement invariance for each measure holds over time (described in detail below).

I then build on the first analyses by assessing the multidimensionality of FO and FE using a latent class framework (question 2). Applying a latent class analysis as a data driven approach,

I assess whether subclasses of future-motivated cognition can be empirically identified to inform our understanding of the heterogeneity of FO and FE. Although it seems probable that high levels of FO are typically present among youth with high FE (or vice versa), question 2 also considers groups of adolescents showing mismatched levels of FO and FE. Some adolescents may think optimistically about the future, but struggle to consider their future when behaving in the present (i.e., high FE, low FO). Alternatively, some youth may hold pessimistic views of their future, yet simultaneously consider their future when making present decisions (low FE, high FO). I also tested whether these subclasses relate to indicators of risk-taking and delinquency.

All analyses were conducted among a sample of male adolescents who had been arrested for the first time at study enrollment. Because males are arrested at approximately twice the rate of females (OJJDP, 2017), understanding these relations among adolescent males is paramount. Males have also shown lower future orientation (Steinberg et al., 2009a) and more pessimistic future expectations (Mello, 2008) compared to females. Moreover, studying these relations among a sample of high-risk, arrested adolescents ensures that the findings will be applicable to illegal behaviors that carry serious consequences.

Hypotheses

Question 1. I hypothesize that future orientation and future expectations are distinct and will be best represented by a two-factor confirmatory factor analysis (CFA), rather than a one-factor CFA. Moreover, this factor structure will be present across development.

Question 2. I predict that a four-group latent profile will demonstrate the best fit to the data: high/high FO and FE, low/low FO and FE, high/low FO and FE, low/high FO and FE. I expect the low/high FO and FE and high/low FO and FE to show a heighted risk of criminal

behavior, compared to the high/high group. I predict that the low/low subscale will display the most delinquency, compared to every other group. That is, I expect the "mismatched" groups to demonstrate some advantages over the low/low group regarding criminal behavior.

Methods

Participants

The present analyses used data from the Crossroads Study, a longitudinal investigation of 1,216 male first-time adolescent offenders. Participants were recruited between 13 and 17 years of age at the time of their first arrest (M_{age} = 15.29) and were arrested for one of several types of misdemeanor offenses, including vandalism (17.5%), theft (16.7%), and possession of marijuana for personal use (14.8%). Data were obtained from youth at three sites: Philadelphia, Pennsylvania; Jefferson Parish, Louisiana; and Orange County, California. The sample is reflective of the overrepresentation of minority youth in the juvenile justice system and includes Latino (46.8%), African American (36.9%), Caucasian (14.8%), and self-identified other race/ethnicity (2.5%) youth.

Procedures

The Institutional Review Board at each site approved all study procedures. Participants provided assent and their parents signed consent forms prior to the beginning of the interview. Baseline interview data was collected within six weeks of their disposition hearing, and follow-up interviews were conducted every six months for three years following their initial interview (6mo, 12mo, 18mo, 24mo, 30mo, 36mo) as well as an additional interview one-year later (48mo). Face-to-face interviews with the youth ranged from 2 to 3 hours and were recorded using a secure computer-based program. Interviews were conducted at participant homes or other locations convenient for the participants, such as local coffee shops and restaurants or in a facility if the participant was incarcerated. Participants had the option to respond to questions

using a keypad so their responses could remain private. All interview responses are protected by a Privacy Certificate issued by the Department of Justice which protects participants' privacy by exempting their responses and identity from subpoenas, court orders, or other types of involuntary disclosures. Exceptions to the promise of confidentiality included situations in which a participant 1) was suspected of being abused, 2) expressed plans to hurt himself or someone else or plans to commit a crime and 3) reported that someone was in jail for a crime the participant had committed. Interviewers explained in detail the purpose of the Privacy Certificate before beginning the interview, and reminded participants again before asking sensitive questions, such as those about reoffending. Youth were paid $50 for the first interview, and compensation increased by $15 with each additional interview. Study retention remained high, with a rate of nearly 87% maintained for the completed waves of data collection. Participants with complete data did not report differences in baseline future expectations ($t(1213) = -.67$, $p = .50$) or future orientation ($t(441.524) = -.25$, $p = .81$) compared to youth with at least one wave of missing data.

Measures

Future Orientation (all follow-ups). The Future Outlook Inventory (Cauffman & Woolard, 1999) is an 8-item questionnaire that assesses youths' consideration for and attention towards the future. The scale was administered at the baseline and at each follow-up interview. Participants indicated the degree to which each statement reflects how they usually are (e.g., "I usually think about the consequences before I do something," using a scale from 1 (*never true*) to 4 (*Always True*). A composite score is created from the average score of the 8 items, with higher scores indicating a stronger orientation towards the future ($\alpha_{baseline} = .66$).

Future Expectations (all follow-ups). Expectations for the future was assessed using the Perceptions of Opportunities scale to measure an adolescent's prediction of his future adult success (adapted from Menard & Elliot, 1996). The 7-item measure assessed the participants' perceived likelihood for achievement in school, work, family, and law abiding behavior. Participants responded on a 5-point Likert scale ranging from 1 (*poor*) to 5 (*excellent*) (e.g., "What do you think your chances are to earn a good living?"). Higher scores are indicative of holding more optimistic future expectations ($\alpha_{baseline}$ = .90).

Delinquency (baseline and 6-month follow-up). Delinquency was measured using both self-reported and official records. Participants completed the Self-Report of Offending scale (SRO; Huizinga, Esbensen & Weiher, 1991) and indicated if they had been involved in any of 24 various criminal acts, ranging from selling drugs to homicide, at any point during the follow-up period. The number of offenses an adolescent endorsed was summed over the data collection period to create a variety score of offending, with higher scores indicative of more severe levels of offending. Variety scores provide a consistent and valid estimate of involvement in illegal activity (Osgood, McMorris, & Potenza, 2002) and have several advantages over summing how frequently youth offend. Variety scores are highly correlated with measures of seriousness of antisocial behavior yet present a lower risk of recall bias compared to frequency of offending measures (Hindelang, Hirschi, & Weis, 1981; Osgood et al. 2002). Offending frequency outcomes tend to be poorly distributed, with only a small number of respondents engaging in the behavior many times and many youth reporting "0" (Osgood et al. 2002). In addition, official court records were collected to evaluate filed petitions during the 6-months following an adolescent's first arrest, to evaluate whether the youth had been re-arrested (0 = *not re-arrested*, 1 = *re-arrested*).

Substance-use (baseline and 6-month follow-up). Participants completed the Substance Use/Abuse Inventory (modified from Chassin, Rogosch, & Barrera, 1991). The current study will use the Substance Use subscale, which evaluates an adolescent's use of illegal drugs or alcohol over the past six-months (alcohol, marijuana, sedatives, stimulants, cocaine, opiates, ecstasy, hallucinogens, inhalants, amyl nitrate, prescription medications). A variety score detailing the number of different substances an adolescent used during each follow-up period was calculated at the baseline and follow-up one (6-month) interview. Scores ranged from 0 (*never used drugs/alcohol in the past 6 months)* to 13 (*used 13 types of drugs/alcohol in the last 6 months*). Higher scores are indicative of youth using a greater number of different types of substances (e.g., more severe substance use).

Sexual risk-taking (baseline and 6-month follow-up). Participants completed a 15-item questionnaire assessing several facets of sexuality and sexual behavior, including questions pertaining to sexual activity over the past six-months. First, participants indicated if they engaged in vaginal sex over the past six months, and if so, they were asked a series of questions relating to sexual risk behavior. The current study will use two of the items to evaluate risky sexual behavior: (1) frequency of condom use and (2) casual sex. Condom use was assessed with the question: "Thinking about the past six months, how often do you use condoms when you have vaginal sex?" (answer choices: *never (1), sometimes (2), most of the time (3)* or *always (4))*. For the purposes of this study, these choices were dichotomized into inconsistent users (coded 0; *never*, *sometimes* and *most of the time*) and consistent users (coded 1; *always*). Youth who abstained from sex were also coded as 1. Casual sex was measured with the question: "Have you had vaginal sex with someone you didn't know very well in the past six months?" (answer

choices: *yes (1)* or *no (0)*). Youth who abstained from sex were also coded as 0. Each item will be evaluated separately.

Cigarette smoking (baseline and 6-month follow-up). Two questions were asked to assess cigarette use. Participants responded to the question, "In the past six months, how often have you smoked cigarettes?" with answer choices ranging from 1 (*not at all*) to 9 (*everyday*). If respondents answered affirmatively to smoking cigarettes, participants then indicated the number of cigarettes they would smoke in a typical day, with answer choices ranging from 1 (*0 cigarettes*) to 6 (*more than a pack a day*). For both items, higher scores on each item represents more frequent or greater quantities of cigarette use. In addition, I created a dichotomous variable to indicate whether the participant had engaged in any cigarette smoking over the past 6-months (0 = *no*, 1 = *yes*). All three items were considered separately.

Covariates (baseline). Participants reported their birthdate, race, and parents' highest level of education. Their age at each interview was calculated by subtracting their birthdate from the interview date. Youth also reported on the highest level of education that either of his parents had received at the baseline interview, which was used as a proxy for socioeconomic status (Galobardes, Lynch, & Smith, 2007; Lynch and Kaplan 2000). Approximately 29.9% of the sample did not have a parent who had graduated from high school, and 70.1% had at least one parent who had obtained at least a high school diploma. Finally, participant IQ was evaluated using the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999), a brief and reliable measure of general intelligence (Ryan et al. 2003). A full-scale IQ estimate was created by combining scores from the verbal ability scale (Vocabulary) and the performance ability scale (Matrix Reasoning). Studies have shown that the WASI demonstrates strong psychometric

properties, especially its strong convergent validity with longer measures of intelligence in samples of adolescents (Canivez et al. 2009).

Plan of Analysis

Prior to conducting the analyses for question 1, the Crossroads data were transformed to better account for developmental differences in FO and FE. The Crossroads study follows an accelerated longitudinal cohort design, with participants of varying ages at each wave (e.g., 13-17 at baseline, 14-18 at follow-up 2, 15-19 at follow-up 4, etc.). To better discern developmental patterns, the data were re-organized by age, rather than follow up. The data restructuring allowed me to consider whether a two-factor model holds across *development*, rather than *time since baseline interview*. Individual CFAs for each measure (orientation and expectations) at each age were first conducted to ensure each factor demonstrated adequate model fit, and to evaluate item-level factor loadings. Model fit was evaluated using the comparative fit index (CFI) and the root-mean-square error of approximation (RMSEA). CFI values above .90 and RMSEA values lower than .08 represent acceptable fit (Hu & Bentler, 1999).

Before testing the factor structure of FO and FE, I tested for measurement invariance from ages 13 to 20. Including a test of measurement invariance ensures that when comparing the factor structure of FO and FE over time, the same constructs are being compared (i.e., comparing "apples to apples" rather than "apples to oranges"; McArdle, 1996; Odgers et al., 2008). That is, the tests of measurement invariance indicate whether the items of the FO and FE scales assess the same attributes at different points during development (e.g., age 13 and age 17). Due to the data restructuring, two independent invariance models will be considered for each scale: invariance between ages 13-17 (early adolescence) and ages 17-21 (late adolescence). The Crossroads study was designed with planned missing data (missing completely at random), such

that participants provided data at varying ages. Participants who completed their baseline interview at 13 provided data between the ages 13-17, whereas an adolescent who was 17 at the time of their initial interview provided data from ages 17-21. Although intentional, this data structure precludes the possibility of a full measurement model including all data from ages 13-21. Because certain age groups have complete missing data (e.g., no participant who was 13 at the baseline interview also provides data at 21) several covariance paths in the measurement model are not possible. Factor covariances would not be feasible for several age groups (i.e., age 13 with age 19-21, age 14 with age 19-21, age 15 with 20-21, etc.). In addition, youth arrested for the first time at age 13 are likely drawn from a distinct population than youth arrested for the first time at age 17, a challenge present within accelerated cohort designs. Considering these restrictions, I conducted two separate invariance models including age groups with sufficient data coverage. Specifically, I ran one model with data for adolescents between 13-17 (early adolescence), and a second model with data for adolescents between 17-21 (late adolescence), for each measure.

Configural, weak and strong invariance were tested using a series of model constraints, as recommended by Vandenberg and Lance (2000) and Little (2013). Weak invariance tests if the indicator loadings are equivalent across age whereas strong invariance considers if the intercepts for the indicators are equivalent. I also examined whether the covariance between FO and FE is equal across development, by running two additional models (for early and late adolescence) with both FO and FE included. The first model allowed the covariance between FO and FE at each age to freely covary (e.g., FO14 with FE14). The second model constrained these covariances to be equal over time (e.g., FO14 with FE14 = FO16 with FE16). I then compared the Chi Square difference and CFI to evaluate if model fit declined after constraining the

parameters. Given the number of parameters using latent variables (e.g., 10 latent variables each with 7-8 indicators each), I conducted these comparisons using the observed means score for FO and FE. This substantially reduced the number of parameters (reducing the Chi Square) to increase the likelihood of detecting significant differences in the strength of the correlation. Model fit was reassessed after each respective model constraint to test for significant changes in the Chi Square and CFI.

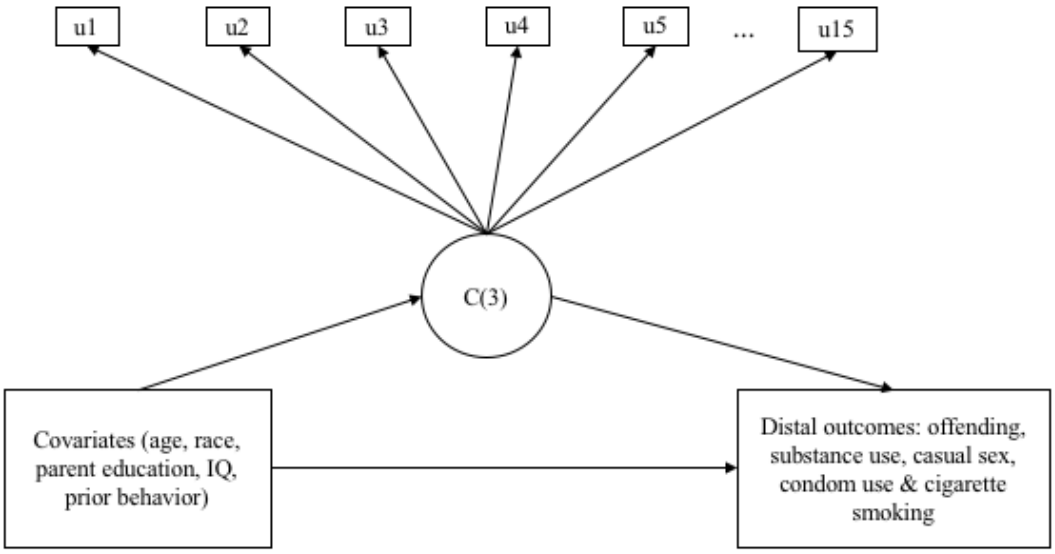
For the second analysis, I performed a latent class analysis to assess if distinct categories of individuals emerged, with a subset of individuals suggestive of a "developmental mismatch" (e.g., low FE-high FO or high FE-low FO). All items for both the FO and FE scales were used in the model (15 items total). In order to conduct the LCA, items response choices were combined and dichotomized to indicate low and high levels of FE and FO. For FE, the item responses including "poor" and "fair" were dichotomized as low (0) and "good", "very good" and "excellent" were dichotomized as high (1). In a similar fashion, the answer responses of "never true" and "rarely true" were dichotomized as low (0), and "often true" and "always true" dichotomized as high for the FO scale. I made the decision to dichotomize the study indicators to improve model convergence and aid the interpretability of the findings, a step followed by previous researchers (Quirk, Nylund-Gibson & Furlong, 2013; Nylund, Bellmore, Nishina & Graham, 2007).

I performed a LCA to establish the appropriate number of distinct classes and to evaluate whether these classes related to various forms of risk-taking. I used the three-step manual method (Asparouhov & Muthen, 2013, Vermut, 2010), to account for both covariates (age, race, parent education, IQ and baseline behavior) and distal outcomes (self-reported offending, re-arrest, substance use, risky sexual behavior and cigarette smoking) within the same model. As

part of the first step, I determined the appropriate number of classes by running a 1-class model and iteratively testing additional models with added classes (e.g., 2-class, 3-class, 4-class, etc.). I considered up to four possible classes. Model fit was compared across the different solutions to determine the best fitting model. As recommended by Pastor and colleagues (2007), the following criteria were used to evaluate the appropriate number of classes: the Bayesian Information Criteria (with lower values signaling better fit) and the Lo-Mendell-Rubin Likelihood Ratio Test (a non-significant *p*-value will suggest that the model with fewer classes is adequate). In addition, I examined whether the different classes were useful and interpretable, and evaluated the number of individuals within each class.

After selecting the appropriate number of classes, I continued with the manual 3-step estimation. For a comprehensive and detailed explanation of the manual 3-step approach, see Asparouhov and Muthen (2013). The primary benefit of the 3-step approach is the ability to simultaneously account for covariates and distal outcomes within the latent class framework (see Figure 1.1). Within this framework, mean estimates of the distal outcomes are computed and a Wald Test is provided (as well as post-hoc comparisons) to indicate significant differences in distal outcomes across classes. A negative binomial distribution was specified for self-reported offending and substance use.

Figure 1.1. Diagram of three-class latent class analysis with covariates and distal outcomes (3-step)



Results

Measurement invariance

Before assessing measurement invariance, individual confirmatory factor analyses (CFA) were conducted for each measure at each age. Overall, the models suggested acceptable or excellent fit to the data (see Table 1.1) for all ages. Next, four separate measurement invariance models were tested: an early adolescent model (FO and FE) and a late adolescent model (FO and FE). As a reminder, the early adolescent model included individuals who were between the ages of 13 and 15 (baseline age mean = 14.24, $N = 618$) at the baseline interview, and the late adolescent model included individuals who were between the ages of 15 and 17 (baseline age mean = 16.00, $N = 790$) at the baseline interview.

The early adolescent FE model provided support for partial strong invariance. As documented in Table 2.1, after three loadings (items 1, 4, and 7), and three intercepts were free to vary (items 2, 6, and 7), the model did not statistically differ from the configural model. For FO, the model showed partial strong invariance, with two loadings (items 8 and 10) and one intercept (item 8) allowed to remain free.

The late adolescent future expectations model similarly showed partial strong invariance. After freeing the loading of one item (item 2), the model met criteria for weak and strong invariance. After freeing three intercepts (items 3, 8 and 10), FO also exhibited partial strong invariance. Table 3.1 details the results of the configural, weak and partial strong invariance for the late adolescent cohort. Overall, these results support the notion that both measures, FO and FE, remain comparable as youth age.

Table 1.1. CFAs for future orientation and future expectations from age 13-21

	Age	CFI	TLI	RMSEA	Chi Square	Item loadings							
						1	3	5	6	8	10	14	15
Future Orientation	13	.91	.87	.06(.00|.11)	$\chi^2(19) = 28.74, p = .07$	.24	.31	.53	.56	.29	.35	.52	.44
	14	.98	.96	.03(.00|.07)	$\chi^2(18) = 26.22, p = .09$	.30	.30	.54	.48	.25	.37	.50	.49
	15	.98	.97	.04(.02|.06)	$\chi^2(18) = 33.00, p = .02$	.37	.36	.36	.42	.41	.45	.37	.41
	16	.98	.97	.04(.02|.06)	$\chi^2(18) = 32.81, p = .02$	.38	.36	.52	.54	.33	.39	.41	.43
	17	.99	.98	.04(.01|.06)	$\chi^2(17) = 29.59, p = .03$	.46	.40	.50	.48	.45	.43	.42	.39
	17*	.99	.99	.03(.00|.05)	$\chi^2(18)=28.77, p = .05$	.35	.36	.45	.50	.37	.39	.42	.45
	18	.98	.86	.05(.03|.06)	$\chi^2(17)=44.03, p < .001$	.35	.37	.37	.47	.40	.40	.37	.37
	19	.97	.96	.05(.03|.06)	$\chi^2(18)=49.74, p < .001$	.38	.37	.47	.53	.41	.42	.49	.48
	20	.98	.97	.04(.02|.06)	$\chi^2(18)=32.17, p = .02$	.38	.33	.51	.42	.49	.51	.51	.42

	21	.97	.95	.05(.01|.09)	$\chi^2(19)=31.23,\ p = .04$	.37	.43	.49	.55	.44	.49	.46	.48
						1	2	3	4	5	6	7	
Future Expectations	13	.98	.96	.08(.03|.13)	$\chi^2(12)=23.84,\ p = .02$	.65	.78	.73	.70	.51	.41	.47	
	14	.99	.99	.04(.00|.09)	$\chi^2(8)=13.31,\ p = .10$	.61	.83	.87	.76	.81	.51	.59	
	15	.99	.98	.06(.04|.09)	$\chi^2(9)=32.90,\ p<.001$	.71	.86	.83	.86	.68	.58	.72	
	16	.99	.99	.05(.02|.07)	$\chi^2(8)=18.26,\ p = .02$	.70	.80	.83	.72	.69	.49	.73	
	17	.99	.99	.04(.01|.07)	$\chi^2(8)=16.49,\ p = .04$	.80	.87	.88	.79	.73	.53	.74	
	17*	.99	.99	.06(.04|.08)	$\chi^2(9)=35.93,\ p< 001$	.82	.89	.87	.81	.74	.53	.69	
	18	.99	.99	.06(.04|.09)	$\chi^2(8)=33.73,\ p<.001$	.74	.82	.81	.75	.64	.54	.66	
	19	.99	.98	.07(.05|.09)	$\chi^2(10)=44.38,\ p<.001$	.78	.78	.80	.77	.76	.56	.66	
	20	.99	.99	.05(.02|.08)	$\chi^2(10)=21.17,\ p=.02$	.76	.73	.78	.78	.71	.55	.62	
	21	.98	.95	.11(.07|.15)	$\chi^2(10)=35.85,\ p<.001$	.73	.78	.83	.75	.75	.59	.55	

*Includes individuals who were 17 at baseline interview

Table 2.1. Early adolescent measurement invariance

	Chi Square						RMSEA		CFI		TLI	
Model Tested	χ^2	*df*	*p*	$\Delta\chi^2$	*df*	*p*	RMSEA	90%CI	CFI	ΔCFI	TLI	ΔTLI
Future Expectations												
Configural	932.78	458	<.001				.036	.033, .040	.977		.970	
Partial Weak	958.14	478	<.001	14.18	20	>.20	.036	.033, .040	.977	.001	.970	0
Partial Strong	986.01	502	<.001	27.87	24	>.20	.035	.032, .038	.977	0	.972	.002
Future Orientation												
Configural	1178.35	641	<.001				.033	.030, .035	.935		.921	
Partial Weak	1208.239	669	<.001	29.89	28	>.20	.032	.029, .035	.935	0	.924	.003
Partial Strong	1230.64	685	<.001	22.4	16	>.10	.032	.029, .035	.934	.001	.925	.001

Table 3.1. Late adolescent measurement invariance

	Chi Square						RMSEA		CFI		TLI	
Model Tested	χ^2	*df*	*p*	$\Delta\chi^2$	*df*	*p*	RMSEA	90%CI	CFI	ΔCFI	TLI	ΔTLI
Future Expectations												
Configural	760.24	455	<.001				.033	.029, .037	.98		.97	
Partial Weak	774.24	467	<.001	14.00	12	>.20	.033	.029, .037	.98	0	.97	0
Partial Strong	789.07	479	<.001	14.84	12	.20	.032	.028, .036	.98	.01	.97	0
Future Orientation												
Configural	1147.64	640	<.001				.036	.032, .039	.907		.886	
Partial Weak	1178.91	660	<.001	31.27	20	.05	.036	.032, .039	.905	.002	.887	.001
Partial Strong	1209.31	684	<.001	30.4	24	>.10	.035	.032, .038	.903	.002	.890	.002

Factor Structure

Two methods were used to assess whether a 1-factor or 2-factor model better represented the relation between FO and FE. First, I compared the models using the Chi-Square difference test, to evaluate whether including a second factor significantly improved model fit. I also evaluated changes in the CFI and TLI across the 1 vs. 2 factor models, to examine whether the 2-factor model demonstrated improvements exceeding .01 (Chen, 2007; Cheung & Rensvold, 2002). Table 4 displays the results from the Chi Square tests for each age group. For every age group, the 2-factor model demonstrated better fit to the data, compared to the 1-factor model according to both the Chi Square and CFI/TLI. I also performed a Wald test to evaluate whether the correlation between the two factors significantly differed from one. As displayed in Table 4.1, the Wald tests were all significant, confirming that the 2-factor models better represents the relation between the FO and FE factor indicators.

Table 4.1 Models comparing 1 vs. 2 factors for future expectations and future orientation

Model	Chi Square						RMSEA		CFI	TLI	Wald
	χ^2	df	P	$\Delta\chi^2$	*df*	*p*	RMSEA	90%CI			Test
13 1-factor	177.15	87	<.001	-	-	-	.088	.07, .11	.862	.834	48.35 *p*<.001
13 2-factor	109.07	86	<.001	68.08	1	<.001	.045	.005, .068	.965	.957	
14 1-factor	310.63	87	<.001	-	-	-	.088	.078, .099	.895	.873	69.05 *p*< .001
14 2-factor	196.01	86	<.001	114.62	1	<.001	.062	.051, .074	.948	.937	
15 1-factor	575.19	87	<.001	-	-	-	.096	.088, .103	.890	.867	156.01 *p*<.001
15 2-factor	282.10	86	<.001	293.09	1	<.001	.061	.053, .069	.956	.946	
16 1-factor	668.45	87	<.001	-	-	-	.105	.098, .112	.875	.849	141.22 *p*<.001
16 2-factor	350.11	86	<.001	318.34	1	<.001	.071	.063, .079	.943	.931	
17 1-factor[1]	735.87	87	<.001	-	-	-	.113	.106, .121	.864	.836	156.92 *p*<.001
17 2-factor[1]	323.79	86	<.001	412.08	1	<.001	.069	.061, .077	.950	.939	
18 1-factor	894.15	87	<.001	-	-	-	.109	.102, .115	.869	.842	203.70 *p*<.001
18 2-factor	468.34	86	<.001	425.81	1	<.001	.075	.069, .082	.938	.924	
19 1-factor	776.12	87	<.001	-	-	-	101	.095, .108	.878	.852	194.33 *p*<.001
19 2-factor	194.33	86	<.001	581.79	1	<.001	.056	.050, .064	.962	.954	
20 1-factor	580.27	87	<.001	-	-	-	.107	.099, .115	.854	.824	137.78 *p*<.001
20 2-factor	247.63	86	<.001	332.64	1	<.001	.061	.053, .070	.952	.942	
21 1-factor	362.51	87	<.001	-	-	-	.119	.107, .132	.817	.780	75.70 *p*<.001
21 2-factor	179.64	86	<.001	182.87	1	<.001	.070	.056, .084	.938	.924	

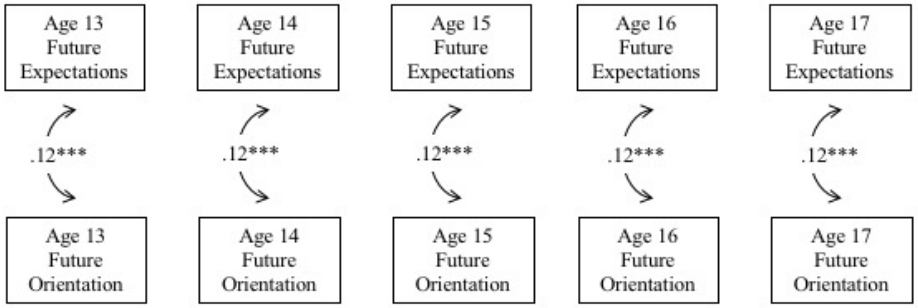
[1]Results from early adolescent model presented

Future Expectations and Future Orientation Covariance

The factor analyses supported my hypothesis that FO and FE represent unique aspects of adolescent development. Next, I compared the correlation between FO and FE in both the late

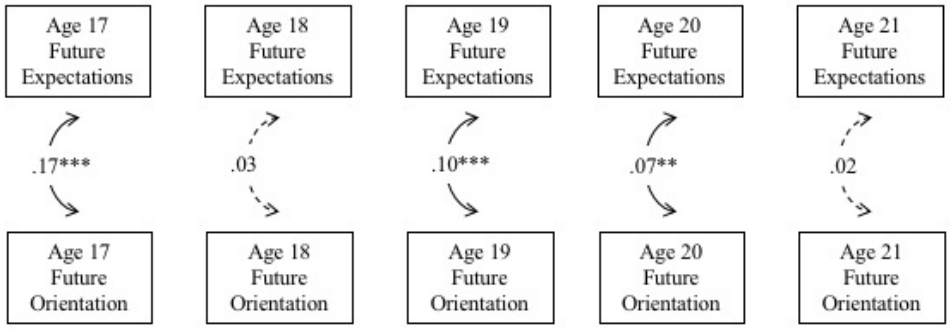
and early adolescent models to test if the strength of the correlation changed over time. For the early adolescent model, the constrained model (Figure 2.1) fit the data just as well as the free model, suggesting the strength of the correlation is comparable from age 13 to 17 (Free model $\chi^2(20) = 202.857$, $p < .001$, RMSEA = .12, CFI = .91; constrained model $\chi^2(24) = 208.59$, $p < .001$, RMSEA = .11, CFI = .91; $\Delta\chi^2(4) = 5.73$, $p > .05$). The late adolescent pattern differed, and the findings implied that the free model (Figure 3.1) fit the data best (Free model $\chi^2(20) = 266.50$, $p < .001$, RMSEA = .13, CFI = .92; constrained model $\chi^2(24) = 295.53$, $p < .001$, RMSEA = .12, CFI = .92; $\Delta\chi^2(4) = 29.03$, $p < .001$). This pattern suggested that overall, the strength of the correlation between Fo and FE declines as youth enter young adulthood.

Figure 2.1. Early adolescent model testing the correlation between future expectation and future orientation (constrained)



Notes. $N = 618$; Standardized estimates presented. All within-construct correlations included, but not shown (e.g., FE13 with FE14 and FE15 and FE16, etc.)

Figure 3.1. Late adolescent model testing the correlation between future expectation and future orientation (free)



Notes. $N = 790$; Standardized estimates presented. All within-construct correlations included, but not shown (e.g., FE17 with FE18 and FE19 and FE20, etc.)

Latent Class Analysis: 3-Step Manual Approach

Next, I conducted an LCA to establish whether some youth displayed a mismatch in levels of FO and FE. As a reminder, only baseline and 6-month interview data were used for the following analysis. This decision was made in light of research suggesting that FO and FE change across development (Monahan et al., 2009; Mello, 2008). Because I did not expect baseline FO and FE to relate to long-term outcomes, I focused exclusively on the more immediate 6-month outcomes. Table 5.1 displays the results from the LCA. The BIC was lowest for the 3-class model, although the aBIC was lowest for the 4-class model. The LMR-LRT was not significant for the 4-class model suggesting 3-classes sufficiently described the data. Given these fit statistics, I moved forward with the 3-class model as the preferred model. Figure 4.1 displays the item probability plot showing the probability that youth in a specific latent class reported high FO and FE. Nearly half of the sample exhibited high FO and FE (*consistent high*, 49%), and a much smaller percentage showed low FO and FE (*consistent low,* 11%). Only one

mismatched group emerged, and represented 39% of adolescents in the sample. These youth (*mismatched*) displayed relatively high FE, but lower FO.

Table 5.1. Fit statistics for LCAs (testing 1-4 classes)

Model	*Loglikelihood*	*BIC*	*aBIC*	*Entropy*	*% in each class*	*LMR-LRT*
1-class	-8807.49	17721.523	17673.88	-	100%	-
2-class	-8168.91	16558.030	16459.561	.93	12%; 88%	p<.001
3-class	-7917.00	16167.862	16018.571	.75	49%; 40%; 11%	p<.001
4-class	-7866.09	16179.697	15979.583	.73	45%; 11%; 35% 9%	p= .05

Note. LCA = latent class analysis; BIC = Bayseian Information Criterion, aBIC = adjusted BIC, LMR-LRT = Lo-Mendell-Rubin Likelihood Ratio Test.

As shown in Table 6.1, as part of the 3-step process I evaluated whether different covariates predicted the likelihood of being in one class over another. I was especially interested in testing for developmental differences, to evaluate if younger adolescents were more likely to fall into the mismatch group. Neither race, IQ nor parent education distinguished the consistent high from the mismatch or consistent low groups. As expected, older adolescents were less likely to be in the mismatch class compared to the consistent high class. No age differences between the consistent low and consistent high groups were present. Interestingly, when using the consistent low group as the reference category (mismatch vs. consistent low in Table 6.1), older youth were also less likely to be in the mismatch group relative to the consistent low group (Logit = .20, SE = .09, Logit/SE = .22, p = .03). These findings support the notion that younger adolescents are more likely to display a mismatch in future expectations and future orientation.

Table 6.1. Covariate effects predicting class membership

Covariate		Logit	SE	Logit/SE	p-value
Mismatch vs. Consistent High[1]					
Age		-.21	.07	-3.17	.002
Race					
	Black	-.10	.28	-.35	.73
	Latino	.24	.28	.85	.40

	Other	.56	.66	.85	.40
IQ		.01	.01	1.61	.11
Parent Education					
	No HS	.02	.23	.11	.92
	HS Only	-.24	.21	-1.15	.25
Consistent Low vs. Consistent High[1]					
Age		-.01	.09	-.11	.91
Race					
	Black	-.11	.38	-.30	.77
	Latino	.42	.37	1.14	.25
	Other	.71	.75	.95	.34
IQ		.01	.01	1.08	.28
Parent Education					
	No HS	.01	.32	.03	.98
	HS Only	.20	.28	.71	.48
Mismatch vs. Consistent Low[2]					
Age		-.20	.09	-2.19	.03
Race					
	Black	.01	.38	.03	.92
	Latino	-.18	.37	-.39	.63
	Other	-.15	.74	-.21	.84
	IQ	.002	.01	.20	.84
Parent Education					
	No HS	.01	.32	.05	.96
	HS Only	-.44	.29	-1.54	.12

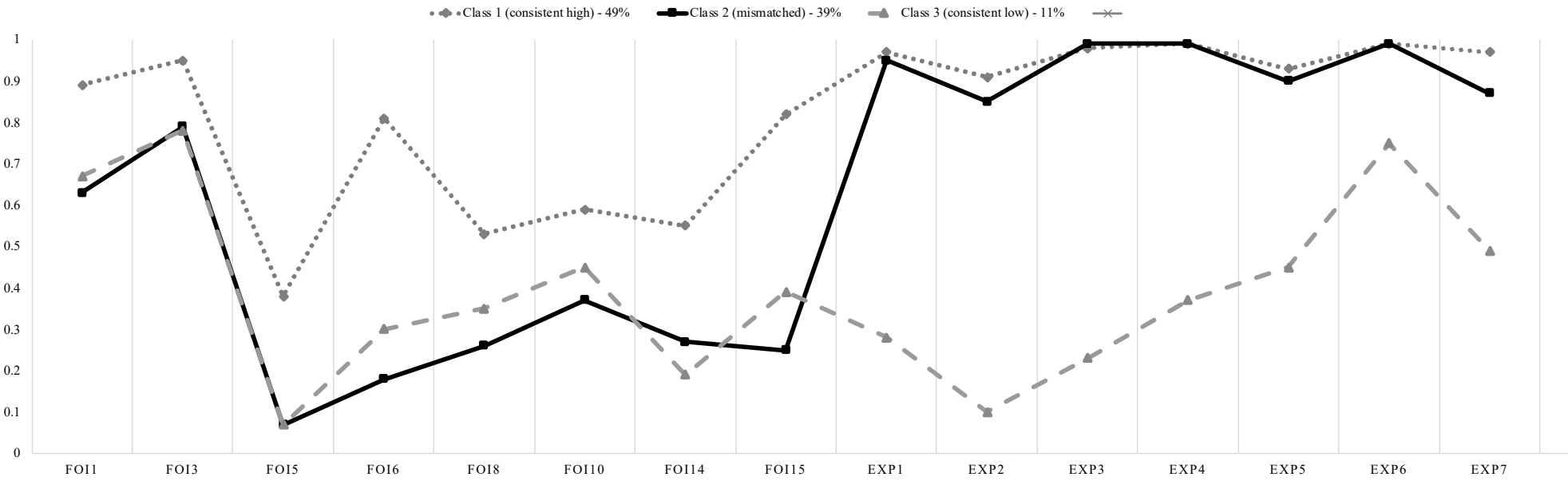
Note.[1]Reference group is consistent high, [2]Reference group is consistent low; SE = standard error.

The results also suggest that the classes differ on several distal outcomes. Figure 5.1 graphically displays the results for the self-reported offending and substance use class comparisons. This figure displays the intercepts, rather than scale means of self-reported offending and substance use because of the inclusion of covariates (i.e., self-reported offending and substance use were regressed onto control variables). After controlling for race, age, parent education, IQ and baseline levels of self-reported offending or substance use, significant differences in self-reported offending and substance emerged between the consistent high and consistent low, and the consistent high and mismatch group. Youth in the consistent high group used fewer substances and reported fewer crimes than youth in the mismatch and consistent low

group. No differences in substance use or self-reported offending emerged between the mismatch and consistent low group. Contrary to my hypothesis, youth in the mismatch group engaged in risky behaviors at levels comparable with that of the consistent low group.

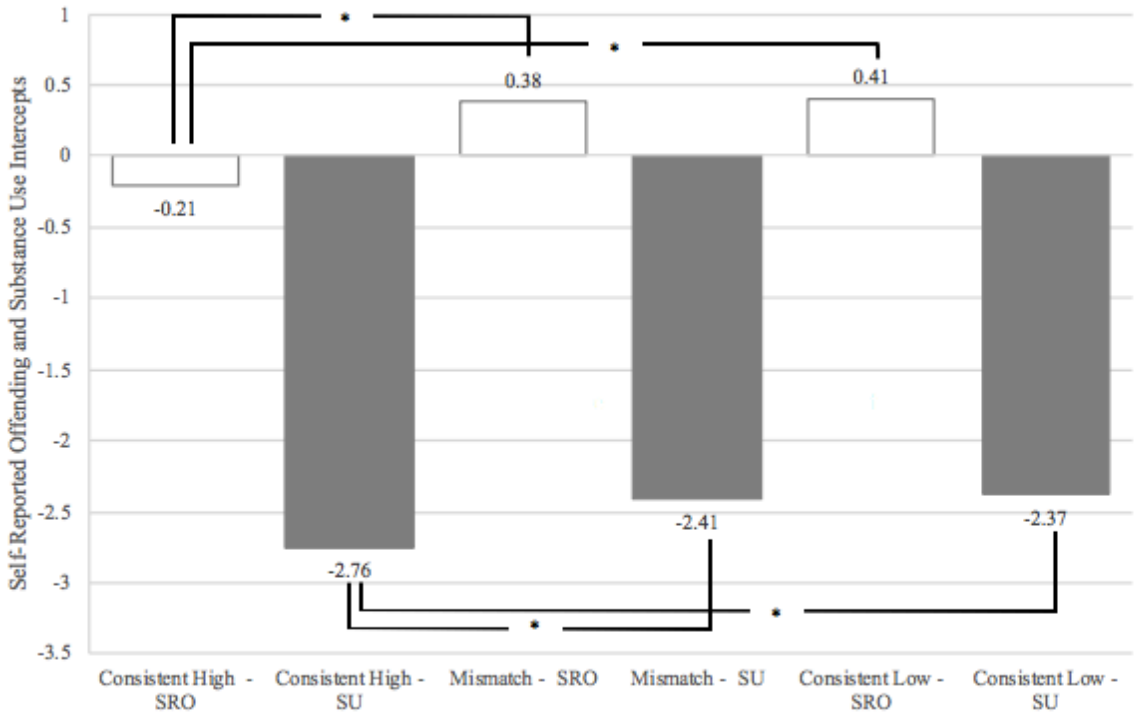
I compared the classes on three additional outcomes: re-arrest (via official record), condom use, casual sex, and cigarette smoking. After accounting for all covariates (race, age, parent education, IQ and baseline reports of condom use), there were no differences in the likelihood of consistently using condoms across any of the classes. Due to model convergence issues with the 3-step approach for casual sex, cigarette smoking, and re-arrest, I instead switched to the manual BCH method (Bolck, Croon & Hagenaars, 2004) for testing covariates and distal outcomes within a latent class framework. Although similar to the 3-step approach, this method computes BCH weights for each individual which are used to help estimate the likelihood of classification errors. Figure 6.1 displays the results for the casual sex and cigarette smoking at 6-months. Youth in the consistent high group were less likely to engage in casual sex at the 6-month follow-up interview, compared to both the mismatch and consistent low group. No differences in casual sex were present between the mismatch and consistent low group. For cigarette smoking, there were no significant differences between the consistent high and mismatch classes. However, youth in the consistent low group were more likely to smoke cigarettes than both the consistent high and mismatch classes. There were no significant differences in the frequency of smoking or the number of cigarettes youth smoked across any of the classes. There were also no significant differences in rates of re-arrest across the three classes.

Figure 4.1. Item probability plot of the three FO/FE classes



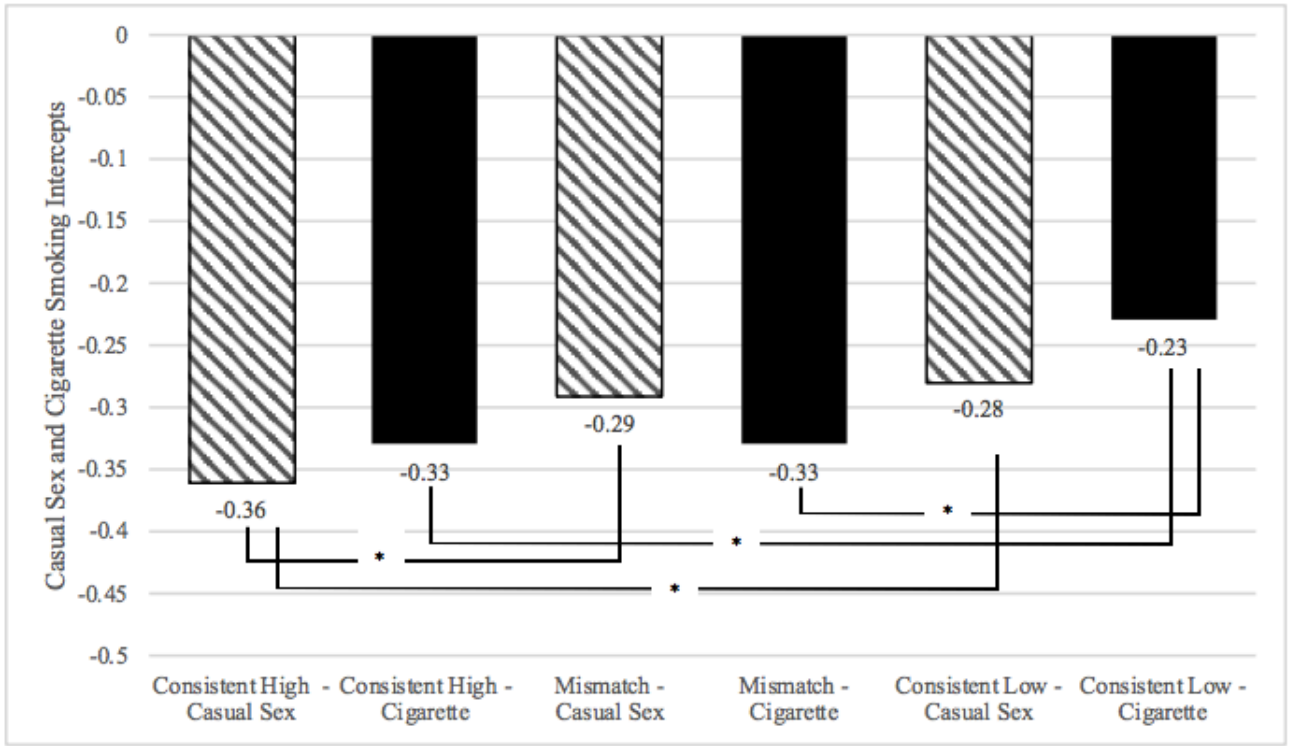
Notes. FOI = Future Orientation Inventory, EXP = Future Expectations Scale. 1 = item 1, 3 = item 3, etc.

Figure 5.1 Self-reported offending and substance use intercepts by class.



Notes. SRO = self-reported offending; SU = substance use. Higher values represent more SU and SRO.

Figure 6.1 Casual sex and cigarette smoking intercepts by class.



Notes. More positive values represent a higher likelihood of casual sex and cigarette use.

Discussion

Future orientation and future expectations carry different implications for the reduction and prevention of adolescent crime. Whereas FO functions as a key part of one's psychosocial capacity to think about future consequences, FE emphasize an adolescent's evaluation of his future chances for success. While previous work distinguishes between these two developmental assets (Nurmi, 1991), few researchers have empirically tested whether these different aspects of future-thinking are analytically distinct, or the extent to which they are related. Study 1 aimed to fill this gap in the literature and confirmed that although related, FO and FE represent unique aspects of future-thinking. Moreover, results from the LCA analysis revealed that a substantial number of adolescents exhibited a "mismatch" in FO and FE. Specifically, a subgroup of adolescents were optimistic about the future but failed to consider how their present behavior would influence their future selves and potential success. Indeed, teenagers in the mismatch category differed in their tendency to take risks. Youth displaying the FO/FE mismatch reported higher levels of self-reported offending, substance use, and casual sex compared to youth with high levels of FO/FE.

Importantly, younger justice-involved adolescents were more likely to fall into the mismatch class than both the inconsistent high and inconsistent low classes. One possible explanation is that the mismatch is developmental in nature: younger adolescents present more difficulties calibrating their future orientation with their expectations for future success, a skill that adolescents hone as they age. Alternatively, because all youth were arrested for the first time, younger participants may display more risk factors for delinquency (such as mismatched FO/FE) compared to older participants. Early onset delinquency represents an important risk factor for continued criminal behavior, and youth who begin committing crime at a young age

are more likely to continue on a path of antisocial behavior and delinquency (Patterson, Crosby, Vuchinich, 1992; Moffitt, 1993; Piquero & Chung, 2001). Patterson et al. (1992) found that antisocial trait scores (parent, peer, teacher and child reports of overt and covert antisocial behavior) and reports of social disadvantage (parent SES) partially accounted for early police contact. That is, youth arrested at younger ages were more likely to display early behavioral problems and come from lower SES environments. Simons and colleagues (1994) similarly found that "early starters" (committing a crime by age 14) tended to have oppositional deviant behavior as well as antisocial peers. Compared to older teenagers, those arrested at earlier ages are also more likely to have neuropsychological problems (Moffit, 1994). In a similar fashion, mismatched FO/FE may operate as another risk factor for early onset delinquency.

Definitions of FO and FE inherently overlap; to some extent, both require an adolescent to envision aspects of their future. The current study measured FO with questions primarily pertaining to planning (Nurmi, 1991), time perspective (Cauffman & Steinberg, 2000), and temporal extension (Lessing, 1972). Adolescents were considered to demonstrate high FO if they understood their decisions carried consequences for the future, and spent time planning and thinking about the future. The FE scale also asked individuals to envision their future, but this measure included an evaluative component. Adolescents were asked to think about their chances of achieving different positive goals, such as academic and professional success, similar to previous studies measuring possible selves (Markus & Nurius, 1986) and aspects of Social Control Theory (Hirschi, 1969). Indeed, the results from the current study support FO and FE as distinct yet related constructs. When included as part of the same CFA, a two-factor model demonstrated superior model fit for all age groups. Although several theoretical models distinguish these two aspects of future-thinking, few studies have analytically tested this

distinction. Given that both scales probe an adolescent's thoughts about the future, ensuring that each map onto distinct analytic factors was an important step towards understanding the association between FO and FE. Some researchers also continue to combine indicators of FO and FE into one mean scale score (So, Voisin, Burnside & Gaylord-Harden, 2016) leading to ambiguous interpretations of study findings. Thinking positively about the future is not inherently tied to the capacity to consider how present behaviors carry consequences for the future, and this study confirms the need to distinguish these two facets of future-thinking.

Nurmi (1991) argued that FO and FE worked together as part of a three stage process: setting goals, planning strategies, and evaluating their feasibility. Based on her model, FO an FE operate as part of a feedback loop: youth who plan and think about the future expect to achieve their goals, but expecting to achieve goals also influences the extent to which an individual plans and thinks about the future. This model suggests that youth high in FO would similarly report optimistic FE (and vice versa), as they would each promote the other's development. I was surprised to find that the correlations between FO and FE ranged from small to moderate in size, suggesting the variance in FO is largely unexplained by the variance in FE (and vice versa). That is, the ability to plan and think ahead may not be inherently tied to expecting to achieve future goals, and expecting to achieve future goals may not necessarily motivate planning and future-thinking. The findings from the developmental analysis (question 1) also suggest that as adolescents transition into young adulthood, the association between FO and FE becomes even weaker. As adolescents age, they likely obtain more information regarding the possibility of achieving specific goals, such as graduating from college. In some ways, their goals may be more realistic compared to younger adolescents (e.g., re-evaluating their chances of graduating

from college based on their class standing towards the end of high school), and external factors may be more highly related to what youth expect for their futures.

The mismatched LCA class that emerged similarly supports the notion that while some adolescents may expect to achieve their future goals, they struggle to behaviorally orient themselves to the future. Nearly 40% of the sample demonstrated high levels of FE but low levels of FO, suggesting that this mismatch is not only present, but also relatively common among youth involved in the justice system. However, it is worth noting that approximately 60% of youth were grouped into "consistent" categories of FO and FE (consistent high or consistent low), which aligns with Nurmi's (1991) model. For many youth, the development of FO and FE go hand-in-hand: having positive future goals facilitates planning and future-oriented thinking, and vice-versa. For a subset of teenagers, however, although they can envision a bright future, they are still developing the psychosocial tools they need to make those goals a reality. It is worth noting that contrary to my hypothesis, only one mismatched class emerged, and the model did not identify a group of adolescents who reported high FO and low FE. Because the LCA analysis only focused on baseline data (when youth were between 13-17), the age of participants may account for this finding. Thinking about the future while simultaneously holding pessimistic expectations aligns with symptoms of both anxiety and depression, psychopathologies that are more common as youth age (Leadbeater, Thompson & Gruppuso, 2012). This mismatch may also be tied to neuroticism, a personality trait that similarly increases as youth age and is associated with anxiety and depression (Aldinger et al., 2014). A class of youth displaying a high FO-low FE mismatch may emerge as youth enter young adulthood.

The results also suggest that this mismatch carries implications for risk-taking and delinquency. Although prior research has linked both FO and FE to risk-taking and crime,

researchers have typically focused on one aspect at the expense of the other. Teenagers reporting pessimistic views about the future tend to engage in delinquent and risky behaviors (Chen & Vazsonyi, 2012; Clinkinbeard, 2013, as do youth who report lower levels of FO (Stoddard et al., 2011). Research specific to justice-involved adolescents similarly report the important role of both FO and FE (Robbins & Bryan, 2004; Iselin et al., 2012; Mahler, Fine, Frick, Steinberg & Cauffman, 2018) in promoting desistance from crime, as well as other forms of risky behavior such as sexual risk-taking (Mahler et al., 2019). While informative, these studies do not aid our understanding of youth who demonstrate one aspect of future-thinking, but deficits in the other.

The current study extended these findings to assess how mismatched FO and FE influence risk-taking. Contrary to my hypothesis, the mismatched group of youth appeared more similar to the consistent low youth in regards to self-reported offending, substance use and casual sex. That is, the presence of high FE (even when paired with low FO) did not seem to protect against several types of risk-taking. Future expectations may not sufficiently motivate individuals who fail to connect their present decisions to future outcomes. For example, although an adolescent may want and expect to graduate from college, there may be a disconnect as to how a risky decision may impede their chances of that happening. Also, given that adolescent crime often occurs in the presence of peers (Farrington, 2003), without sufficiently developed FO, the immediate rewards of peer acceptance may outweigh any concerns as to how a decision will impede future life events.

Mismatched youth were also more likely to engage in casual sex. Although not illegal, casual sex is typically treated as a form of risk taking (Paul, McManus & Hayes, 2000; Grello, Welsh, Harper & Dickerson, 2003). A previous study examined predictors of casual sex using the same sample from the current investigation (Knowles et al., 2019). The authors compared impulse

control and future expectations, and found only impulse control predicted casual sex. Although FO is distinct from impulse control, both serve as key aspects of psychosocial maturation (Cauffman & Steinberg, 2000), and suggest that casual sexual encounters may result from a tendency to discount, rather than devalue one's future. Interestingly, mismatched youth were as likely to use cigarettes as the consistent high group, and only consistent low youth displayed a heighted risk of smoking. Given previous work connecting FE to health risk behaviors such as cigarette smoking and levels of physical activity (McDade et al., 2011), it is possible that the presence of high FE, even if accompanied by low FO, may be sufficient to deter this unhealthy behavior.

The current study used two independent scales to compare whether a one or two-factor model best described the relation between FO and FE. A stronger test of this hypothesis would involve a scale that includes both FO and FE items within a single measure, as the use of two separate scales may have artificially inflated the likelihood of finding two factors. The LCA also revealed some potential problems with the FO scale. Several items exhibited low homogeneity, suggesting individuals within a given class differed substantially with respect to item responses. For example, for FO item eight, "*I will give up my happiness now so that I can get what I want in the future*," approximately 50% of youth in the consistent high group endorsed this item, and 50% did not. Ideally within a given class, a higher proportion of youth would respond in a similar fashion. Item five ("*I make lists of things to do*") also presented some issues, as even among the consistent high group, only 40% answered this item with "*often true*" or "*always true*". The young age range of participants at the baseline interview (13-17) may explain why making lists was not common, an item that may better measure FO as youth get older and develop stronger planning and organization skills. Finally, to assess the factor structure of FO and FE for the CFA

analysis, I reorganized the data by age. This reorganization assumes that all participants are drawn from the same population, an assumption that may not be feasible given known differences among youth arrested at younger ages (Moffitt, 1993, Patterson et al., 1992). Although I partially accounted for this issue by conducting two independent models (early and late adolescence), all findings should be interpreted in light of this limitation.

Despite these limitations, this study offers a novel assessment of the intersection of FO and FE during adolescence. Understanding and preventing adolescent delinquency requires a multi-method approach, as both contextual (neighborhoods and schools), social (parent-child relationships) and individual factors (e.g., FO and FE) play a role. Individual traits such as FO and FE may be feasible targets for intervention, particularly when unsafe neighborhood or home conditions cannot be immediately remedied. Recent worked has documented the effectiveness of programs aimed to strengthen maturity and reduce delinquency (Piquero, Jennings, Farrington, Diamond & Gonzalez, 2016). These intervention programs may consider recent calls to incorporate the "self" into self-regulation (Silver and Ulmer, 2012), which stress the importance of considering how adolescents' view of their futures relate to cognitive capacities such as FO. In a similar fashion, prior research has questioned why expectations do not always lead to behavioral change (Oyserman, Bybee & Terry, 2006). The authors argued that expectations will likely not lead to the hoped for behavioral changes if they are not linked to contextually salient strategies. Given the sizable number of adolescents who displayed a mismatch in FO and FE, interventions targeting both aspects of development may result in larger reductions in delinquency.

Chapter 2: Mechanisms linking future expectations and crime

Hopeful expectations for the future serve as a robust predictor of developmental outcomes during adolescence. Not only are youth with positive future expectations more likely to succeed academically (Arbona, 2000; Beal & Crockett, 2010) and exhibit healthy behaviors (McDade et al., 2011), they are also less likely to abuse substances (Boroswky, Ireland & Resnick, 2009), and less likely to engage in risky sexual behaviors (Sipsma, Ickovic, Lin & Kernshaw, 2015). Scholars employing large, nationally representative datasets have found that optimism towards the future also reduces the likelihood of problematic or illegal behaviors (Chen & Vazsonyi, 2011; Knight, Ellis, Roark, Henry & Huizinga, 2016). Prior work has also demonstrated the importance of future expectations among at-risk populations such as adolescents who have been arrested for both low- and felony-level offenses. Indeed, positive future expectations appear to play an important role in encouraging desistance from crime as youth enter adulthood (Piquero, 2016; Iselin et al., 2012; Mahler et al., 2018).

However, the nature of adolescent crime may be at odds with the argument that future expectations exert a direct and immediate effect on behavior. Although adolescents with hopeful expectations for their future would likely not plan to commit a crime, delinquency is often impulsive. Adolescent crime tends to occur within highly emotional contexts, under time pressure, in the presence of peers, and is often unplanned (Farrington, 2003; Steinberg, et al., 2009b). Adolescents, compared to older adults, tend to commit crime in groups (Puzzanchera, 2009), which is consistent with experimental work suggesting teenagers' increased susceptibility to peer influence in risky situations (Gardner & Steinberg, 2005). It seems unlikely that in the highly emotional context of committing a crime, an adolescent may be suddenly reminded of his future expectations and stop himself. Rather, positive future expectations likely exert an indirect

effect on behavior by influencing the decision-making processes that deter crime altogether. Thus, understanding the influence of future expectations on crime requires the use of longitudinal data that can capture the potential mediating mechanisms.

Although empirical evidence is limited, several scholars have attempted to develop theoretical frameworks to describe how expectations relate to risky behaviors. Harris and colleagues proposed the "nothing to lose" hypothesis, which argues that adolescents with high expectations for their future perceive greater costs associated with risky or illegal behavior, compared to youth with low expectations (Harris, Duncan & Boisjoly, 2002). In contrast, more recent work emphasizes self-regulation and maturity as a separate potential mechanism. Schmid and colleagues (2011) propose a model of intentional self-regulation (ISR) that argues positive future expectations prompt adolescents to develop and apply self-regulatory skills to help transform their goals into reality. Both mechanisms would suggest that future expectations influence the decision-making processes closely tied to delinquency (i.e., discounting long-term consequences, failing to exercise self-restraint, Gottfredson & Hirschi, 1990; Piquero, 2016). Although discussed theoretically, few studies have explicitly tested whether future expectations influence these two proposed mechanisms: the perceived costs/rewards of crime and impulse control. The present study considers whether these mechanisms partially account for the relation between future expectations and criminal behavior during adolescence and young adulthood.

Future Expectations, perceived costs and rewards of crime, and offending

Harris and colleagues (2002) proposed the nothing to lose hypothesis to explain the link between pessimistic expectations and risky behavior. The authors argue that low expectations are indicative of a nothing to lose attitude towards risk-taking. That is, if adolescents don't expect to achieve positive life outcomes, the consequence of engaging in crime will not be as costly (e.g.,

getting fired from a job may not be important for an individual who does not expect to succeed professionally). Several studies support the influential role of adolescents' perceived risks of crime on actual decisions to engage in crime. Indeed, findings from one longitudinal investigation supported the idea that adolescents who anticipate greater costs offend less frequently (Matsueda, Kreager & Huizinga, 2006). Sweeten and colleagues (2013) also considered how the perceived costs of crime could potentially explain the relation between age and delinquency within a sample of felony-level offenders. The authors used data from the Pathways to Desistance project (the data included in the current study) and found that developmental changes in the anticipated costs predicted desistance from crime (Sweeten, Piquero & Steinberg, 2013). To my knowledge, prior research has not considered if future expectations actually influence the perceived costs of crime. Based on Harris' (2002) nothing to lose hypothesis, pessimistic future expectations would reduce the perceived costs or risks associated with crime, and therefore encourage delinquent behavior.

The nothing to lose perspective, however, ignores the possibility that the *rewards* of crime, rather than the potential costs, drive delinquency. Rather than nothing to lose, adolescents may believe they have *everything to gain*: crime may potentially improve their futures. In comparison to the nothing to lose perspective, the everything to gain perspective focuses on the relation between future expectations and the perceived rewards associated with crime. Adolescents and young adults with a bleak view of their future may perceive greater benefits of criminal behavior, such as respect from their peers or financial gains. Adolescents are particularly responsive to the potential for rewards (Shulman et al., 2017; Steinberg, 2008), and low expectations may make the benefits even more salient. Indeed, Sweeten and colleagues found that the perceived social rewards of crime helped to explain changes in offending across

development, more so than the perceived risks (Sweeten et al., 2013). The perceived rewards of crime are an important predictor of delinquency and violence (Shulman et al., 2017), yet we know little about where these perceptions come from. Both the everything to gain and nothing to lose hypotheses provide a helpful framework for understanding how expectations might relate to the perceived costs and rewards of crime, as well as to between explain the connection between future expectations and delinquency.

Future expectations, impulse control and offending

The nothing to lose hypothesis is not the only available explanation linking expectations to crime, and other theoretical and empirical work considers the role of self-regulatory capabilities, such as impulse control. Cessation of crime is often attributed to an adolescents' maturity that strengthens across development (Cauffman & Steinberg, 2000; Monahan, Steinberg, Cauffman & Mulvey, 2013). Gottfredson and Hirschi's (1990) General Theory of Crime is largely based on the essential premise that impulsive tendencies and low self-control explain nearly all crime and risk-taking. Empirical work (Moffitt et al., 2011) including a number of meta-analyses and reviews (Vazsonyi, Mikuska & Kelley, 2017; Pratt and Cullen, 2000), all provide ample support that individuals who struggle to suppress their impulses tend to engage in more criminal behaviors. Within the Pathways dataset, Monahan and colleagues (2013) confirmed longitudinally the important role impulse control plays in promoting adolescent and young adult desistance from crime.

Theoretical and empirical work suggests that future expectations may indeed be connected to adolescents' impulsivity. For example, Silver and Ulmer (2012) stressed the importance of considering an adolescent's view of his future-self into our understanding of self-regulation. Silver and Ulmer (2012) argue that long-term goals may motivate individuals to

exercise self-control and therefore reduce the likelihood of criminal behavior. Indeed, one experimental test of these relations found that when possible selves were made salient, participants showed higher self-control compared to a control condition who did not consider their possible future selves (vanDellen & Hoyle, 2008). Similarly, adolescents who participated in an intervention program strengthening their possible selves showed improvement in self-regulatory behaviors (e.g., attending school, behaving in class, spending time on homework) (Oyserman et al., 2006).

A separate line of research links positive expectations with goal-engagement strategies (see Heckhausen and Wrosch, 2016). The Motivational Theory of Lifespan Development highlights the importance of goal engagement in which individuals actively choose goals that subsequently motivate the use of control strategies (e.g., investing resources, developing skills towards a goal) to make success more likely (Heckhausen, Wrosch & Schulz, 2010). Positive goals motivate the use of regulatory strategies. Similarly, Schmid, Phelps and Lerner (2011) proposed a model linking hopeful expectations to "intentional self-regulation" (ISR), which consists of selecting goals, optimally using resources to achieve goals, and compensating when goals or strategies fail (Freund & Baltes, 2002). The authors found that youth with more positive expectations of the future showed stronger ISR skills, which subsequently predicted positive developmental outcomes including competence (academic, social, cognitive, vocational) and confidence (e.g., self-worth, self-efficacy) (Schmid et al., 2011). Collectively, these studies suggest expectations may exert their influence on behavior partially through their positive effect on essential self-regulatory processes. Prior research has yet to consider whether positive expectations may similarly prompt the development of impulse control.

Present Study

The current study examines the mechanisms underlying the future expectations-behavior link. A recent cross-sectional analysis provided preliminary evidence to support both potential mediators. Data from the Pathways to Desistance study indicated that optimistic expectations were associated with stronger impulse control, higher perceptions of the certainty of sanctions and lower perceptions of the benefits from crime (Piquero, 2016). While informative, two important limitations are worth noting. Piquero (2016) conducted the analysis using data from only the baseline assessment (i.e., a cross-sectional analysis) and he did not formally test the indirect paths from expectations to offending through these proposed mediators. The proposed study will build of Piquero (2016) and provide a more nuanced assessment of the longitudinal relations between these variables.

Specifically, this study examines two possible mechanisms underlying the expectation-behavior association: the perceived costs/benefits of crime and impulse control. Question 1 directly tests the nothing to lose vs. everything to gain distinction, to assess if either connects future expectations to criminal behavior. Question 2 considers the role of impulse control, and tests whether higher future expectations promote the development of impulse control to ultimately reduce the likelihood of crime. Importantly, both questions use data from a longitudinal study of serious felony-level offenders, who were between the ages of 14-18 when they enrolled in the study, and were followed for seven years. The longitudinal nature of the data allows me to test if future expectations predict each mediator and if each mediator subsequently predicts offending (as well as if the indirect effect is significant), while accounting for prior levels of all study variables as well as all other reciprocal relations. As described in detail on page 49, I use autoregressive latent trajectory models with structured residuals (ALT-SR), a strong analytic technique that ensures the separation of within- and between-person differences.

The ALT-SR model includes all possible cross-lagged paths that provide the opportunity to formally test mediations between study variables, while providing more precise within-person estimates (Berry & Willoughby, 2016). Due to the focus of the current investigation, the hypotheses that follow focus primarily on the within-person predictions provided by the cross-lagged paths, but the between-person aspects of the model are explained in more detail on page 49.

Hypotheses

Question 1. In line with recent work examining the relation between the perceived costs and rewards of crime with self-reported offending (Sweeten et al. 2013), I predict that the perceived rewards, rather than the perceived costs, will mediate the relation between future expectations and self-reported offending. I predict that individuals with pessimistic expectations will perceive greater rewards associated from crime one-year later, which will increase self-reported offending the subsequent year. These associations will be present, even after accounting for all autoregressive (e.g., future expectations$_t$ predicting future expectations$_{t+1}$) and reciprocal paths (e.g., offending$_t$ predicting impulse control$_{t+1}$, perceived rewards$_t$ predicting future expectations$_{t+1}$, etc).

Question 2. I predict that impulse control will mediate the relation between future expectations and crime. Specifically, more positive future expectations will promote the development of stronger impulse control one-year later which will subsequently predict lower levels of self-reported offending the following year. Similar to question 1, I account for all autoregressive and reciprocal paths to strengthen model estimates and leave open the possibility for alternative developmental pathways linking these variables together.

Methods

Participants

Data for this study came from the Pathways to Desistance study (see Mulvey et al., 2004 and Schubert et al., 2004 for complete details of study methodology). Pathways is a 7-year longitudinal study of 1,354 serious adolescent offenders, although for the current investigation I solely focus only on the male participants (N = 1,170), due to the small number of female participants (relative to the complexity of the analysis). Adolescents in Arizona and Pennsylvania were eligible for the study if they were between 14 and 17 years old and had been charged with a felony or serious non-felony offense. Eligible offenses included all felony offenses (except less serious property crimes), misdemeanor weapons offenses and misdemeanor sexual assault. The proportion of participants whose enrollment offense was drug-related was capped at 15% of the sample to avoid an overrepresentation of drug offenses. Of eligible youth invited to participate, 67% agreed to enroll in the study. For the present study, the male sample consists of 225 White youth (19.2%), 493 Black youth (42.1%), 398 Latino youth (34%) and 54 youth who identified as "Other" (4.6%).

Procedures

The juvenile courts in each site provided the names of eligible adolescents. All eligible youth were contacted, and parental consent as well as juvenile assent were obtained from each youth who agreed to participate. Baseline interviews were conducted over two days in two 2-hour sessions. All questionnaires were administered with interviewers reading the questions to the participants, who were sitting side-by-side facing a computer. All interview responses were protected by a Privacy Certificate issued by the Department of Justice, which prohibited disclosure of any information obtained during the study to anyone outside the project staff. Youths were informed that the only exceptions to a promise of confidentiality were 1) if the

interviewer suspected child abuse, 2) the participant expressed plans to hurt himself or someone else, 3) the participant indicated a specific plan to commit a crime, or 4) the participant disclosed that someone was in jail for a crime that he had committed. Interviews were conducted at locations convenient for the participant and in spaces that allowed for privacy. All recruitment and assessment procedures were approved by the institutional review boards of the participating universities. Adolescents were paid $50 for their participation in the baseline interview. Participants completed a follow-up interview every six-months for three years. Participants were interviewed annually thereafter for an additional four years, providing a total of 11 measurement occasions. To minimize attrition, participant compensation for the follow-up interviews increased gradually over time to a maximum amount of $150. Rates of sample retention were high, with 87.6% of participants completing at least 9 of the 11 assessments.

The current study combines data from the six-month interviews to create year-long indicators of study variables (e.g., 6-12mo – year 1, 18-24mo – year 2, 30-36mo – year 3). This decision was made in an effort to create more meaningful periods of developmental growth, and to reduce the number of model parameters. Measures using a continuous scale were averaged across the two follow-up periods, and the self-report of offending measures were counted over the course of the 6- and 12-month assessments, 18 and 24-month assessments, and the 30 and 36 month assessments. After combining the 6-month follow-up periods, there were eight total measurement occasions.

Measures

Future Expectations. Expectations for the future were assessed using the Perceptions of Opportunities scale to measure the adolescent's prediction of his future adult success (adapted from Menard & Elliot, 1996). The 7-item measure assesses the participants' perceived likelihood

for achievement in school, work, family, and law abiding behavior. Participants responded on a 5-point Likert scale ranging from 1 (*poor*) to 5 (*excellent*) (e.g., "What do you think your chances are to graduate from college?"). At the baseline interview, the scale demonstrated excellent reliability ($\alpha_{baseline}$ = .81). Higher scores are indicative of more optimistic expectations for the future.

Impulse Control. The Weinberger Adjustment Inventory (WAI; Weinberger & Schwartz, 1990) was used to assess impulse control. The WAI includes an impulse control subscale ($\alpha_{baseline}$ = .76, 8 items; e.g., "I do things without giving them enough thought," 1 (*false*) – 5 (*true*)). Higher scores are indicative of a stronger ability to suppress and control one's impulses.

Anticipated Benefits and Costs of Crime. The Indices of Personal and Social Costs and Rewards (Nagin & Paternoster, 1994) assess an adolescent's perceptions about the consequences of engaging in crime. The current analyses will use three scales: anticipated social rewards, anticipated personal rewards, and the anticipated social costs. The *social rewards* scale ($\alpha_{baseline}$ = .89) is a mean score of 15 items measuring adolescents' perception of how others might react to three different crimes: stealing, fighting or committing robbery (e.g., "If I take things other people my age will respect me more"; 1 (*strongly disagree*) – 4 (*strongly agree*)). Higher scores represent greater perceived benefits. The *personal rewards* scale ($\alpha_{baseline\,baseline}$ = .87) is a mean of 7 items and assesses how much thrill or rush is expected when engaging in different types of crime (e.g., "How much 'thrill' or 'rush' is it to break into a store or home?"; 0 (*no fun or kick at all*) – 10 (*a great deal of fun or kick*)). The *social costs* scale ($\alpha_{baseline}$ = .68) is a mean of 5 items assessing an adolescents' perceived likelihood of consequences because of crime (e.g., "If the police catch me doing something that breaks the law, how likely is it that it

would be harder to find a job?"; 1 (*very unlikely*) - 5 (*very likely*)). The scale was coded such that higher scores are indicative of higher perceived costs.

Delinquency. Delinquency will be measured using the Self-Report of Offending scale (SRO; Huizinga et al., 1991). The scale is composed of 22 items which ask the adolescent about his involvement in illegal activities, such as selling drugs and assault, at any point during the past 6-months. The number of offenses an adolescent endorses (i.e., variety score) will be summed across the combined 6-month collection periods (e.g., how many different types of crimes during the 6-12-month, 18-24 month and 30-36 month interviews) as well as the annual follow-ups, to generate yearlong estimates of the adolescents' involvement in criminal activity. Previous research supports the use of variety scores as a consistent and valid estimate of the severity of illegal activity (Thornberry & Krohn, 2000). These sum scores were subsequently logged transformed to improve the negatively skewed distribution.

Covariates. All youth self-reported their race (dummy coded such that each group is compared to White youth) and baseline age. Socioeconomic status was measured using the Hollingshead's Index of Social Position (Hollingshead, 1957). Parent occupation and education were coded using a seven-point scale ranging from 1 (higher executives, professional degree) to 7 (unskilled employees, less than seven years of school), and a combined parent Index of Social Position was calculated using the formula provided by Hollingshead (1971). I also included a measure to capture the proportion of time individuals had spent in secure settings with no community access, to account for whether youth had the opportunity to engage in crime. This variable was computed by dividing the number of months youth spent in a secure facility by the total number of months within the recall period. We then used these yearly indicators to create a

total mean score that captured the average amount of time youth spent in a facility throughout the seven years.

Plan of Analyses

Cross-lagged models serve as a helpful tool for assessing mediating relations, to control for previous levels of behavior or outcomes (e.g., prior impulse control, prior offending, etc.) and to account for all possible reciprocal pathways. However, a growing body of literature recognizes the limitations of traditional autoregressive cross-lagged models (ARCL, Berry & Willoughby, 2016; Curran, Howard, Bainter, Lane & McGinley, 2014; Merrin, Davis, Berry, D'Amico & Dumas, 2016). Traditional ARCL models do not differentiate between within- and between-person effects, which leads to imprecise and ambiguous path coefficients (Berry & Willoughby, 2016, Curran et al., 2014). The traditional ARCL model does not indicate whether a coefficient describes changes in behavior relative to one's own prior level of behavior (i.e., within-person differences) or to other participants' behavior (i.e., between-person differences).

Auto-regressive latent trajectory models with structured residuals (ALT-SR) address this limitation and analytically separate within- and between-person effects (Berry & Willoughby, 2016). The ALT-SR models include latent growth curves for the time-varying indicators, and the standardized correlations between the latent factors represent the total between-person association among the different variables. The within-person variation is captured through the specification of structured residuals. The covariance between the latent factors removes the between-person effect from the time-lagged coefficients, and allows for clearer interpretations of the cross-lagged effects as within-person changes. As described by Berry and Willoughby (2016), the model creates a latent variable for each time-varying observed indicator by constraining the residual variances to zero and the factor loadings to one, which moves the

within-person residual variance into the newly formed latent variables. An increasing number of scholars have employed these methods in lieu of traditional ARCL models (Merrin et al., 2016; Davis et al., 2017; Mahler et al., 2018; Lee & Vaillancourt, 2019; Davis et al., 2019).

Prior to estimating the full ALT-SR models, I first conducted two preliminary steps. Because the future expectations, costs/rewards and impulse control scales were administered multiple times over the course of the study, I tested whether measurement invariance was present across all time-varying measures. Including a test of measurement invariance ensures that when evaluating changes in these variables over time, the same constructs are being evaluated (McArdle, 1996; Odgers et al., 2008). A series of three models were conducted for each measure, testing whether the model demonstrated configural, weak (factor loadings constrained to be equal) and strong (intercepts constrained to be equal) invariance across the seven years. Although the scale mean scores were used in the final analysis, individual items were included when testing for measurement invariance.

Next, growth models for each respective variable (time varying IVs, DVs and mediators) were conducted separately. Using an iterative approach, a series of models compared different growth curve shapes to establish the best fit for the data (e.g., unconditional, linear, quadratic). For the quadratic models, the slope and quadratic terms were mean-centered on year four, to assist with model convergence. The best fitting growth models were subsequently included in the ALT-SR model. Although the growth models do not directly test mediated pathways, they do provide helpful information regarding the overall between-person associations between future expectations, impulse control, the perceived costs and rewards of crime, and offending over the course of the study.

After determining the appropriate shapes for the growth models, I moved forward with the full ALT-SR models. A total of four separate ALT-SR models were used to evaluate each mediator separately, although several specifications were held constant across the four models. In addition to the growth models, structured residuals were added for the mediated path analyses. In line with prior research using ALT-SR models (Berry & Willoughby, 2016; Merrin et al., 2016), each series of paths was constrained equal (e.g., Figure 2, εexp_{Y1} on εexp_{Y0} constrained equal to εexp_{Y2} on εexp_{Y1}, and εexp_{Y1} on εsro_{Y0} constrained equal to εexp_{Y2} on εsro_{Y1}, etc.). The residual variances of the structured residuals (e.g., Figure 2, εexp_{Y1} with εsro_{Y1}, and εexp_{Y2} with εsro_{Y2}) were also constrained to be equal, with the exception of the baseline residuals. Each respective intercept/slope was regressed onto the covariates (race, age, socioeconomic status, time in facility). Finally, the variance for the slope/quadratic terms of self-reported offending were constrained to zero, to assist with model convergence. All analyses were conducted using Mplus version 8.0 (Muthen & Muthen, 1998-2019) using the MLR estimator, which uses maximum likelihood estimation with robust standard errors. In line with prior research, model fit was evaluated using the comparative fit index (CFI) and the root-mean-square error of approximation (RMSEA). CFI values above .90 and RMSEA values lower than .08 represent acceptable fit (Hu & Bentler, 1999). Twenty-two cases were dropped due to missing data on x-variables, and a total of 1,148 male participants were included in all models.

Results

Descriptive statistics and measurement invariance

The means, standard deviations and other descriptive statistics for study variables are provided in Table 1.2. The results from the measurement models are provided in Table 2.2. I assessed measurement invariance by testing for significant changes in the Chi Square ($p < .001$)

as well as changes in the CFI and TLI greater than .01 when comparing the configural to the weak and strong invariance models. The future expectations scale did not demonstrate weak or strong invariance based on the change in Chi Square statistic (p <.001), however, when comparing the strong invariance model to the configural model, the CFI and TLI did not exhibit changes greater than .01 across models. For the impulse control scale, the measure also did not demonstrate weak or strong invariance based on changes in the Chi Square, although the model showed little change in regards to the CFI and TLI. A similar pattern of findings was evident for the personal rewards, social rewards, and social costs scales. Given the sensitivity of the chi-square difference test in large samples, prior researchers (Hawes, Mulvey, Schubert & Pardini, 2014; Callina, Johnson, Buckingham & Lerner, 2014) have instead compared models based on changes in absolute fit indices (e.g., changes in the CFI equal to or less than .01; Chen, 2007; Cheung & Rensvold, 2002). Considering the large sample size of male youth in the Pathways study, I proceeded with the longitudinal models despite the significant chi-square difference tests, but discuss the potential lack of invariance as a limitation in the discussion.

Table 1.2 Descriptive statistics of study variables for males only

	Mean (*SD*) *or %*	*Min-Max*	*N*
Race			
White	19.6%	0-1	1148
Black	41.5%	0-1	
Latino	34.4%	0-1	
Other	4.5%	0-1	
Age	16.04(1.15)	14-19	1148
SES	51.72(12.29)	11-77	1148
Avg. Time in Facility	.37(.30)	0-1	1148
Future Expectations			
Baseline	3.41(.81)	1-5	1141
Year 1	3.56(.76)	1.75-5	1121
Year 2	3.58(.82)	1.25-5	1103

Year 3	3.60(.83)	1.35-5	1087
Year 4	3.66(.92)	1-5	1032
Year 5	3.68(.88)	1-5	1015
Year 6	3.69(.88)	1.33-5	990
Year 7	3.65(.88)	1-5	950
Impulse Control			
Baseline	2.96(.95)	1-5	1145
Year 1	3.13(.83)	1.07-5	1122
Year 2	3.12(.87)	1-5	1104
Year 3	3.21(.88)	1-5	1088
Year 4	3.25(.95)	1-5	1036
Year 5	3.24(.97)	1-5	1022
Year 6	3.30(.99)	1-5	999
Year 7	3.34(.96)	1-5	954
Personal Rewards			
Baseline	2.42(2.42)	0-10	1147
Year 1	2.32(2.21)	0-10	1122
Year 2	2.11(2.15)	0-10	1104
Year 3	1.18(2.12)	0-10	1088
Year 4	1.59(2.24)	0-10	1037
Year 5	1.66(2.33)	0-10	1023
Year 6	1.62(2.24)	0-10	999
Year 7	1.65(2.26)	0-10	955
Social Rewards			
Baseline	2.03(.19)	1-3.6	1147
Year 1	1.95(.19)	1-3.6	1122
Year 2	1.91(.21)	1.3.3	1104
Year 3	1.88(.23)	1-3.5	1088
Year 4	1.88(.29)	1-4	1037
Year 5	1.91(.28)	1-4	1023
Year 6	1.84(.29)	1-3.9	999
Year 7	1.91(.25)	1-4	955
Social Costs			
Baseline	2.72(.85)	1-5	1147
Year 1	2.98(.77)	1-5	1122
Year 2	3.04(.79)	1-5	1104
Year 3	3.08(.79)	1-5	1088
Year 4	3.17(.91)	1-5	1036
Year 5	3.27(.93)	1-5	1023
Year 6	3.32(.93)	1-5	999
Year 7	3.34(.93)	1-5	955
Self-Reported Offending (logged score)			
Baseline	1.47(.76)	0-3.00	1145
Year 1	1.04(.82)	0-3.05	1096

Year 2	.91(.82)	0-3.09	1054
Year 3	.75(.79)	0-3.05	1042
Year 4	.63(.76)	0-2.77	1034
Year 5	.57(.73)	0-3.05	1019
Year 6	.54(.70)	0-2.71	990
Year 7	.47(.66)	0-2.83	940

Table 2.2. Tests of measurement invariance (configural, weak and strong) for mediators and future expectations.

	Chi Square						RMSEA	CFI			
Model Tested	χ^2	*df*	*p*	$\Delta\chi^2$	Δdf	*p*	RMSEA[90%CI]	CFI	ΔCFI	TLI	ΔTLI
Impulse Control											
Configural	3467.29	1681	<.001				.03[.03, .03]	.94		.93	
Weak	3583.18	1730	<.001	115.89	49	<.001	.03[.03, .03]	.94	0	.93	0
Strong	3980.16	1779	<.001	396.98	49	<.001	.03[.03, .03]	.93	.001	.92	.001
Future Expectations											
Configural	2134.80	1234	<.001				025[.02, .02]	.98		.97	
Weak	2223.91	1276	<.001	89.11	42	<.001	.025[.02, .03]	.98	0	.97	0
Strong	2428.56	1318	<.001	204.64	42	<.001	.027[.03, .03]	.97	.002	.97	0
Personal Rewards of Crime											
Configural	3847.78	1246	<.001				.042[.04, .04]	.96		.94	
Weak	4043.39	1288	<.001	196	42	<.001	.043[.04, .04]	.95	.01	.94	0
Strong	4433.58	1330	<.001	390	42	<.001	.045[.04, .05]	.95	0	.94	0
Social Rewards of Crime[1]											
Configural	162.93	140	.09				.01[.00, .02]	.99		.99	
Weak	183.47	154	.05	20.54	14	p>.10	.01[.00, .02]	.99	0	.99	0
Strong	373.48	168	<.001	190.01	14	P<.001	.03[.03, .04]	.99	0	.99	0
Social Costs of Crime											
Configural	768.78	568	<.001				.017[.01, .02]	.99		.98	
Weak	819.64	596	<.001	50.86	28	P<.05	.018[.02, .02]	.99	0	.98	0
Strong	1060.70	624	<.001	241.06	28	<.001	.024[.02, .03]	.98	.01	.97	.01

[1]The 15 items were reduced to three subscales scales: rewards from robbery, rewards from stealing and rewards from fighting.

Latent Growth Models (LGM)

Prior to conducting the full ALT-SR models, I estimated a series of latent growth curves for each time-varying set of variables (e.g., future expectations, impulse control, costs/rewards, and self-reported offending) to evaluate patterns of change across the 7-year assessment period. These LGMs are a key component of the final ALT-SR specification for estimating the between-person effects. For each variable, model fit for linear and quadratic models were compared to an unconditional growth model to evaluate the best fitting growth curve. For all variables, the quadratic model was a better fit to the data, compared to the unconditional model (see Table 3.2 for comparisons between unconditional and quadratic models). These models suggested that overall, future expectations and impulse control increased over the 7-year period and self-reported offending declined. Over time, youth reported perceiving fewer personal and social rewards from crime, and also perceived greater costs.

Table 3.2 Results from latent growth curves comparing quadratic to unconditional models

	Chi Square						RMSEA	CFI		TLI	
Model Tested	χ^2	*df*	*p*	$\Delta\chi^2$	Δdf	*p*	RMSEA [90%CI]	CFI	Δ CFI	TLI	Δ TLI
Impulse Control											
Unconditional Model	234.61	32	<.001				.07 [.07, .08]	.96		.97	
Quadratic Model	203.25	34	<.001	31.36	2	<.001	.07 [.06, .07]	.97	.01	.97	0
Future Expectations											
Unconditional Model	321.74	32	<.001				.09 [.08, .10]	.93		.94	
Quadratic Model	228.86	34	<.001	92.88	2	<.001	.07 [.06, .08]	.95	.02	.96	.02
Personal Rewards											
Unconditional Model	366.04	32	<.001				.09 [.07, .10]	.92		.93	
Quadratic Model	283.87	34	<.001	82.07	2	<.001	.08 [.07, .09]	.94	.02	.95	.02

Social Rewards											
Unconditional Model	334.31	31	<.001				.09 [.08, .10]	.90		.91	
Quadratic Model	260.06	33	<.001	74.24	2	<.001	.08 [.07, .08]	.92	.02	.93	.02
Social Costs											
Unconditional Model	233.02	32	<.001				.07 [.06, .08]	.91		.92	
Quadratic Model	230.92	34	<.001	3.19	2	> .20	.07 [.06, .08]	.91	0	.93	.01
Self-Reported Offending											
Unconditional Model	234.99	32	<.001				.07 [.07, .08]	.89		.77	
Quadratic Model	180.53	34	<.001	70.64	2	<.001	.06 [.04, .07]	.93	.04	.94	.17

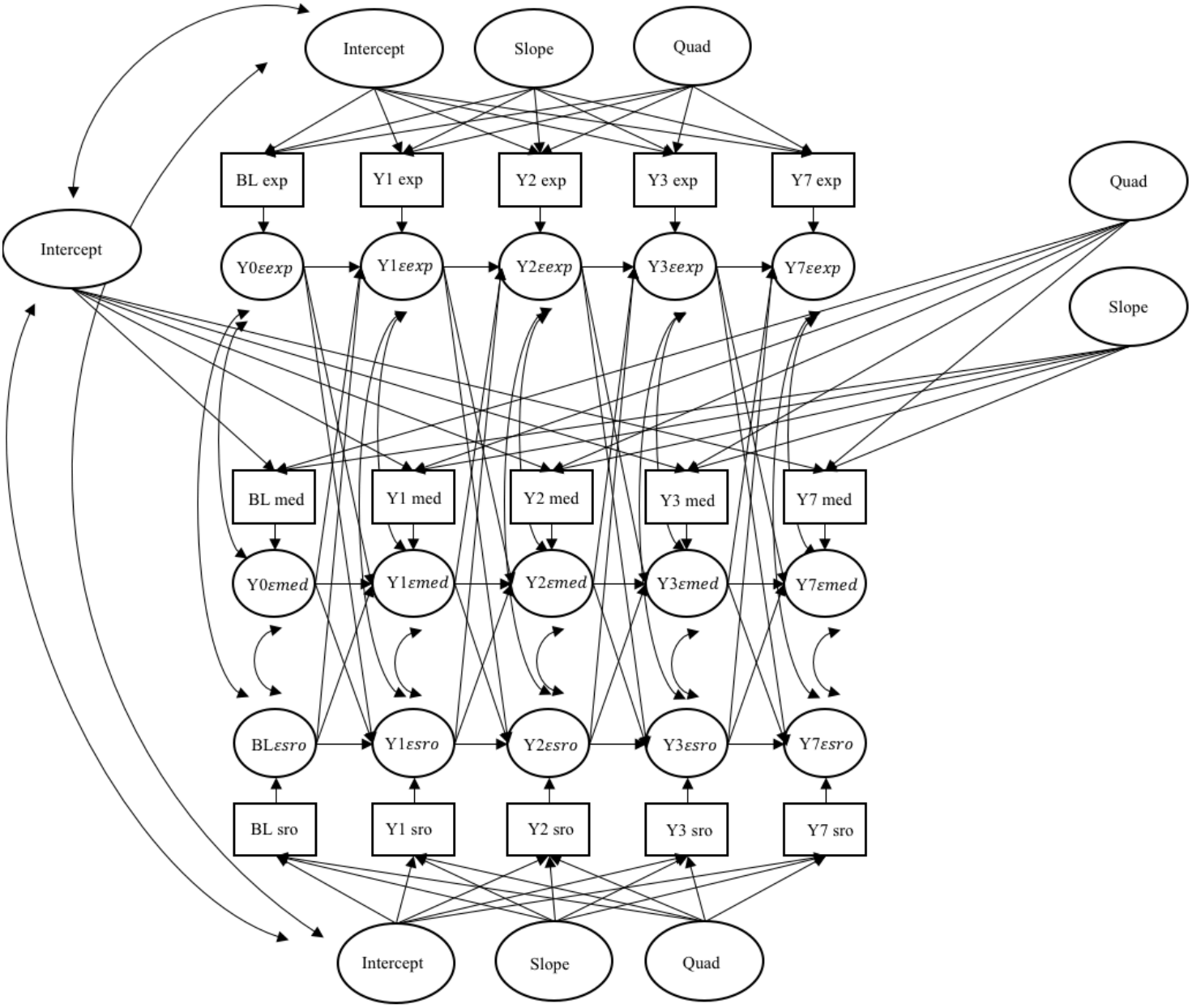
Does impulse control mediate the relation between future expectations and self-reported offending?

Next, I estimated the full ALT-SR specifications to assess the within and between person associations between future expectations, impulse control and self-reported offending. The complete ALT-SR diagram is provided in Figure 1.2 to visually display the full model parameters (without specific path estimates). Figure 1 is not specific to a single mediator, but instead demonstrates all components of the ALT-SR model included for all models. For the purposes of interpretability, Figures 2.2-5.2 represents simplified versions of the ALT-SR models and focus only on the within-person relations.

Figure 2.2 demonstrates the within-person findings from the impulse control model. The model demonstrated adequate model fit ($\chi^2(388) = 876.97$, $p < .001$, RMSEA = .03 (.03, .04), CFI = .96). All autoregressive paths were significant, with each variable showing stability over time (e.g., SROt → SROt+1 = .18, $p < .001$; EXPt → EXPt+t = .17, $p < .001$; IMPt → IMPt+t = .14, $p < .001$). The primary research question focused on whether impulse control mediated the

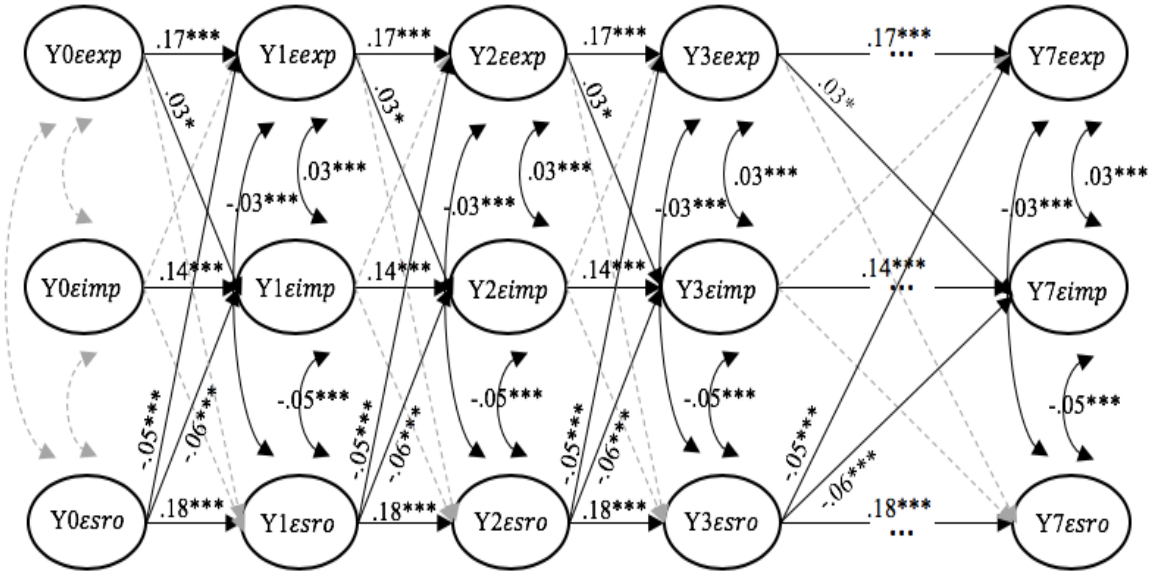
relation between future expectations and crime. Although I did find that within-person, higher future expectations at *t* were related to higher levels of impulse control at *t+1* ($B = .03$, $p = .04$), impulse control at *t* was not associated with self-reported offending at *t+1* ($B = .01$, $p = .44$). Because I could not find support for a longitudinal association between impulse control and self-reported offending, I could not support the hypothesized mediation. The models included all possible reciprocal pathways, and the results suggested that lower self-reported offending was associated with higher future expectations one year later ($SRO_t \rightarrow EXP_{t+1} = -.05$, $p < .001$). Future expectations did not significantly predict self-reported offending, and impulse control did not significantly predict future expectations. I did find evidence for concurrent associations between self-reported offending and impulse control ($B = -.13$, $p < .001$), as well as future expectations ($B = .03$, $p < .001$). I also found concurrent associations between self-reported offending and future expectations ($B = -.05$, $p < .001$).

Figure 1.2 Full ALT-SR specifications



Notes. sro = exp = future expectations; med = mediator, self-reported offending

Figure 2.2. Simplified ALT-SR model showing the relation between future expectations, impulse control and offending



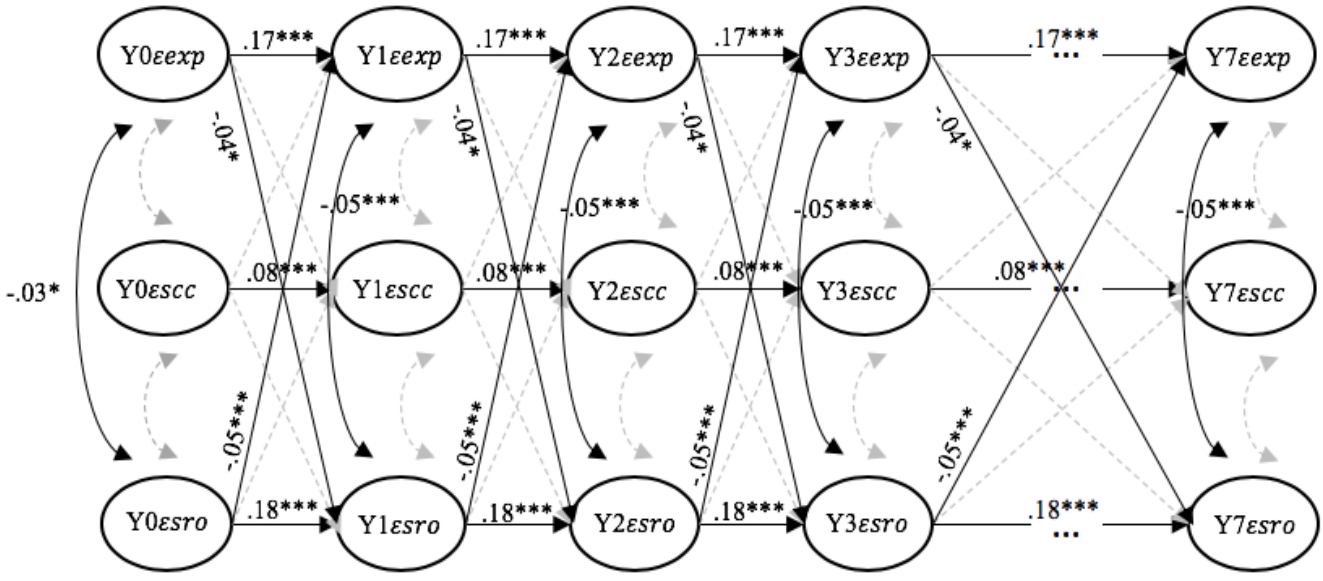
Notes. Exp = expectations, imp = impulse control, sro = self-reported offending. Y0 = baseline data, Y1 = year 1 data, Y2 = year 2 data, Y3 = year 3 data and Y7 = year 7 data. Because corresponding path coefficients were constrained to be equal, data from years 4-6 are omitted from the figure (but included in the model). See Figure 1.2 for full specifications

To evaluate the between-person associations between future expectations, impulse control and self-reported offending, I examined the covariances between the intercept components of the growth models. The results suggest that individuals reporting higher future expectations on average report lower self-reported offending ($\Psi_{standardized}$= -.23, p < .001) and higher impulse control ($\Psi_{standardized}$ = .18, p < .001) compared to individuals who report lower future expectations. Similarly, individuals who reported higher levels of impulse control report less crime ($\Psi_{standardized}$ = -.42, p <.001) compared to individuals reporting lower levels of impulse control. All covariates were incorporated in the model at the between-person level. The intercept and slope of each set of variables were regressed onto race, parent socioeconomic status, age at study enrollment and the average time spent in a secure facility. Table 4.2 describes the associations between these variables.

Do the perceived costs and rewards of crime mediate the relation between future expectations and self-reported offending?

Social Costs. As hypothesized, I found little evidence that the perceived costs of crime mediated the relation between future expectations and self-reported offending. The model fit the data adequately ($\chi^2(388) = 991.60$, $p < .001$, RMSEA = .04 (.03, .04), CFI = .93, $N = 1148$). Future expectations were not related to the perceived costs of crime (Future Expectations$_t$ → Costs$_{t+1}$ = B = .01, p =.55), and the perceived costs of crime were not related to self-reported offending (Costs$_t$ → SRO$_{t+1}$ B = .002, p =.90). In this model, expectations were significantly associated with self-reported offending (Future Expectations$_t$ → SRO$_{t+1}$ B = -.04, p =.03), and self-reported offending was related to an individual's future expectations (SRO$_t$ → Future Expectations$_{t+1}$ B = -.06, $p < .001$). See Figure 3.2 for details regarding all within-person estimates.

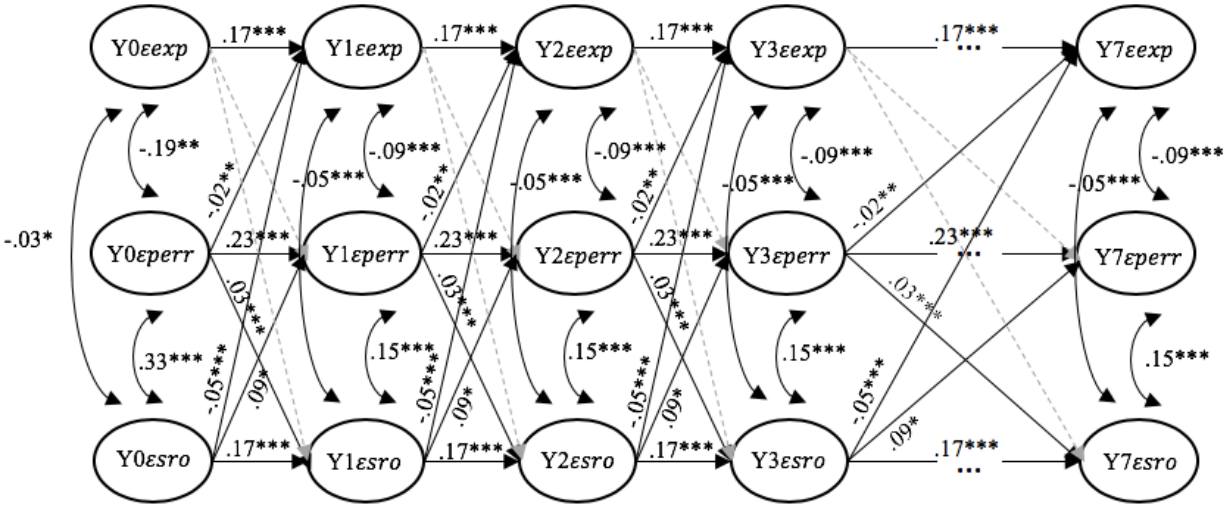
Figure 3.2. Simplified ALT-SR model showing the relation between future expectations, perceived social costs of crime and offending



Notes. Exp = expectations, scc = social costs of crime, sro = self-reported offending. Y0 = baseline data, Y1 = year 1 data, Y2 = year 2 data, Y3 = year 3 data and Y7 = year 7 data. Because corresponding path coefficients were constrained to be equal, data from years 4-6 are omitted from the figure (but included in the model). See Figure 1.2 for full specifications for ALT-SR model.

Personal and Social Rewards. Two independent models were conducted to assess each perceived reward type separately. Model fit was acceptable for both the personal (χ^2((392) = 1007.92, $p < .001$, RMSEA = .04 (.03, .04), CFI = .94) and social reward scales (χ^2((388) = 993.77, $p < .001$, RMSEA = .04 (.03, .04), CFI = .94). I did not find support for personal rewards as a significant mediator. Future expectations were not significantly associated with personal rewards (Future Expectations$_t$ → Personal Rewards$_{t+1}$ B = -.08, p = .05), although personal rewards were related to offending behavior (Personal Rewards$_t$ → SRO$_{t+1}$ B = .03, $p < .001$). Interestingly, the personal rewards were associated with later future expectations (Personal Rewards$_t$ → Expectations$_{t+1}$ B = -.02, $p < .001$). In this model, future expectations were not predictive of self-reported offending (Future Expectations$_t$ → SRO$_{t+1}$ B = -.03, p =.09) although self-reported offending was related to an individual's future expectations (SRO$_t$ → Future Expectations$_{t+1}$ B = -.05, $p < .001$). These findings suggest that youth with higher expectations do not report fewer personal rewards from crime, although individuals reporting fewer personal rewards from crime do engage in less offending across time. See Figure 4.2 for details regarding all within-person estimates.

Figure 4.2. Simplified ALT-SR model showing the relation between future expectations, perceived personal rewards of crime and offending

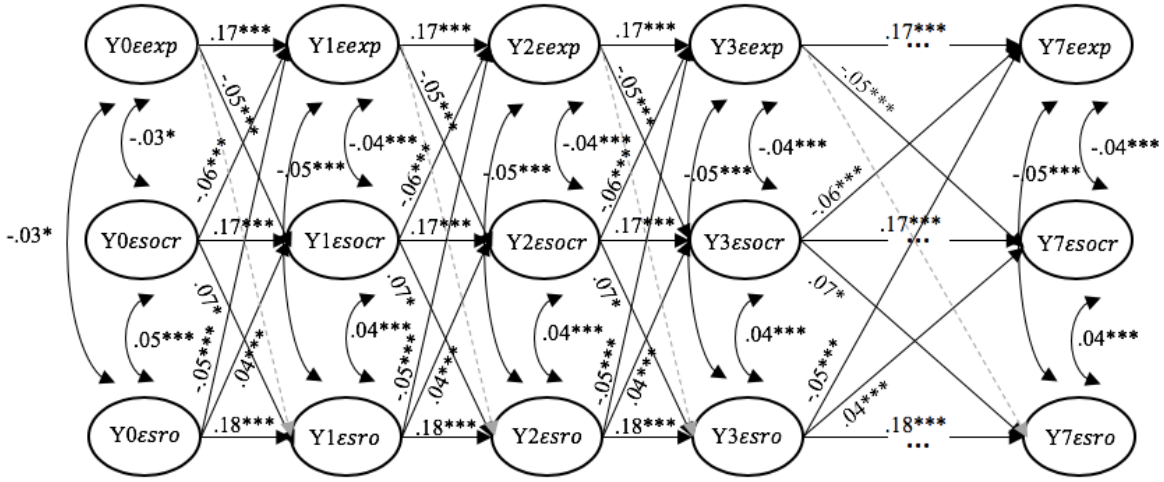


Notes. Exp = expectations, perr = personal rewards from crime, sro = self-reported offending. Y0 = baseline data, Y1 = year 1 data, Y2 = year 2 data, Y3 = year 3 data and Y7 = year 7 data. Because corresponding path coefficients were constrained to be equal, data from years 4-6 are omitted from the figure (but included in the model). See Figure 1.2 for full specifications for ALT-SR model.

A different pattern of findings emerged for the social rewards scale. Individuals with higher future expectations reported perceiving fewer social rewards from crime 1-year later (Future Expectations$_t$ → Social Rewards$_{t+1}$ B = -.05, p < .001). In turn, individuals reporting fewer social rewards from crime also engaged in less crime 1-year later (Social Rewards$_t$ → SRO$_{t+1}$ B = .07, p < .001). The indirect pathway from future expectations to self-reported offending *through* social rewards of crime was also significant (Indirect Estimate = -.003, p = .02), supporting the hypothesized mediation. Importantly, several other significant pathways emerged, suggesting reciprocal relations between study variables. For example, individuals who perceived fewer social rewards from crime subsequently reported higher future expectations 1-year later (Social Rewards$_t$ → Future Expectations$_{t+1}$ B = -.06, p < .001). Those engaging in higher levels of crime reported lower future expectations 1-year later (SRO$_t$ → Future Expectations$_{t+1}$ B = -.05, p < .001) and perceived more social rewards from crime (SRO$_t$ →

Social Rewards$_{t+1}$ B = .04, p < .001). These findings suggest that social rewards, but not personal rewards, mediated the relation between future expectations and self-reported offending. See Figure 5.2 for details regarding all within-person estimates.

Figure 5.2. Simplified ALT-SR model showing the relation between future expectations, perceived social rewards of crime and offending



Notes. Exp = expectations, socr = social rewards from crime, sro = self-reported offending. Y0 = baseline data, Y1 = year 1 data, Y2 = year 2 data, Y3 = year 3 data and Y7 = year 7 data. Because corresponding path coefficients were constrained to be equal, data from years 4-6 are omitted from the figure (but included in the model). See Figure 1.2 for full specifications for ALT-SR model.

The between-person estimates were evaluated by assessing the standardized covariances between growth model intercepts. Individuals who reported perceiving more costs associated with crime reported lower self-reported offending ($\Psi_{standardized}$ = -.23, p < .001) and higher expectations ($\Psi_{standardized}$ = .11, p < .001) compared to individuals reporting fewer perceived costs of crime. Individuals reporting more personal rewards from crime indicated higher levels of offending ($\Psi_{standardized}$ = .44, p < .001) and lower future expectations ($\Psi_{standardized}$ = -.19, p < .001). Finally, individuals reporting more social rewards from crime engaged in higher levels of offending ($\Psi_{standardized}$ = .40, p < .001) and reported lower future expectations ($\Psi_{standardized}$ = -.32, p < .001), compared to individuals reporting fewer social rewards from

crime. Table 4.2 reflects the relations between the intercepts, slopes and covariates for each of the separate models.

Table 4.2 Relations between intercepts, slopes and covariates (race, SES, age, time in facility)

	Self-Reported Offending[1]		Future Expectations[1]		Impulse Control	
	Int. Est	Slope Est.	Int. Est	Slope Est.	Int. Est	Slope Est.
Race						
Black	-.21***	.02*	-.14**	-.03**	.61***	-.002
Latino	.10*	-.008	-.09	.01	.28***	.01
Other	.07	.005	-.07	.02	.25*	.01
SES	-.002	.000	-.006***	.000	-.002	.000
Age	-.02	-.003	-.03	.000	.02	-.001
Time in facility	.34***	-.06***	-.37***	.01	-.34***	.02
	Social Costs		Personal Rewards		Social Rewards	
	Int. Est	Slope Est.	Int. Est	Slope Est.	Int. Est	Slope Est.
Race						
Black	-.34***	-.003	-1.16***	.04	.12***	.03***
Latino	-.17**	-.05***	-.18	-.06	.002	-.01
Other	-.07	.005	-.20	.01	.00	.01
SES	-.001	.000	-.003	.001	.001	.00
Age	-.002	.01	-.05	.008	.01	-.001
Time in facility	-.26***	-.02	.49***	-.005	.27***	.02**

[1]Estimates reported from impulse control model

Discussion

Unlike prior research which has focused on the direct association between an adolescent's future expectations and crime (Iselin et al., 2012; Chen & Vazsonyi, 2011; Mahler et al., 2018), I questioned whether future expectations operated through intermediary psychosocial processes to influence delinquency (i.e., impulse control and the perceived costs and rewards of crime). The results suggested that individuals holding more positive future expectations reported perceiving fewer social rewards from engaging in crime. Subsequently, perceiving fewer social rewards from crime was associated with engaging in lower levels of offending the following year. These findings suggest that adolescents and young adults lacking prosocial expectations may view crime as an alternative pathways towards earning social respect, rather than through conventional means such as academic or professional success. While no other mediator significantly accounted for the future expectations-crime link, all between-person associations were significant, suggesting that overall, youth with high expectations about their futures reported perceiving more costs and fewer rewards from crime, higher impulse control, and lower self-reported offending compared to youth with low expectations.

Contrary to past research and theory, I found limited support for a direct link between future expectations and crime. Instead, higher levels of self-reported offending were subsequently related to lower future expectations the following year. Youth appeared to lower their expectations as they engaged in criminal behavior. This finding aligns with previous research reporting that crime predicted expectations rather than expectations predicting crime (Mahler et al., 2018). Lowering expectations (e.g., disengaging from a goal) after committing crime may serve as a compensatory strategy to protect against the disappointment and blame of not successfully working towards a specific goal (Heckhausen et al., 2010). Past research

typically asserts a direct relation between expectations and crime (Iselin et al., 2012; Chen & Vazsonyi, 2011), without considering that youth may be constructing their expectations partially based on how they behave. Youth committing crime may be selecting into low expectations, instead of low expectations leading to delinquency.

Beyond testing the direct effect between expectations and crime, the present study explored mechanisms that may partially account for this association. Researchers have typically assumed the underlying mechanisms, without empirically testing them. For example, Harris and colleagues argued "adolescents who have low expectations for their future may feel that they have nothing to lose and engage in more risk behavior..." (pg. 1007, Harris et al., 2002). Other studies focus on the direct association between future expectations and behavior, and assume that future expectations directly facilitate goal-relevant behaviors (e.g., because an adolescent expects to attend college, he or she studies for high school exams) (Sipsma et al., 2015; Beal and Crockett, 2010; Stoddard et al., 2011). The current study operationalized a "nothing to lose" attitude as perceiving fewer potential costs from engaging in crime. That is, individuals who do not expect to achieve goals such as graduating from college or achieving professional success may not express concern regarding the associated costs of crime. Perceived costs of crime did not mediate the relation between future expectations and offending, suggesting that other mechanisms may be more relevant. One limitation concerns the precise wording of the perceived costs of crime scale available within the Pathways dataset. Participants in Pathways indicated how *likely* it is that a consequence would occur as a result of a crime. While this measure aligns with other work that has also assessed the perceived costs of crime (Loughran, Paternoster, Chalfin & Wilson, 2016), regardless of high or low future expectations, some youth may be overly confident in their ability to evade police contact or other consequences of crime. Future

research should consider questions that ask the extent to which an arrest would have personal or social consequences (e.g., If you commit a crime and are arrested, how harmful would this be towards your future career plans?). Open-ended qualitative questions may also provide insight on how youth view crime as costly towards their goals.

The current study also put forward the possibility that rather than a nothing to lose attitude, youth with low expectations would instead exhibit an everything to gain attitude relating to crime. I hypothesized that youth with low expectations may perceive more possible benefits (social and personal) from crime compared to youth who have high expectations. Partial support for this hypothesis emerged, as perceived social rewards from crime mediated the relation between future expectations and offending. Cauffman et al.'s behavioral study (2010) demonstrated that adolescents tend to prioritize reward-oriented behaviors compared to older individuals, who are more likely to avoid costs. A growing body of neurological research similarly supports the notion that adolescents are hypersensitive to the possibility for rewards (Van Leijenhorst et al, 2009; Urošević, Collins, Muetzel, Lim & Luciana, 2012; Somerville, Jones & Casey, 2010). This research lends support to the idea that perceived rewards, rather than costs, would more likely mediate the relation between expectations and crime.

It is worth noting that only social rewards, rather than personal, mediated the relation between expectations and crime. Moreover, no direct path between future expectations and personal rewards emerged. Previous research highlights the particular significance of social rewards during adolescence and young adulthood. Gardner and Steinberg's (2005) seminal study provided strong behavioral evidence that the influence of peers on risk taking was stronger for younger individuals. This finding has been confirmed with neurological research, by demonstrating that adolescents display greater activation of the ventral striatum and orbitofrontal

cortex (brain areas related to reward sensitivity and valuation) when making decisions about risk taking, but only in the presence of their peers (Chein, Albert, O'Brien, Uckert & Steinberg, 2011). Given the salience of peers during this developmental period, it is not surprising that social rewards played a key mediating role.

Social control theory (Hirschi, 1969) offers a helpful framework for understanding the relation between future expectations and the perceived social rewards from crime. Hirschi (1969) describes the importance of an individual's attachment to conventional activities and goals as a deterrent of delinquent behavior. Individuals lacking these commitments may view crime as an alternative pathway towards achieving social respect (e.g., gaining peer respect from committing crime, rather than attending college), a premise supported by the present study. Youth with low expectations reported higher potential rewards from crime, which subsequently related to criminal behavior.

One benefit of the cross lagged analysis is the ability to simultaneously test competing models. Although not the focus of the current investigation, the models also revealed that individuals who perceived greater social and personal rewards from crime subsequently reported lower expectations one year later. This finding supports an alternative pathway in which youth who find crime personally or socially rewarding may be less likely to hold conventional societal goals, such as graduating from college or achieving professional success. Several studies have linked perceptions of the costs and rewards of crime to offending behavior (Shulman et al., 2017; Sweeten et al., 2013; Schubert, Mulvey & Pitzer, 2016), yet how these beliefs relate to other behaviors and attitudes remain unclear. This study provides preliminary evidence that perceptions of the costs and rewards from crime may indeed relate to motivational processes, such as future expectations.

Higher future expectations were also associated with stronger impulse control one year later, consistent with intentional self-regulation (ISR) models. Schmid and colleagues (2011) reported that positive expectations for the future related to ISR, which they defined as the ability to select goals, apply resources and compensate when strategies fail. The present study used impulse control as a proxy for ISR, and similarly found that future expectations were associated with an individual's ability to suppress impulsive tendencies. Heckhausen and colleagues (2010) argue that goal engagement is an active and intentional process that requires using specific strategies to succeed. Goal engagement involves primary control strategies, such as investment of behavioral resources, and selective secondary control strategies, such as enhanced valuation of selected goals. Impulse control is particularly relevant to the selective secondary control strategies, which involve the use of self-regulation as well as avoiding distractions as a way to enhance commitment to a particular goal (Heckhausen et al., 2010). Silver and Ulmer (2012) also emphasized the importance of considering the role of future selves in reference to self-control. Specifically, the authors argued that an individual's vision of his or her future motivate self-regulatory efforts, a finding supported in the current research.

Although future expectations were associated with impulse control, surprisingly, impulse control was not related to crime at the within-person level of analysis (e.g., the cross lagged portion of the model). A large body of evidence provides support for a robust association between impulse control and crime (see Vazsonyi et al., 2017; Pratt and Cullen, 2000) even among studies using the Pathways to desistance dataset (Monahan et al., 2009; Sweeten et al., 2013). One possible reason for this discrepancy is the time lags between measurements. The model tested whether impulse control predicted crime *one-year later*, a period during which an individual's impulse control may strengthen or weaken. Crime is likely more strongly associated

with an individual's impulse control at the time the individual commits the offense, rather than their impulse control one-year prior. Indeed, I did find significant within-time correlations (e.g., year 1 impulse control correlated with year 1 self-reported offending, etc.), suggesting the time lag may account for these differences.

Several strengths of the present study are worth highlighting. Analytically, the ALT-SR model serves as a more rigorous method of assessing mediated relations between study variables over time. Berry and Willoughby (2016) describe the limitations of traditional cross-lagged models, and a growing body of research has applied the ALT-SR model to provide more precise estimates that separate within- and between-person differences (Merrin et al., 2016; Davis et al., 2018; Mahler et al., 2018; Lee and Vaillancourt, 2019). In addition, the nature of the cross lagged models provided the opportunity to simultaneously test competing hypotheses (e.g., how perceived social costs predict expectations, etc.), a consideration often neglected in psychological research. The longitudinal nature of the data is also an improvement over cross-sectional work and allows for the temporal ordering of the study variables and provides for stronger inferences regarding directionality. Finally, all analyses were conducted with a sample of serious juvenile and young adult offenders, ensuring that the findings are pertinent for behaviors that carry serious legal implications compared to lower level externalizing problems, such as bullying or general aggression.

All results should be interpreted in light of the measurement invariance described on pages 51-52. Strong invariance was only met using the criteria recommended by Cheung and Rensvold (2002) which focuses on changes in the CFI equal to or less than .01. It is possible that over time, future expectations, impulse control, or the other time-varying covariates operate differently for different stages of development (i.e., despite using the same scale, the items tap into different

aspects of development). These analyses also do not include female offenders, a decision made in light of the relatively small sample included in the Pathways study. Due to the complexity of the ALT-SR models, conducting multiple-group comparisons within this context was not feasible. Also, given the differences between male and female offenders (Cauffman, Fine, Thomas & Monahan, 2017), I did not want to generalize the findings of the present study to female participants without formal comparisons. Finally, participants were provided with a preset list of possible expectations to respond to, leaving open the possibility that these goals were not sufficiently motivating. Considering the universal importance of the goals listed on the scale, it is likely that most youth understood the significance of achieving success in one's professional, academic and family life. However, as proposed by Eccles, Wigfield and colleagues (Eccles et al., 1983; Wigfield and Eccles, 2000), goal relevant behaviors are not only motivated by expectations of success, but also by subjective task value (e.g., the individual understands the task is important and useful). This study did not assess task value, and youth may not have valued the goals listed.

Despite these limitations, the present study offers a comprehensive analysis of how several psychosocial factors mediation the relation between future expectations and crime. Few studies directly explore the mechanisms that address *why* youth with low expectations seem more inclined to take risks and break the law. The results suggest that future expectations relate to both impulse control and perceived social rewards from crime, although only the latter operates as a mediator. Youth with low expectations for their future may feel that engaging in crime is a viable route for obtaining social status or respect, which subsequently translates into criminal behavior. Considering only one of the four mediators tested reached statistical significance, future research should consider alternative mechanisms. Generating and developing positive future goals

remains an important aspect of adolescent and youth development, in and of itself. The present study underscores the importance of these beliefs, given their relation to key psychosocial capacities known to reduce crime. Studies of juvenile offenders demonstrate that despite their offenses, many youth continue to report prosocial future goals (Iselin et al., 2012; Mahler et al., 2018). Understanding how these goals translate into behavioral changes remains an important area for continued inquiry.

The study findings offer insight on how to intervene and reduce crime among adolescents and young adults who have engaged in serious crimes. For younger individuals who still live at home or who are legally required to attend school, encouraging teachers, parents and mentors to encourage prosocial goals and facilitate planning may help to promote developmental assets that reduce the likelihood of crime. While some youth may fail to live up to their expectations, research suggests that youth who fall short of high expectations ultimately fare better than youth with low expectations (Villarreal, Heckhausen, Lessard, Greenberger & Chen, 2015). Moreover, adolescent expectations are multi-faceted (Sipsma et al., 2012) and promoting positive expectations in domains beyond education may promote positive outcomes for a broader group of developing adolescents. These findings also stress the importance of altering youth perceptions of how to obtain social respect from peers, romantic partners and family members. Previous research emphasizes the importance of perceived norms on risky and antisocial behaviors such as using tobacco (Pischke et al., 2015) and bullying (Perkins, Craig & Perkins, 2011). Correcting misconceptions about effective ways of achieving social respect and success may help to reduce delinquency.

Chapter 3: Estimated life expectancy and crime

Adolescent future expectations are not limited to *what* adolescents expect for their futures, but also *if* adolescents expect a future at all. While measures of future expectations primarily focus on the likelihood of meeting specific goals (e.g., attending college, obtaining a good job), measures of estimated life expectancy (ELE) tap an alternative future belief: how long an adolescent expects to live. Objective life expectancy has steadily increased since 1970, a finding true for both males and females, and for different racial groups (Centers for Disease Control, 2017). Yet, subjectively, some adolescents are uncertain about their chances of surviving past early adulthood. Data from Add Health indicated that 1 in 7 adolescents expressed some doubt that they would live past 35 (Boroswky, Ireland, Resnick, 2009). An abbreviated expected lifespan is not without consequence. Youth who expect to die young are more likely to engage in risky and reckless decision making (Boroswky et al. 2009; Brezina, Tekin, & Topalli, 2009), which scholars attribute to adolescents' reasonable focus on the present (Brezina et al., 2009; Piquero, 2016). In essence, why bother orienting behavior towards the future if an adolescent doesn't foresee a long-term future at all? The current study evaluates changes in ones estimation of life expectancy between adolescence and young adulthood and examines whether changes in ELE relate to changes in criminal behavior.

Only recently have scholars begun to study how an adolescent's ELE influences crime and other risky behaviors. Our knowledge of this subject relies heavily on data from the National Longitudinal Study of Adolescent to Adult Health (Add Health), a nationally representative sample of adolescent high school students that began during the 1990s and recently completed the fifth wave of data collected (2016-2018). As part of this study, adolescents answered two items about their perceived chances of living until age 35 or dying before age 21. Boroswky and

colleagues (2009) examined whether youth who expected to live past 35 were less likely to engage in risk behaviors and report poor health outcomes the following year, as well as six years later. They found that youth who expected to live past 35 were less likely to report a suicide attempt, fight-related injury, and unprotected sex the following year, and less likely to report a police arrest and diagnosis of HIV/AIDs six-years later (Borowsky, et al., 2009).

A separate analysis using Add Health compared youth who estimated a less than 50% chance of living past 21, compared to those estimating a greater than 50% chance. Adolescents who indicated that they would live past 21 were less likely to commit crime one- year later, in comparison to youth who did not think they would live past 21 (Brezina et al., 2009). One study considered whether "consistent" pessimists (i.e., someone who reported an expected early death at both waves) fared worse than consistent optimists (Duke, Borowsky, Pettingell, Skay & McMorris, 2011). The findings suggest that consistent pessimism was associated with a greater likelihood of a fight-related injury, reduced prosocial involvement, and lower levels of academic achievement during adulthood, compared to consistent optimism (Duke et al., 2011).

Overall, studies using Add Health highlight the importance of an adolescent's ELE on future life outcomes. Youth who do not expect to live past 21 or 35 tend to engage in higher rates of risky and delinquent behaviors. However, the reliance on data from Add Health warrants continued research within diverse samples of developing adolescents. The two items available in Add Health provide a stringent indicator of ELE, limiting potential variability. To my knowledge, scholars have not considered whether the division of youth estimating a life expectancy younger or older than 35 is the appropriate metric to use. It is possible that youth whose estimation surpasses 35, but falls short of 50 or 55 may similarly be at risk. This restricted item also precludes tests considering whether an *overly optimistic* ELE is problematic (e.g.,

adolescents expecting to live past 100). For example, Oettingen and Mayer (2002) differentiate between positive expectations, which are based on prior facts and past performance with "positive fantasies" which disregard prior behaviors or performance and are typically poor predictors of future outcomes. Research also links traits such as narcissism, which is characterized in part by grandiosity (Bushman & Baumesiter, 1998) to delinquent behaviors (Barry, Grafeman, Adler and Pickard, 2007). An overly optimistic perceived life expectancy may be tied to narcissism or other relevant traits and may be subsequently related to higher rates of offending.

Moreover, Add Health collected data from high school students who were predominantly White, yet youth of color are more likely to report a high perceived risk of early death (Borowsky et al., 2009). A larger percentage of Black and Latino youth perceived a high risk of an early death, compared to White participants, and youth from a lower socioeconomic (SES) status similarly perceived a high risk of early death, compared to youth from higher SES families (Borowsky et al., 2009). While Add Health research has been informative, additional work evaluating diverse and at-risk samples of adolescents remains an important area for continued research.

Samples of justice-involved youth are particularly pertinent to study as they represent a population with a high likelihood of being exposed to stressful and traumatic experiences (Chung & Steinberg, 2006, Mulvey et al., 2010) which could lead them to doubt their chances of survival (Brezina et al., 2009). Piquero (2016) tested similar questions concerning life expectancy using the Pathways to Desistance Study, described in chapter two. Compared to Add Health, the life expectancy measure consisted of a single-item with a continuous scale: "How old do you think you will live to be?", providing more variability in participant responses. The study tested

whether baseline reports of ELE predicted trajectories of self-reported offending across seven years. Indeed, youth who perceived a later age-at-death at the initial assessment were more likely to be classified in the lowest offending group, compared to groups who continued to engage in some degree of crime (Piquero, 2016). This study serves as an important contribution towards our understanding of adolescent perceptions of life expectancy and highlights the need for continued research among this population. For example, 1.2% of adolescents at the first assessment of Add Health indicated that they would be dead by 35, compared to approximately 6% of adolescents in the Pathways study. One limitation, however, concerns the assumed stability of adolescent ELE across development. Piquero (2016) focused on how initial reports of ELE related to trajectories of offending, but could not test whether adolescents' lifespan expectations change, or whether changes in ELE account for changes in offending.

In fact, the treatment of adolescent ELE as time stable may not be accurate. A few studies, primarily using data from Add Health, have evaluated changes in life expectancy beliefs across the first three waves of data collection (a total of 7 years). Among youth who anticipated an early death at wave one, approximately 43% held that belief one year later, and 17% continued to hold this belief six years later (Borowsky et al., 2009). Because risk-behaviors such as delinquency, drug use, unsafe sex and police contact influence adolescents' perceived life expectancy (Borowsky et al., 2009; Tillyer, 2015), it is possible that as youth age out of life-threatening behaviors they become more optimistic about their chances of survival. Nguyen and colleagues similarly noted that Add Health adolescents became more certain they would live until at least 35 as they aged (Nguyen et al., 2012) and attributed this change to better developed risk-perceptions. Whereas adolescents overestimate their chances of dying young (Borowsky et al., 2009), older adults report overall accurate perceptions of their life expectancy (Hurd &

McGarry, 2002). In sum, these findings from Add Health provide initial evidence that many adolescents alter their perceptions of ELE over the course of time.

Whether ELE demonstrates developmental patterns, however, remains largely ignored by empirical research. Research using Add Health suggests adolescents update their ELE, but because the study combines age groups within each wave (e.g., including 7^{th}-12^{th} graders at wave 1) most analyses typically mask any developmental change by focusing on stability from one measurement occasion to the next. Other related measures of future-motivated thinking change systematically across development, and an adolescent's ELE may behave in a similar manner. For example, an adolescents' tendency to think about and consider the future increases steadily through adolescence with growth plateauing during early adulthood (Monahan et al., 2013). Researchers have also considered how adolescents' education and occupation expectations vary from 14 to 26 years of age, and found that also exhibited patterns of growth and decline across development (Mello, 2009).

Few studies have extended this research to consider whether ELE varies with development, or are better represented as a stable attitude. One notable exception transformed the Add Health data to examine if youth change their perceptions of living past 35 between ages 12 and 23 (Warner & Swisher, 2015). Results suggested that expectations for living past 35 decreased slightly between ages 12 and 17 and subsequently increased between ages 17 and 23 (i.e., a U-shape pattern) (Warner & Swisher, 2015). The authors also considered several factors that might account for changes in perceived life expectancy across development. For example, increases in exposure to violence and violence perpetration was associated with decreases in ELE. Adolescents experiencing higher poverty also reported a shorter life expectancy compared to their higher SES peers (Warner & Swisher, 2015). Considering risk-taking and crime are

associated with adolescents' ELE, it is no surprise that individuals report more pessimistic expectations during the period of development where risky decision-making peaks.

Present Study

This study builds on this emerging body of work in three important ways. First, our understanding of adolescents' ELE comes largely from participants in Add Health. Although Add Health provides a large, nationally representative dataset to understand this topic, additional research including diverse samples of adolescents will broaden our understanding of the link between ELE and adolescent criminal behavior. The current analyses uses longitudinal data from the Crossroads study, which provides greater variability in reports of crime. Second, Add Health uses particularly extreme indicators of life expectancy: living past 35 or being killed before 21. I use a continuous scale ("How old do think you will live to be?") which will allow for greater variability and a greater likelihood of detecting nuanced change. The continuous scale available in Crossroads also provides the opportunity to assess the cut point of age 35 that Add Health uses and to assess whether alternative values of life expectancy relate to substantial reductions in crime. Third, building on Warner and Swisher (2015), I consider *developmental* changes in ELE, and test whether it is best represented as a changing or stable attitude and if changes are accompanied by altered patterns of risk-taking.

This study addresses the following questions: 1) Does adolescents' ELE change across development? 2) Do changes in ELE (positive or negative) influence adolescent crime, above and beyond alternative measures of future-oriented thinking (future orientation, future expectations) and 3) Is 35 an appropriate life expectancy cut-point to designate who is at heightened risk for delinquency? That is, at what estimated life expectancy do youth tend to engage in crime?

Hypotheses

Although few studies consider developmental changes in ELE, Warner and Swisher (2015) provide reasonable evidence that ELE will show a curvilinear pattern of change. I hypothesize that life expectancy will mirror developmental patterns of risk-taking such that estimated life-expectancy will decline between 14-18 and subsequently increase (Question 1).

Prior research also supports an association between perceived life expectancy and adolescent crime, such that youth estimating a shorter lifespan engage in more risk, compared to those estimating a longer lifespan (Boroswky et al., 2009; Brezina et al., 2009; Haynie, Soller, & Williams, 2014). In line with these findings, I hypothesize that these patterns will persist using longitudinal data, and that changes in ELE (both within- and between-person changes) will be associated with reductions in delinquency across development (Question 2). Finally, I predict that age 35 may not necessarily serve as the ideal cut-point for research regarding life expectancy. Considering these last analyses are somewhat exploratory in nature, I do not have a prediction as to a specific estimate. However, I expect that both extreme low and extreme high values of life expectancy will relate to increases in offending (Question 3).

Methods

Participants and Procedures

Data for this study will be drawn from the Crossroads Study. The details regarding sampling and procedures for Crossroads were previously described in chapter 1. Please reference page 10 for details on the Crossroads Study participants and procedures.

Measures

*Estimated Life Expectancy***.** Participants answered the free response question, "*How old do you think you will live to be*?" at each interview. Previous research using this question has top

coded responses above a specific age (e.g., 100, Piquero, 2016). Participants estimating an age above 122-years-old (the age of the oldest person ever recorded in 2019) were top coded at 122.

*Delinquency***.** Similar to chapters one and two, delinquency was measured using the Self-Report of Offending scale (SRO; Huizinga et al. 1991). The scale is composed of 24 items which ask the adolescent about his involvement in illegal activities, ranging from selling drugs to homicide, at any point during the past 6-months (or 12-months for the 48th month assessment). Adolescents are asked to indicate whether they engaged in each illegal activity (0 = *no*, 1 = *yes*). The number of offenses an adolescent endorses (i.e., variety score) are summed to create a variety score, with higher scores indicative of more serious offending behavior. For a more detailed description of the SRO scale, please refer to page 12.

Time-stable covariates

Demographic characteristics such as race and parent's highest level of education will be included. Participants also completed the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999 at the baseline), described in more detail on page 14.

Time-varying covariates

*Age***.** Participants' age at each interview was included to account for the well-documented relation between age and crime, specifically, youth desisting from crime as they age (Farrington, 1986; Gottfredson & Hirschi, 1990).

*Future Orientation and Future Expectations***.** Because few studies consider adolescents' ELE, prior researchers have not tested whether ELE provides predictive utility above and beyond known measures of adolescent future-motivated thinking. The Future Outlook Inventory was used to assess adolescents' future orientation, or their consideration for and attention towards the future (see page 11 for description). Adolescent expectations for the future were assessed using

seven items from the Perceptions of Opportunities Scale, to measure adolescents' prediction of their chances for success (see page 12 for complete description).

Street Time. Not all adolescents have the same opportunity to commit crime, particularly among youth who spent time in a facility during the follow-up period. I accounted for the proportion of time during the follow-up period that each adolescent spent in a residential facility or secure institution. At each interview, participants used a calendar to indicate the specific months during each follow up period that they spent in a detox/drug treatment program, psychiatric hospital, residential treatment program or secure institution. This number was used to account for the number of months they spent in a facility, therefore limiting their ability to reoffend.

Propensity score covariates. A number of measures were used only for the purpose of propensity matching the different cohorts. These covariates were chosen as factors that could potentially account for differences in age of first arrest. In addition to several measures described above (WASI, self-reported offending, race, parent education) a number of other measures were included. During the baseline administration of the SRO scale, when participants reported that they had engaged in a particular crime (in their lifetime), they were asked "How old were you when you first did this?" The youngest age provided was used as the indicator of a participant's age at first offense. Participants also completed the Neighborhood Conditions Measure (Sampson & Raudenbush, 1999) to describe the extent to which their neighborhoods were characterized by social (e.g., public fighting, people using drugs) or physical (e.g., garbage, graffiti) disorder. The Revised Child Anxiety and Depression Scale (Chorpita, Yim, Moffitt, Umemoto & Francis, 2000) was used to assess depressive symptoms (e.g., feelings of worthlessness, emptiness, sleep disturbances, etc.) and anxiety (e.g., general worries and worries about catastrophic events).

Adolescents indicated the number of their friends who were engaging in different types of crime using the 13-item Delinquent Peers Scale (Thornberry, Lizotte, Krohn, Famworth & Jang, 1994). Participants answered these same questions about their parents (used as an assessment of parent criminality) and also reported if either of their parents had ever been arrested. Lifetime exposure to violence was assessed with the Exposure to Violence Inventory (Selner-O'Hagan, Kindlon, Buka, Raudenbush & Earls, 1998), a 13-item measure asking if youth experienced or witnessed different types of violence. A variety score represented the total number of different types of violence exposure (witnessed or experienced) within a participant's lifetime. A substance use variety score was also computed using the Substance Use/Abuse Inventory (Chassin et al., 1991), which indicated the number of different types of substances (e.g., 13 total types: marijuana, opiates, hallucinogens, etc.) a participant had used in his lifetime. Finally, the eight item impulse control subscale of the Weinberger Adjustment Inventory (Weinberger & Schwartz, 1990) measured an adolescent's tendency to act without thinking.

Plan of Analysis

Latent growth curve modeling (LGCM) was used to evaluate the developmental patterns of ELE from adolescence through young adulthood (Question 1). Before conducting the LGCM, I reshaped the data to model ELE by age, rather than follow-up period. Data from all seven interviews (baseline, 6-months, 12-months, 18-months, 24-months, 30-months, 36-months and 48-months) were used in the latent growth curve. Because Crossroads uses an accelerated cohort design, each age group will consist of a different number of participants, with more participants providing data for the middle age groups (e.g., 16-18). However, latent growth curves are well suited to handle unequal sample sizes over time. Due to the small number of participants who were 13 and 22, the tails of the study were excluded from the analysis.

Accelerated cohort designs assume that each cohort is part of a single developmental trajectory, an assumption that may not be met. Because study recruitment for Crossroads was based on a first arrest, the current sample includes youth who experienced their first arrest at age 13, as well as youth experiencing an arrest for the first time at age 17. Prior research demonstrates how age at first arrest is a significant predictor of future life outcomes (Moffitt, 1993, Patterson et al., 1992), such that younger individuals tend to fare worse over time (Natsuaki, Ge & Wenk, 2008). Therefore, prior to conducting the LGCM, I analytically tested for cohort differences in ELE to assess the extent to which these differences were present. Following the recommendation of Miyazki and Raudenbush (2000) as well as Davis and colleagues (2017), I tested a series of hierarchical models to establish whether cohort differences were present. The first model included a linear and quadratic time variable, the cohort variable (baseline age 14, 15, 16, or 17) and an interaction between cohort and time (Table 1.3 – unweighted). Because the interaction between time and cohort was significant for one cohort (the slope of ELE for age 14 was significantly different than the slope of ELE for age 17), this suggested the presence of cohort differences in ELE that warranted adjustment. I used the R package TWANG (McCaffrey et al., 2013, R. Core 2019, Burgette, Griffin & McCaffrey, 2017) which includes a function to correct for imbalance across multiple groups (multinomial propensity scores function). Davis et al. (2017) provides a thorough description of the package and explains how the R package estimates these corrections (pp. 1521). Using TWANG, I weighted participants across 14 baseline variables that would likely relate to differences across cohorts: age at first self-reported offense, IQ, lifetime self-reported offending variety score, race, neighborhood quality, parent education, depressive symptoms, anxiety symptoms, peer delinquency, parent criminality, parent arrest, lifetime exposure to violence variety score,

substance use variety score (ever), and impulse control. After the matching was completed, I re-tested the model with the weights to evaluate if cohort differences were reduced (Table 1.3 - weighted). The time*cohort effects were reduced to non-significance (Time*cohort 4 = .70, $p >$ .05). Additional details regarding the propensity weighting procedure can be found in the results.

Table 1.3. Comparing cohort differences using unweighted and weighted hierarchical models. Results demonstrate cohort differences in estimated life expectancy.

	Unweighted	*Weighted*
Intercept	81.26***	80.58***
Linear Slope	1.45***	1.59***
Quadratic Slope	-.21*	-.15
Cohort 2 (15)	-1.55	-1.48
Cohort 3 (16)	-5.55***	-4.56**
Cohort 4 (17)	-8.89***	-7.15***
Time*cohort 2	.19	-.11
Time*cohort 3	1.01	.78
Time*cohort 4	1.41*	.70
Fit indices		
LL	-20142.95	-20117.87
AIC	40317.905	40267.94
BIC	40387.645	40347.86

Reference group is Cohort 1 (age 14 at baseline); Cohort 2 = age 15 at baseline, Cohort 3 = age 16 at baseline, Cohort 4 = age 17 at baseline

After the weights were established, they were used in the subsequent LGCM. Latent growth curves describe within-person changes over time, but also allow researchers to describe inter-individual differences in intra-individual change (i.e., differences between individuals) (Ram and Grimm, 2007). I first ran an unconditional growth model to estimate the best growth shape for estimated life expectancy between ages 14 and 21 (e.g., set the slope for age 14 to 0 and age 21 to 1, and freely estimate the remaining ages). All growth models were conducted using Mplus version 8.0, although when using sample weights traditional fit indices are not available (Chi Square, RMSEA, CFI, etc.). To establish the best fitting model, I ran an intercept-

only, linear and quadratic model and assessed the lowest BIC value in comparison to the unconditional model.

Next, I considered whether changes in ELE related to changes in self-reported offending, both within- and between individuals (Question 2). I applied a between-within (hybrid) model for a negative binomial distribution (*menbreg* STATA command) (Raudenbusch, 2009). A negative binomial model is appropriate (Gardner, Mulvey & Shaw 1995), given that self-reported offending variety scores tend to have a skewed distribution, which prohibits the use of ordinary least squares regressions (Long, 1997; Long & Freese, 2003). Hybrid models provide both fixed (within-person) and random (between-person) effects by decomposing each time-varying predictor into two parts: within and between. Both components are included in the model and provide unique estimates. Post-hoc Wald tests are also used to confirm whether the coefficients of the two parts are equivalent. The between-person coefficient is calculated by generating a person-specific mean for each time-varying covariate. The within-person predictor is calculated by subtracting the person-specific variable mean from the grand mean. Each component is subsequently included in the longitudinal model. The fixed effects estimates are particularly useful as they reduce the influence of potential omitted variables by statistically accounting for time-stable unobserved heterogeneity (e.g., an unmeasured underlying trait driving an individual's tendency to engage in crime). I also included an interaction between time and within-person ELE, to assess if the effect of ELE on crime varies across stages of development.

Finally, I conducted exploratory analyses to descriptively evaluate whether Add Health's focus on the perception of living before or past 35 adequately accounts for differences in crime (Question 3). For this analysis, only data from baseline and the 6-month follow-ups were used.

Because I expected ELE to change across development, it seemed unlikely that baseline ELE would predict long-term self-reported offending. In addition, given the exploratory and descriptive nature of question 3, a parsimonious analysis did not require all available waves of Crossroads data. The age 35 cut off was evaluated using two different methods, each which carry unique strengths and limitations. I first conducted a negative binomial regression, in which life expectancy at baseline predicted self-reported offending six-months later (accounting for all covariates as well as baseline offending). I then used STATA's margins command to generate the adjusted marginal predictions of self-reported offending at different values of life expectancy, adjusting for all other covariates (holding the covariates constant at their mean value) (Royston, 2013). The margins command generates the adjusted marginal predictions of self-reported offending at different values of ELE. One limitation is that the marginal predictions are primarily descriptive, and can only approximate trends in self-reported offending. For example, a plot of the estimated margins could visually suggest if and where the effect of life expectancy plateaus, that is, where it no longer shows changes in self-reported offending. A statistical test of each specific life expectancy values is beyond the scope of the estimated margins analysis.

A second useful technique for testing potential life expectancy "cut-off" scores is a Receiver Operating Characteristic (ROC) analysis. Recent work highlights the use of ROC analyses to evaluate the utility of continuous scales as predictors of binary outcomes. For the purposes of the present analysis, ROC curves also provide a method of assessing and adjusting cut points (Hudziak, Copeland, Stanger, and Wadsworth, 2004). An ROC analysis will provide information on the sensitivity of different cut-points of ELE (i.e., an adolescent commits a crime and is identified as an offender, a "true positive") as well as specificity (i.e., an adolescent does

not commit a crime and *is* identified as an offender, a "false positive"). Graphs generated by ROC analyses provide the "area under the curve" (*AUC*) statistic, which provides the probability that the measure will rank a random positive instance higher than a random negative instance (Fawcett, 2006). Higher *AUC* values are suggestive of stronger measurement performance. The ROC analysis also generates the estimated specificity and sensitivity for each value of the measure (i.e., life expectancy). The output generated by a ROC analysis indicates which value of the measure contains both the lowest specificity and highest sensitivity. One limitation, however, is that ROC analyses require a binary outcome. Due to this restriction, the self-reported offending variable was dichotomized (0 = did not commit a crime, 1 = did commit a crime). The ROC analysis was conducted using SPSS version 26.

Results

Descriptive data

Table 2.3 provides the descriptive data for all time-varying covariates as well as the minimum and maximum values, for each age group. For the hybrid models, the life expectancy variable was divided by 10 (for purposes of coefficient interpretation).

Table 2.3 Descriptive statistics of study variables by age

Age	*N*	Self-Reported Offending		Estimated Life Expectancy		Future Orientation		Future Expectations		Street Time	
		M	*Min/ Max*	*M*	*Min/ Max*	*M*	*Min/ Max*	*M*	*Min/ Max*	*M*	*Min/ Max*
14	341	1.64	0/13	78.73	22/122	2.54	1.38/4	3.89	1.57/5	.25	0/8
15	637	1.82	0/18	78.93	17.5/122	2.57	1/4	3.82	1.28/5	.51	0/13
16	926	1.63	0/18	79.32	20/122	2.65	1/4	3.86	1/5	.63	0/12
17	1143	1.63	0/17	79.05	20/122	2.72	1/4	3.91	1.21/5	.68	0/13
18	1017	1.33	0/15	81.06	25/122	2.83	1/4	4.05	1.64/5	.73	0/13
19	786	1.09	0/17	81.18	22/122	2.90	1/4	4.13	1.14/5	.52	0/13
20	517	.86	0/11	81.77	22/122	2.93	1.38/4	4.18	1.29/5	.44	0/13
21	223	.87	0/14	81.67	24/122	2.97	1.53/4	4.28	1.14/5	.47	0/12

Propensity weighting

Table 3.3 displays the differences in covariates across cohorts before and after matching. The majority of the standardized effect sizes were reduced across cohorts, as demonstrated by the smaller maximum absolute standardized mean difference (ASMD) score and minimum *p*-values associated with the ASMD. For example, the lifetime self-reported offending variety score ASMD changed from .16 ($p<.001$) to .04 ($p = .65$). Only lifetime report of substance use remained above the recommended .25 cut off (Stuart & Rubin, 2008) after matching, however the ASMD score was still reduced (from .73 to .27).

Table 3.3. Propensity score weighting results (TWANG)

	Unweighted		Weighted	
Variable	*Max ASMD*	*Min p*	*Max ASMD*	*Min p*
IQ	.18	.03	.05	.51
Lifetime SRO	.16	<.001	.04	.65
Race				
White	.15	.16	.07	.36
Black	.19	.16	.15	.36
Latino	.16	.16	.17	.36
Other	.04	.16	.04	.36
Neighborhood disorder	.19	.03	.07	.46
Parent Education				
< HS	.19	<.001	.12	.12
HS only	.04	<.001	.05	.12
> HS	.29	<.001	.11	.12
Depressive Symptoms	.13	.12	.05	.53
Delinquent Peers	.31	<.001	.11	.24
Age at first self-reported offense	.21	.01	.17	.06
Parent Criminality	.08	.31	.09	.36
Parent Arrest	.11	.20	.07	.46

Lifetime Exposure to violence	.31	<.001	.09	.41
Anxiety Disorder	.13	.13	.12	.22
Substance use	.73	<.001	.27	<.001
Impulse control	.08	.36	.01	.91

Is estimated life expectancy stable across development?

Table 4.3 presents the results from the LGCM after applying the propensity weights. Overall, I found little evidence for a quadratic growth curve across development, as the quadratic estimate and variance were not statistically significant. A linear model appeared to fit the data best, and suggests that each year, estimated life expectancy increased by 1.69. That is, youth became *more* optimistic regarding their life expectancy as they entered young adulthood. The slope and intercept estimates and variances were all significant, suggesting youth varied in both their initial life expectancy predictions, as well as growth over time. I subsequently regressed the slope and intercept onto race and parent education and found that Latino youth reported a lower perceived life expectancy compared to white youth (B = -7.95, p <.001) as did youth identifying as "other" (B = -10.01, p <.05). Both Latino and "other" youth increased their life expectancy faster than white youth (B_{latino} = 1.47, p < . 001) (B_{other} = 1.97, p = .04). Parent education was not related to either the ELE slope or intercept. These findings suggest that perceived life expectancy is not stable, and generally improves across development.

Table 4.3. Life expectancy latent growth curve models

Model	Model Fit		Intercept		Slope		Quadratic	
	AIC	BIC	Est.	Var.	Est.	Var.	Est.	Var
Unconditional[1]	40493.76	40553.56	-	-	-	-	-	-
Intercept only	40784.40	40799.35	79.57***	163.92***	-	-	-	-
Linear	40496.88	40526.78	74.94***	275.83***	1.34***	9.54***	-	-
Quadratic	40480.67	40530.51	74.52***	264.13***	1.69***	26.38***	-.06	.22

[1]Unconditional model for comparison only, coefficients are not meant for interpretation.

Do changes in life expectancy related to changes in offending, within and between individuals?

The next model considered how changes in ELE related to changes in self-reported offending across development. I used the multilevel mixed effects negative binomial regression command (*menbreg*) in STATA v13. It is worth noting that *menbreg* does not allow the use of sample weights which prohibited correcting for cohort effects as I did for the LGCM. There was one significant difference in the slope for self-reported offending between 15 and 17-year-olds (B = .12, SE = -.05, p = .012) which could not be corrected.

Before conducting the full hybrid model, I ran an unconditional growth model for self-reported offending, to assess the overall pattern of offending from 14-21. Self-reported offending declined in a quadratic pattern across development, and substantial variation was present across the slope and intercept, suggesting adolescents demonstrate inter-individual variability (Table 5.3). The LR test confirmed that a negative binomial distribution was the appropriate specification (χ^2 (3)= 1482.23, p < .001).

Table 5.3. Unconditional growth model for self-reported offending

	B	*SE*
Fixed effects		
Intercept	-.33***	.05
Linear slope	-.32***	.02
Quadratic slope	-.04***	.01
Random effects		
Intercept	1.49	.10
Slope	.08	.01
LL	-7879.87	
AIC	15773.74	
BIC	15819.90	

N observations = 5399, *N* cases = 1214

Next, all time varying (age, life expectancy, future orientation, future expectations, time spent in a facility) and time-invariant covariates (race, parent education, IQ) were entered into

the negative binomial hybrid model simultaneously. As a reminder, for all time-varying covariates (except age), the estimates were separated into within- and between-person components. I also included a random slope for age, allowing individuals to vary in their trajectories of offending across development. Table 6.3 describes the results from the hybrid models, separated by within and between person effects. The Wald post-hoc tests suggested that the between and within person effects were significantly different for life expectancy ($\chi^2(1) = 7.03$, $p = .008$), future orientation ($\chi^2(1) = 6.85$, $p = .009$), and time spent in a facility ($\chi^2(1) = 25.26$, $p < .001$). These tests confirm that the decomposition of between-within person effects is appropriate. Across development, within-person changes in ELE were associated with within-person changes in self-reported offending, such that as ELE improved, self-reported offending declined. This effect was over and above the significant contribution of future orientation and future expectations. The between-person estimates for life expectancy were also significant, suggesting that youth reporting a longer perceived life expectancy engaged in less crime across development, compared to youth reporting a shorter perceived life expectancy. The interaction between ELE (within person) and age was not significant ($B = -.01$, $SE = .009$, $p = .48$), suggesting that the strength of this relation did not vary across development. Together these results suggest that ELE increases over time, and these changes carry implications for adolescent crime. For every 10-year increase in ELE, self-reported offending declines by 9.0%.

Table 6.3. Results from hybrid model predicting self-reported offending

Variables	*Estimate*	*SE*	*p-value*	*95% CI*	*IRR*
Age	-.18	.02	<.001	-22, -.15	.83
Quadratic Age	-.03	.006	<.001	-.05, -.02	.97
Within-Person					
Life expectancy	-.09	.02	<.001	-.12, -.06	.91
Future Orientation	-.31	.06	<.001	-.43, -.19	.73
Future Expectations	-.11	.04	.009	-.18, -.03	.90

Time Spent in Facility	.03	.01	.002	.01, .05	1.03
Between-Person					
Life Expectancy	-.18	.03	<.001	-.24, -.12	.83
Future Orientation	-.62	.10	<.001	-.83, -.42	.54
Future Expectations	-.10	.07	.18	-.24, .04	.91
Time Spent in Facility	.18	.03	<.001	.13, .24	1.20
Race					
Black	-.20	.12	.09	-.42, .03	.82
Latino	.02	.11	.85	-.20, .24	1.02
Other	.22	.23	.34	-.23, .68	1.25
IQ	.001	.003	.81	-.01, .01	1.00
Parent Education	.08	.45	<.001	.04, .11	1.08
Log Likelihood			-6695.35		
BIC			13551.09		
AIC			13428.70		
Random Slope Variance (*SE*)			.06(.01)		
Random Intercept Variance (*SE*)			.92(.07)		

Notes. *N* observations = 4626, *N* cases = 1147. *SE* = standard error; *CI* = confidence interval *IRR* = incidence risk ratio.

What is the significance of age 35?

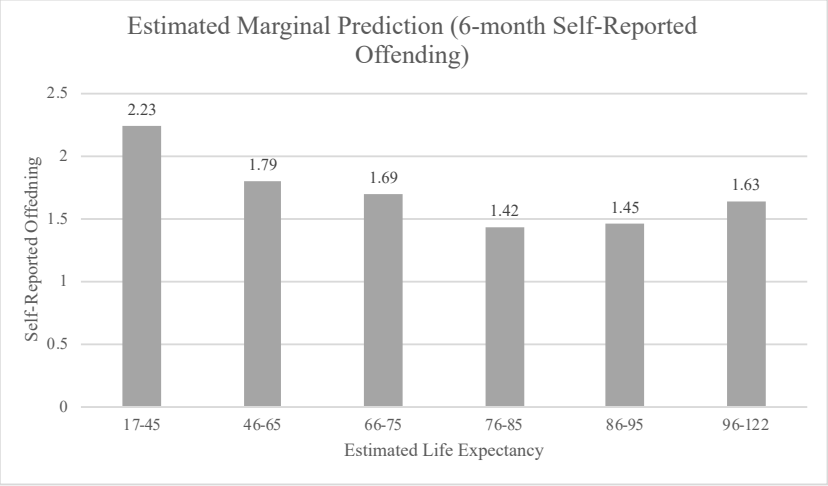
Finally, I tested the usefulness of age 35 as a cutoff when understanding adolescent perceptions of life expectancy. As a reminder, this set of analyses focused only on the baseline and 6-month data collection. An initial descriptive assessment of the data immediately suggested that age 35 may not be appropriate. Only 43 participants (3.69%) did not expect to live past age 35. As a point of comparison, within Add Health, 1.2% of participants reported "almost no chance" of living until age 35 (Duke et al., 2011). Table 7.3 summarizes how youth responded to this free response question at the baseline interview. In order to generate the estimated marginal values, I first had to transform the continuous life expectancy item into a categorical predictor. Because of the relatively small number of youth reporting an ELE lower than 35, I ultimately created six categories based on the distribution: 17-45, 46-65, 66-75, 76-85, 86-95, 96-122. Next,

I entered this categorical predictor along with the covariates (race, IQ, parent education, time in facility, and baseline self-reported offending) in a negative binomial regression predicting offending behavior at 6-months, specified with robust standard errors. I then generated the predicted means for each category of ELE (Figure 1.3). This analysis descriptively suggests that levels of offending continue to decline as ELE increases, although this effect plateaus at 85, after which a slight increase in offending is evident.

Table 7.3. Descriptive statistics of estimated life expectancy at baseline

Estimated Life Expectancy	*N*	%
17-25	13	1.11
26-35	30	2.57
36-45	37	3.17
46-55	77	6.60
56-65	136	11.66
66-75	204	17.50
76-85	309	26.50
86-95	188	16.12
96-105	145	12.44
106-122	27	2.32

Figure 1.3. Estimated marginal predictions for self-reported offending



I then conducted the ROC analysis as another method of discerning the usefulness of perceived life expectancy below/above age 35. Using SPSS v26, two components were entered

into the model: the state variable (dichotomous self-reported offending 6-month score) and the test variable (continuous life expectancy). The AUC value was low (*AUC* = .55), which is not surprising given that the ELE scale is not meant to be used as a risk assessment tool. The coordinates of the curve output suggested that at age 35, only 4% (sensitivity = .042) of positive outcomes (e.g., committing a crime) were correctly identified. The false positive rate was low, with only 2% (1- specificity = .017) of negative outcomes (not committing a crime) incorrectly specified. Overall, none of the ELE values demonstrated a sufficient tradeoff between sensitivity and specificity. For example, at age 81, 65% (sensitivity = .652) of individuals were correctly specified as offenders, but the false positive rate was also high (59%; 1-specificity = .591).

Discussion

Psychologists and criminologists recognize the significance of an adolescent's estimated life expectancy in regard to decision-making, particularly decisions relating to risk and delinquency (Borowsky et al., 2009; Brezina et al., 2009; Brumley, Jaffee & Brumley, 2017). The results of study 3 add to this body of literature in two important ways. First, I found evidence that ELE is not necessarily stable across development, and the overall pattern showed that youth expect to live longer as they grow older. Second, within-person changes in ELE related to changes in self-reported offending, such that as ELE increased, self-reported offending declined. This effect was consistent across development, suggesting a wide variety of youth at different ages (14-21) benefit from improved ELE.

It is worth emphasizing the differences in ELE measurement when comparing Crossroads to Add Health. Because much of the research studying ELE uses data from Add Health, the methods soley rely on two items that ask youth about their chances of dying before they reach the age of 21 or 35. Given the arbitrary nature of this measure, I questioned the utility of this

scale and whether age 35 was an appropriate "cutoff". Findings from this study showed that among youth enrolled in Crossroads, a very small number of adolescents ($N = 43$, 3.69%) indicated they expected to die by 35. The different measures used in Add Health and Crossroads make direct cross-study comparisons challenging. Among Add Health participants, only 1.2% of youth reported "almost no chance" of living until age 35, although another 2.2% reported "some chance but probably not", and another 10.1% reported a "50/50 chance" of living to age 35 (Duke et al., 2011). Given that so few participants in Crossroads provided an age less than 35, the question administered in Add Health likely reduces the amount of variability and may artificially push youth into a category that does not accurately reflect their ELE. In addition, although few participants freely responded with an age less than 35, 13% expected to die before age 55, nearly half the ELE of many of their peers. Although an adolescent may feel confident that he will live past 35, he could still doubt his chances of living beyond middle adulthood. The data from the continuous scales suggests the estimated age associated with a decline in risk-taking may be higher than 35 years old.

The Add Health ELE measure also limits our understanding of youth with an optimistic ELE. It is first worth emphasizing that despite their experiences with the justice system, many adolescents in the present study reported optimistic ELE, and expected to live well into their seventies (e.g., the grand mean ELE for all ages was 80.08 years). This descriptive finding counters the stereotype that youth in the justice system are largely pessimistic about their chances for survival. The continuous scale also provided the opportunity to assess youth who may be *overly* optimistic about their ELE. The margins analyses provided preliminary evidence that some values of ELE, although greater than 35, may relate to a higher rate of offending. For participants falling into the most optimistic category (living to ages 96-122), their predicted

value of offending was also higher than youth in the 76-95 age range. Future work should consider the relation between inflated life expectancy and traits such as unrealistic optimism and grandiosity. Scholars define unrealistic optimism as, "a belief that a personal outcome will be more favorable than it should be according to some quantitative objective standard" (Shepperd, Pogge & Howell, 2017), which could be applicable to an overly inflated life expectancy. Unrealistic optimism is linked to a number of negative outcomes, such as engaging in risky behaviors, inadequately preparing for medical treatments, and experiencing emotional distress (see Shepperd et al., 2017 for a review). Youth reporting an inflated ELE may also be more likely to display attitudes consistent with Elkind's (1967) definition of personal fable. Adolescents with inflated ELE may feel a sense of invulnerability in regards to risk-taking ("other people will grow old and die but not me," Elkind & Ginsberg, 2007) and research supports the notion that the personal fable is associated with patterns of risky behavior (Greene, Rubin & Hale, 1995). Future work should continue to explore the consequences of overly optimistic ELE.

These analyses also contribute to the growing body of empirical studies that move beyond ELE as a stable trait (Duke et al., 2011; Borowsky et al. 2009; Warner & Swisher, 2015). Similar to other aspects of development, ELE demonstrated change over time. From ages 14 to 21, the average ELE increased while also showing variability in the rate of change across individuals. These findings map onto the limited work in this area. Within Add Health, among youth who indicated they did not expect to live to the age of 35, only half maintained this belief one-year later (Duke et al., 2011). By the third wave of data collection (six years later), an even smaller percentage continued to express this belief (17% of youth who expressed doubt at baseline; Borowsky et al., 2009). Interestingly, Warner and Swisher (2015) reported a U-shaped pattern of

ELE, and found that ELE declined from ages 12 to 17, after which it began to increase from age 17 to 21. In contrast, I found no evidence of a quadratic pattern in ELE and instead found that participants grew increasingly optimistic about their chances for survival from ages 14-21. Measurement of ELE differed across the two studies: I used a continuous, free response item, while Warner and Swisher asked participants whether they would survive to age 35, which they answered using a 5-point scale (0 = *almost no chance*, 4 = *almost certain*), an important difference which could account for the varied patterns. Although the growth patterns slightly differed, the results from Warner and Swisher (2015) and the present study both suggest that as adolescents enter young adulthood, they ultimately become more optimistic.

The results also demonstrated that as adolescents increase their ELE, their levels of self-reported offending decline. Despite the differences in sample characteristics (nationally representative vs. justice-involved), this finding aligns with much of the work in this area. Previous research using Add Health similarly suggested that adolescents reporting higher chances for survival were less likely to engage in risk-taking, including crime (Borowsky et al., 2009; Brezina et al., 2009; Brumley et al., 2017). By applying a hybrid between-within model to understand these associations, I also confirmed that this relation persisted at the within-person level, removing the possibility that the link between ELE and offending could be explained by some underlying stable trait (e.g., an underlying propensity to engage in crime). Building on past research, I also found that the relation between ELE and delinquency persisted at different stages of development. Estimated life expectancy was related to crime for individuals as young as 14 and as old as 21.

Life History theory provides a helpful framework for understanding why ELE may related to changes in offending. Life History theory posits that an individual's environment leads to the

adoption of either slow or fast "life strategies" which carry implications for decision making (Ellis et al. 2012; Ellis, Figueredo, Brumbach & Schlomer, 2009). Fast strategies are characterized by an abbreviated time horizon (e.g., expecting an early death) and are associated with psychosocial factors predictive of crime, such as disregarding long-term consequences and prioritizing immediate rewards (Ellis et al., 2012). One study experimentally manipulated mortality cues and found that after participants read articles that prompted individuals to consider their own mortality (e.g., by reading an article describing increasing trends in violence and death), they were more likely to prioritize immediate, smaller rewards. Importantly, this effect was only present for individuals who grew up in poor environments (Griskevicius, Tybur, Delton & Robertson, 2011). Overall, youth with a shorter life expectancy may be more tempted by the immediate rewards associated with crime and risk taking. Brezina and colleagues (2009) conducted in-depth interviews with young people actively involved in serious street crime. These interviews similarly support the idea that youth with a shorter life expectancy are more willing to disregard the consequences of their behaviors and focus on immediate rewards (e.g., "Life is short...Might be dead by 25 so who cares?"). The authors argued that because some youth viewed early death as an inevitable reality, they embraced nihilistic behaviors, including crime.

The present analyses also considered the effect of ELE over and above other aspects of future-motivated cognition: future orientation and future expectations. All three factors independently predicted self-reported offending across development, and did not result in problems relating to multi-collinearity. Previous research has assessed the multi-dimensionality of future expectations and ELE, and found that a two-factor model emerged in the data (Prince et al., 2016). The authors uncovered two factors: "threats to safety" (e.g., life expectancy) and "positive expectations" (e.g., expectations about career and school). A review by Johnson and

colleagues also distinguished these three variables and argued that they operate together to promote positive development and help youth achieve their future goals (Johnson, Blum & Cheng, 2014). In line with these papers, the present analyses suggests ELE, future orientation and future expectations uniquely relate to delinquency.

Because the vast majority of studies on ELE rely on Add Health data, extending these findings to a diverse sample of developing adolescent males represents an important contribution to this body of research. Warner and Swisher (2015) reported that Latino and black youth were less optimistic about their ELE than white youth. Crossroads consists of primarily black and Latino youth, and the present findings also suggest that Latino youth report a lower ELE than their white peers. Future work should evaluate the factors that contribute to this disparity in ELE. In addition, because justice-system populations are more likely to experience violence and trauma (Lauritsen et al., 1992), it seemed plausible that a large portion of these youth would self-report a pessimistic ELE. Indeed, among Crossroads youth, 54% reported experiencing at least one type of violent trauma in their lifetime, such as getting shot, beaten up or attacked with a weapon. Prior research indicates that adverse childhood experiences (physical abuse, sexual abuse, parent incarceration) related to fatalistic future expectations (dying before age 21) (Brumley et al., 2017). Warner and Swisher also found that increasing within-person exposure to violence harmed adolescent ELE (Warner & Swisher, 2015). Contrary to this research, the average estimated life expectancy for the Crossroads participants was quite high (i.e., between 78-81 years-old). Future work should consider the extent to which violence exposure relates to ELE, and whether other contextual factors (e.g., parent-child relationship, peer relationship quality) plays a more important role.

Despite these contributions, several study limitations should also be noted. The ROC analyses, which was also used to assess the age 35 cutoff, did not prove to be the appropriate approach for this question. Because ROC analyses are typically enlisted for evaluating risk assessment tools, the ELE item performed poorly according to risk assessment standards. The ELE is not meant to be used as a risk assessment tool, which may account for the poor performance. Another limitation concerns the correlational nature of the association between ELE and offending. Although the hybrid model specified ELE predicting self-reported offending, the estimates are correlational in nature and it seems likely that there is a reciprocal association among the two variables. Assessing the bidirectional relations was beyond the scope of the present study, but should be considered for future research, particularly given other findings that suggest reciprocal relations between related constructs (e.g., future expectations) and offending (Mahler et al., 2018).

While these analyses reveal that the vast majority of youth expected to live past 35, a portion of participants still reported ages below 55 (13.45%). Given advancements in medicine and technology, and that the average life expectancy for men in the United States is nearly 79, estimated ages in middle adulthood still appear relatively pessimistic. When adolescents do not expect to live into old age, many other goals seem irrelevant. For example, fostering positive relationships with one's spouse or children, or pursuing an ambitious career seem unnecessary when anticipating an early death. A pessimistic ELE may reflect a sense of hopelessness or may be suggestive of depression or anxiety. Fortunately, ELE should not be understood as a stable trait and youth estimating a low ELE have the potential to change their beliefs for the better. Indeed, youth alter their perception of life expectancy, and overall become more optimistic as they age. Although helping youth to formulate future goals and planning strategies remains

essential, ensuring that youth envision a future *at all* may be an important first step in promoting positive outcomes.

Concluding Remarks

Although goals guide and direct behavior at all stages of human development, adolescence is a period during which setting and pursuing goals plays a particularly prominent role (Erikson, 1963). Adolescence is also characterized by risk-taking, a premise supported by statistics showing heighted rates of automobile accidents (AAA Foundation for Traffic Safety, 2017), binge drinking (Centers for Disease Control and Prevention, 2015) and criminal behavior (Farrington, 1986; Loeber et al., 2012). The current dissertation examined the extent to which a lack of goals and expectations are likely to have contributed to increased risk-taking, explored the mechanisms that link expectations to delinquency, and identified instances when positive future expectations failed to improve behavior. Overall, despite their experience with the juvenile justice system, many youth maintained positive beliefs about the future, and these beliefs subsequently helped to reduce the likelihood of re-offending.

The three studies that comprise this dissertation each examined unique aspects of the relation between future expectations and crime during adolescence. Study one distinguished future expectations from future orientation, study two focused on the mechanisms linking future expectations to delinquency, and study three evaluated adolescent future expectations in the form of life expectancy. The findings from study one support my hypothesis that some adolescents report high future expectations, but also report difficulty orienting their behavior towards these future goals (low future orientation). These "mismatched" adolescents (i.e., high future expectations, low future orientation) engaged in risk behaviors such as crime, substance use and casual sex as often as youth with low expectations and orientation. That is, high expectations likely need to be accompanied by high future orientation in order to be associated with reductions in crime. Study two focused on the mechanisms linking future expectations to

delinquency. Specifically, youth with low expectations were more likely to perceive illegal behaviors as socially rewarding, which subsequently related to engaging in crime. This suggest that young people pessimistic about their chances for achieving conventional goals may perceive crime as a feasible route to social respect and success. Finally, study three evaluated adolescent future expectations in the form of estimated life expectancy. The results support the notion that estimated life expectancy can and does change between adolescence and young adulthood. Overall, youth become more optimistic about their chances of survival, and higher estimated life expectancy is associated with reductions in crime.

Findings from this study should also be considered within the context of existing stereotypes about adolescents who engage in delinquent and criminal behavior. FrameWorks (2015) conducted focus groups to assess public perceptions of adolescents committing crime, and found many stereotypes continue to pervade the public discourse. Focus group participants voiced the opinion that youth who engage in offending behavior are "bad people" who are born with psychological problems which lead them to commit crime. They also viewed these behaviors as unamenable to prevention or treatment, and described juvenile delinquents mindsets as "fixed" and "innate". All three studies in the present dissertation help to dispel these misconceptions, and offer a hopeful perspective on the reduction and prevention of juvenile delinquency. Across both samples of participants, many youth expected to live long lives and to achieve prosocial goals relating to school, work and family. The dissertation findings also suggest that these beliefs are malleable and show growth over time. Juvenile delinquency rehabilitative programs should consider integrating future expectations into program curriculum, given that these beliefs are related to reductions in crime, both directly and indirectly. For example, in California, juvenile delinquency reduction programs currently target technical aspects of a minor's arrest (e.g.,

providing an advocate to support the youth throughout their experience in the court), but guidance for academic and career planning remains limited (Judicial Council of California, 2019). Moreover, these findings also highlight instances where adolescents may struggle to align their behavior with their expectations. Programs, particularly for younger adolescents, may benefit from targeting youth expectations in conjunction with other aspects of psychosocial development.

Juvenile court officials exert significant power over an adolescent's future possibilities. Ideally, an arrest can be used as an opportunity to hold adolescents responsible for their crimes, while simultaneously connecting youth with resources and people who can help them formulate and strategize prosocial goals moving forward. It is worth emphasizing that *all* adolescents studied in the present dissertation were arrested for at least one crime. Although all youth could be labeled as juvenile delinquents, basic descriptive statistics regarding their future beliefs help to reframe how we should perceive juvenile offenders. For many adolescents, their crime and arrest is not indicative of their personal hopes and goals. With the help of parents, justice system officials and other important mentors, these beliefs can and should be leveraged for positive change.

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