PARENTAL INFLUENCES ON MARIJUANA USE AND PERCEPTIONS

OF RISK IN EMERGING ADULTHOOD

by

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A DISSERTATION

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DISSERTATION ABSTRACT

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The purpose of this study was to gain a clearer understanding of the relation between parental relationship qualities, emerging adult (EA) perceptions of risk of marijuana use, and overall EA marijuana use outcomes. The present study drew from an ethnically and socioeconomially diverse sample of EAs (ages 19-22) and their parents (n = 470) from the Pacific Northwest region. This study used parent-report and child-report data to capture measures of parenting, EA perceptions of risk, and EA marijuana use outcomes. Regression results revealed quality of parent-child communication, congruence in parent knowledge of marijuana use, and parental underestimation of marijuana use were associated with higher levels of EA marijuana use. Latent Class Growth Analysis (LCGA) was used to model trajectories of marijuana use and risk factor analyses were used to examine how marijuana group membership varied by covariates and parental relationship qualities. Results revealed that lower levels of family cohesion and quality of parent-child communication were more likely to predict membership in the high-using groups and moderate-decreasing user groups in comparison to low-to-non users. Results also indicated that lower levels of frequency of parent-child communication were more likely to predict membership in the high-users group

compared to the low-to-non users. Regarding parent knowledge of marijuana use, trends toward congruence and underestimation of EA marijuana use predicted membership in the high-using and moderate-decreasing groups compared to the low-to-non users. Lastly, a quasilongitudinal mediation model indicated EA perceptions of risk may act as a safety mechanism between the deleterious effects of unhealthy congruence in parent knowledge, and underestimation of use on EA marijuana use outcomes. Study results indicate EAs in their early 20s may be more likely to engage in healthy decision-making regarding marijuana use in an environment that includes warm, supportive parent-child relationships where parents are aware of their EAs use without focusing on their EA's perceptions of risk.

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For my abuelitas, Florestela Quintanilla and Soledad Cárdenas

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CHAPTER I

INTRODUCTION

Emerging adulthood (EA; 18–25 years of age; Arnett, 2007) is a developmental period marked by critical transitions, including increased independence, identity exploration, vocational instability, entrance into the workforce or college, and major life events such as marriage and raising children. During this time, substance use peaks (Johnston, O'Malley, Bachman, & Schulenberg, 2009), perhaps as a result of the instability experienced during such major transitions and life stressors (Arnett, 2005). Emotional maturation parallels neurocognitive development during this time (Kogan, 2017). For example, research suggests that prefrontal regions associated with executive functioning continue maturing in EA until after age 25. Additionally, mesolimbic systems linked with emotion regulation are becoming functionally integrated during this time (Whittle et al., 2014). The result is that EAs are not yet ready for many of the challenges they face during this time period.

For many EAs, family relationships continue to serve as a primary source of support, instrumentally and emotionally. Healthy parent–child relationships during this period are protective for some EAs and reduce the associated risks and stressors (Napper, Froideavaux, & LaBrie, 2016; Padilla-Walker, Harper, & Bean, 2011; Padilla-Walker, Nelson, Madsen, & Barry, 2008). Therefore, parents must balance supporting their children's independence, while also providing support for their children's capacities for decision-making, which are still developing (Kogan, 2017).

Several prospective studies have indicated the important role parents play in EAs and the prevention of substance use (Brody, Yu, Chen, Kogan, & Smith, 2012; Patock-

Peckham & Morgan-Lopez, 2009). The majority of research on EA substance use and parent relationships has focused on alcohol use in college populations. For example, research findings have shown that poor quality of parent–child relationships and parental permissibility of alcohol use predict greater alcohol and drug use among EAs in college (Abar, Abar, & Turrisi, 2009; Abar, Turrisi, & Mallett, 2014; Huh, Huang, Liao, Pentz, & Chou, 2013). Additionally, nurturing parent relationships contribute to abstinence from heavy alcohol use beyond the effect of adolescent relationships (Madkour et al., 2017).

Very little research has been conducted on how family relationships impact the development of marijuana use in EA, despite the fact heavy marijuana use is associated with a number of negative outcomes in EA, including: (a) memory problems, (b) poor academic performance, (c) negative physical outcomes, and (d) mental health issues (Bechtold, Simpson, White, & Pardini, 2015; Buckner, Crosby, Silgado, Wonderlich, & Schmidt 2012; Caldeira, Arria, O'Grady, Vincent, & Wish, 2008). In comparison to non-users, marijuana users reported more depressive symptoms (Troup, Andrzejewski, Braunwalder, & Torrance, 2016), more psychosomatic symptoms (Osborn et al., 2015), and lower levels of subjective well-being (Barnwell, Earleywine, & Wilcox, 2006). In a sample of first year college students, heavy and moderate marijuana users, in comparison to non-users, reported psychological distress, emotional problems, and poorer physical and mental health outcomes (Arria, Caldeira, Bugbee, Vincent, & O'Grady, 2016).

EAs have the highest rates of marijuana use (Substance Abuse and Mental Health Services Administration [SAMHSA], 2013). Furthermore, marijuana use has increased by 35% since 2006, and use is anticipated to continue to increase due to legal status changes (Johnston, O'Malley, Bachman, & Schulenberg, 2013). The results from several

studies suggest parent-related factors are associated with EA marijuana use. For instance, research among college students suggests a link between parental monitoring before and after matriculation of postsecondary education and less frequent use of marijuana use (Napper et al., 2016; Pinchevsky et al., 2012). When parents monitored their child more closely, students reported less frequent marijuana use and less approving attitudes of marijuana use (Napper et al., 2016).

Society and culture play an important role in influencing substance use (Stone, Becker, Huber, & Catalano, 2012). Recently, there has been a notable shift toward the legalization of marijuana in the United States. This has also affected the acceptability of use of medical and recreational marijuana (Paschall, Grube, & Biglan, 2017). Currently, medical use is legal in 28 states and Washington, DC. In addition, recreational use of marijuana is legal in 8 states and Washington, DC (National Conference of State Legislatures, 2017). The legalization of medical marijuana could affect EA marijuana use by encouraging social norms that are positive to marijuana use or by strengthening beliefs that marijuana use is not detrimental (Paschall et al., 2017). On the other hand, some research indicates that increases in marijuana use since 2005 across the population are due to general-period effects that are not related specifically with state marijuana legalization changes (Kerr, Lui, & Ye, 2018). Evaluating how different factors of parenting and family impact the development of EA marijuana use is particularly relevant in the current shifting political climate surrounding marijuana use.

Longitudinal Patterns in Growth of Marijuana Use

Overall, the developmental trajectory pattern for marijuana use involves escalation during adolescence, peak use in young adulthood, and some subsequent

decrease after young adulthood (Homel, Thompson, Leadbeater, 2014; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016). However, there is significant individual variability regarding the onset, period of time, and frequency of marijuana use (Caldeira et al., 2008), and there are distinct trajectories of marijuana use that have been empirically modeled and categorized (Passarotti, Crane, Hedeker, & Mermelstein, 2015; Terry-McElrath et al., 2017). The identification of different trajectories of substance use may provide useful theoretical and intervention implications. For instance, identifying trajectories allows researchers to understand how different sets of risk or protective factors may be relevant to marijuana use trajectory patterns (e.g., escalation, decline; Ellickson et al., 2014). Longitudinal research typically characterizes five general marijuana use patterns across age that include non-use, time-limited low use, chronic heavy use, escalating use, and decreasing use (Terry-McElrath et al., 2017).

Few studies have examined the associations between parental relationship quality and trajectories of EA marijuana use over time. This study investigates how parental relationship qualities may impact marijuana use outcomes, as well as marijuana use trajectories, in EA. This research is important because it will increase our understanding of how different parent factors impact the development of EA marijuana use and perceptions of risk. Additionally, this research will inform research and service delivery relevant to EAs and their families. Several parenting skills will be examined: (a) family cohesion, (b) parent knowledge of substance use, and (c) frequency of parent–child communication, and (d) quality of parent-child communication.

Family Cohesion, Parent Knowledge of Substance Use, and Frequency and Quality of Parent–Child Communication

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Results from multiple studies have shown how parenting factors impact a host of adolescent risk and adjustment outcomes (Conger, Ge, Elder, Lorenz, & Simons, 1994; Han & Waldfogel, 2007; Jackson & Foshee, 1998; Ramsden & Hubbard, 2002; Repetti, Taylor, & Seeman, 2002; Steinberg, 2001). Yet, few studies have been conducted on how these family factors impact the development marijuana use and perceptions of risk in EAs. First, a lack of family cohesion might serve as a risk factor in regard to EAs' engagement in problem behaviors. For instance, supportive family relationships have been shown to mitigate the risk of substance use behavior (Padilla-Walker et al., 2008). Furthermore, family cohesion, which includes closeness, warmth, togetherness, affection, and support, has been shown to contribute to higher levels of well-being in youth (Crespo, Kielpikowski, Pryor, & Jose, 2011) and lower levels of deviant behavior and substance use outcomes in adolescents (Farrell, Barnes, & Banerjee, 1995; Sánchez-Queija, Oliva, Parra, & Camacho, 2016). Additionally, Sánchez-Quejia et al., (2016) found that family cohesion decreased substance use from adolescence to EA. On the other hand, family conflict, such as the expression of anger or escalations in discord, have been shown to be associated with disruptive effects regarding the well-being and emotional health of adolescents (Mechanic & Hansell, 1989; Reinherz, Paradis, Giaconia, Stashwick, & Fitzmaurice, 2003; Roubinov & Luecken, 2013; Sheeber, Hops, Alpert, Davis, & Andrews, 1997). While much literature has documented the role of family cohesion on adolescent risk outcomes, less empirical attention has investigated the role family cohesion plays on EA marijuana use outcomes.

Along with family cohesion, parent knowledge of substance use is a factor that continues to play a role in the development of EA risk behaviors. Similar to parent

monitoring and supervision, parent knowledge refers to what parents know about their children's behaviors and activities (Crouter & Head, 2002; Kerr & Stattin, 2000). General family functioning might play a role in the promotion of parents' knowledge of their adolescent's activities (Henry, Robinson, Neal, & Huey, 2006). However, as adolescents enter EA, the relationship between the desire for autonomy and parents' continued desire to have knowledge of their children's activities can be a source of tension. Nonetheless, researchers have found that parent knowledge of behavior is uniquely associated to risk behaviors in EA, even after controlling for parental closeness (Padilla-Walker et al., 2008). There have been few studies examining the role of parent knowledge about marijuana use in EAs. Research findings suggest parents' level of knowledge about their children's behavior may be linked to overall functioning of the family context (Padilla-Walker et al., 2011). These same researchers found that positive family cohesion, such as family expressiveness and responsiveness, is indirectly related to overall parent knowledge.

In addition to family cohesion and parent knowledge of substance use, the frequency and quality of parent–child communication are protective factors of adolescent substance use (Ackard, Neumark-Sztainer, Story, & Perry, 2006; DeVore & Ginsburg, 2005; Kafka & London, 1990). Parent–child communication refers to the parents' ability to communicate with their children, which leads to information gathering and reciprocity in the relationship (Keijsers & Poulin, 2013). Evidence supports the role of parent–child communication as a predictor of healthy child development and as a protective factor for adolescent substance use (DeVore & Ginsburg, 2005; Ennett, Baumann, Foshee, Pemberton, & Hicks, 2001). Greater frequency and positive quality of general parent–

child communication, such as listening and understanding (Runcan, Constantineanu, Ielics, & Popa, 2012), have been linked to lower levels of adolescent substance use (Ackard et al., 2006; Cohen, Richardson, & LaBree, 1994; Guilamo-Ramos, Jaccard, Turrisi, & Johansson, 2005; Kafka & London, 1991; Oman et al., 2004; Stoker & Swadi, 1990) and reduced risky behaviors among EAs (Holahan, Valentiner, & Moos, 1994; Madkour et al., 2017). While much research has examined the role of parent-child communication in adolescence substance use, far less research has focused on the roles of frequency and quality of parent–child communication as predictors of EA marijuana use.

Research findings have suggested that parent knowledge is promoted through children's self-disclosure and parents' seeking out of information (Crouter, Bumpus, Davis, & McHale, 2005; Stattin & Kerr, 2000; Waizenhofer, Buchanan, & Jackson-Newsom, 2004). Additionally, family environments that promote healthy expressiveness, as well as self-regulation, also encourage parent-child communication (Padilla-Walker et al., 2011). Close, communicative parent–child relationships seem to be protective factors against heavy EA episodic drinking (Madkour et al., 2017). Taken together, this research suggests family cohesion and parent knowledge are linked with the promotion of the quality and frequency of parent–child communication (Padilla-Walker et al., 2011). However, how these parenting factors may influence EA marijuana use and perceptions of risk have not been investigated.

EA Perceptions of Risk as a Mediator Between Parental Relationship Qualities and EA Marijuana Outcomes

Even though marijuana has been linked to several social and health problems, the use of marijuana continues to be on the rise among adolescents and young adults

(Merianos, Rosen, & Montgomery, 2017). False risk perceptions, including the belief that marijuana is not associated with adverse outcomes, are salient aspects of substance use (Larsman, Eklöf & Törner, 2012) and have been associated with marijuana use (Kilmer, Hunt, Lee, & Neighbors, 2007; Piontek, Kraus, Bjarnason, Demetrovics, & Ramstedt, 2013). For example, Johnston et al. (2016) reported that individuals who perceived marijuana as riskier were not as likely to report marijuana use than those who perceived marijuana as less risky. Multiple studies have documented the inverse relationship between adolescents' perceived risk of substance use and later substance use (Bachman, Johnson, & O'Malley, 1998). Therefore, it is clear that the perceived risk that adolescents link to the use of marijuana is an important factor influencing overall marijuana use.

Perceptions of risk may act as a mediator between parental influence and marijuana use. Frequent parent-communication is linked with higher levels of perception of risk associated with binge-drinking in adolescents (Denham, 2014). Further, greater permissive parent-child communication is associated with more approving student attitudes toward marijuana use in EA (Napper et al., 2016).

Given the evidence supporting the importance of parenting behaviors during this developmental period, as well as the role of perceived risk on substance use, this study will test parental relationship quality as a predictor of later marijuana use, with low quality parent–child relationships hypothesized to predict higher use. EA perceptions of risk, as they relate to marijuana use, will mediate this relationship and, when added to the model, might account for the relationship between parental relationship quality and later use. See Figure 1 for a conceptual model of these relationships.
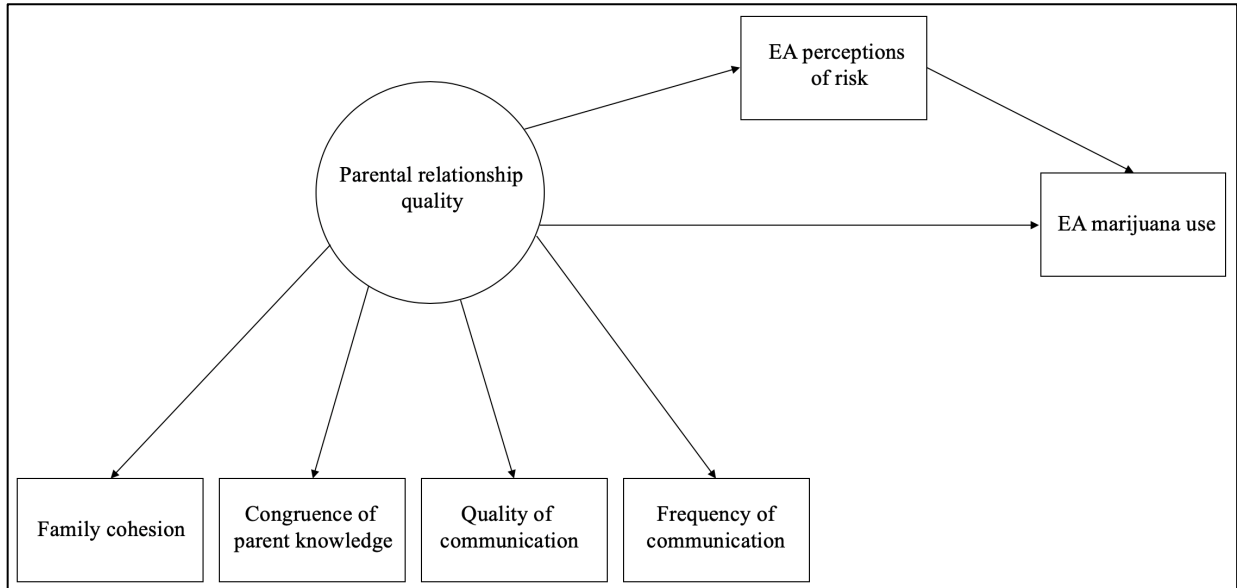
Figure 1. Mediation model between parental relationship quality, EA marijuana use, and perceptions of risk EFA path diagrams.

Research Hypotheses

The proposed study seeks to investigate how different qualities of parenting impact marijuana use and perceptions of risk in EA, these factors include: (a) family cohesion, (b) parent knowledge of substance use, (c) frequency of parent–child communication, and (d) quality of parent-child communication. This study will augment prior research by using longitudinal data with a sample comprised of a majority of EAs who are not in college (Stone et al., 2012). The majority of research that targets EAs has focused on the prevention of binge drinking, has occurred in a college or university setting, and has focused on specific subgroups of the college population, including first-year students (for meta-analyses, see Carey, Scott-Sheldon, Elliott, Garey, & Carey,

2012; Samson & Tanner-Smith, 2015). These studies have not addressed the covariation

of risk behaviors that peak during this period, and there has been a limited focus on

marijuana use. Furthermore, they target a narrow population of young adults (e.g.,

college students) and do not focus on the family as a context for risk or protection (Brody

et al., 2012; Turrisi, Jaccard, Taki, Dunnam, & Grimes, 2001). The proposed study will

draw from a diverse sample of adults and their parents to address this gap in the literature

by evaluating whether parental relationship quality predicts perceptions of risk and

marijuana use in EA. The following research aims were addressed by this study.

The first aim is to test a measurement model of parental relationship quality

during EA comprised of family cohesion, congruence in parent knowledge of marijuana

use, frequency parent–child communication, and quality of parent-child communication

(Madkour et al., 2017). The relationship between parent relationship quality and

marijuana use at age 20 will be examined cross-sectionally. I hypothesize low parental

relationship quality will be associated with higher marijuana use during the transition to

adulthood at age 20.

The second aim is to examine how parental relationship quality impacts emerging

adult marijuana use patterns over time. I predicted that higher levels of parental

relationship quality at age 20 would be associated with declining and low using

trajectories of EA marijuana use at ages 21 and 22, while lower levels of parental

relationship quality at age 20 will predict increasing or high using trajectories of

marijuana use at ages 21 and 22.

Last, the third aim is to test EA risk perception of marijuana use as a mediator

between parental relationship quality and EA marijuana use by controlling for risk

perception at age 22. I predict perceptions of risk will mediate the relationships between parental relationship quality and later use. The hypotheses for each aim are supported by research suggesting supporting the importance of parenting behaviors during this developmental period.

CHAPTER II

METHODS

Sample

The proposed study sample is comprised of EA individuals and their parents from an urban, Pacific-Northwest population participating in a larger longitudinal study (DA018374 and HD075150). This larger study centers on the quality of the parent–child relationship and risk behavior during the transition to adulthood and risk behavior after receiving a family-centered intervention. Participating youths were recruited in sixth grade from three middle schools and have been followed until age 23 ($n = 470$). Parents of all sixth-grade youths in two cohorts were approached for participation, and 80% consented to the study. Youths were then randomly assigned to control or intervention conditions.

The EA participants were ages 19–23 years ($M = 20.0$, $SD = 0.74$). Males and females represented 48.1% and 50.4% of the sample, respectively. Additionally, 1.5% of participants identified as other. The sample was culturally diverse: 32.2% European American/White, 17.0% biracial/mixed ethnicity, 16.0% African American/Black, 22.4% Hispanic/Latino, 7.1% Asian American, 3.2% Native American, and 2.1% Native Hawaiian or Other Pacific Islander. This longitudinal study has maintained a high degree of retention, with 74% of the original sample participating at age 20 ($N = 441$), 70% at age 21 ($N = 415$), and a 78% total retention for the EA years (some participants completed only the assessment at age 21). The sample continued to be an at-risk sample, with an average household income of $45,000 per year for a household of four. At age 20, 54% of young adults were living with their parents, 24% were attending a 4-year

college, and 14% did not yet have a high school degree. Daily use of marijuana was reported by 22% of EAs, and use increased at age 21 to 26%, well above the national average of 4.6% (Center for Behavioral Health Statistics and Quality, 2015); 48% reported multiple binge drinking episodes involving five or more drinks in a row.

Procedure

After recruitment during the middle school years, participants were re-contacted at age 19 and invited to participate in three subsequent waves of data collection (ages 20, 21, and 22). EAs and their caregivers completed self-report questionnaires and were asked to bring the completed documents to the office or return them via mail. Caregivers were compensated $50 and EAs were compensated $100 for completing the questionnaires because the EA questionnaire was substantially longer. Participation was completely voluntary.

Measures

The data examined in this study includes self-report measures. Multiple measures were used in this study, including demographics and question about daily family life. Measures for demographic variables include age, gender, and comorbid alcohol use. Measures for daily life include marijuana use, perceptions of risk, family cohesion, parent knowledge of substance use, frequency of parent-child communication, and quality of parent-child communication.

Factors and Covariates. Research on marijuana/health associations has identified several key covariates associated with chronic heavy or increasing marijuana use during young adulthood, including co-morbid substance use (e.g., co-occurring

tobacco and alcohol use) (Jackson, Sher, & Schulenberg, 2008, Passarotti et al., 2015,

Silins et al., 2013) and gender (Juon et al., 2011, Silins et al., 2013).

Gender. Gender was coded categorically, where 1 = male, 5 = other, and 8 =

female. Gender was dummy coded for the multiple linear regression analysis.

Comorbid alcohol use. Alcohol consumption in the past three months was

assessed through the following self-report questions adapted from the Teen Interview

(CINT; Child & Family Center, 2001b): (a) "When you drank beer in the last 3 months,

how much did you usually drink?" (b) "When you drank wine in the last 3 months, how

much did you usually drink?" (c) "When you drank hard liquor in the last 3 months, how

much did you usually drink?" Possible responses were 0 = less than one, 1 = one drink, 2

= 2 drinks, 3 = 3 drinks, 4 = 4-5 drinks, 5 = If six drinks or more, how many? These three

measures were combined to create a composite variable of comorbid alcohol use.

Marijuana use. Measures of marijuana use in the past three months was completed

by EAs at ages 20, 21, and 22 (Teen Interview, CINT; Child and Family Center, 2001).

This measure was specifically assessed through the following self-report question on the

CINT: "How often did you use marijuana in the last 3 months?" Possible responses were

0 = never, 1 = once or twice, 2 = once a month, 3 = once every 2–3 weeks, 4 = once a

week, 5 = 2–3 times a week, 6 = 4–6 times a week, 7 = once a day, 8 = 2–3 times a day or

more. Marijuana frequency will represent the outcome variable for this study.

Family cohesion. A measure of family cohesion was completed by parents at ages

20, 21, and 22 (Child and Family Center, 2001a, 2001b; Wave 6, α = .845 (parent),

Wave 7, α = .850 (parent), Wave 8, α = .857 (parent). This construct was specifically

assessed through the following self-report questions: Over the last 3 months, how often

were the following statements true? (a) There was a feeling of closeness in our family. (b) We spent time together as a family. (c) Family members backed each other up. (d) Things our family did were fun and interesting. Possible responses were 0 = never, 1 = sometimes, 2 = about half the time, 3 = often, 4 = always. All measures were combined to create a composite variable of family cohesion.

Congruence in parent knowledge of marijuana use and EA marijuana use.

Several studies have measured parent knowledge by asking parents and adolescents how much the parents know with only small correlations between reports (Pettit et al., 2001; Stattin & Kerr, 2000). These results indicate parents and children may be innaccurate regarding their perception of the extent of parents' knowledge about their activities (Padilla-Walker et al., 2008). Thus, in the current study, a measure of parent knowledge of substance use was completed by parents at EA ages 20, 21, and 22 to capture more dimensions of parent knowledge (i.e., underestimation, overestimation). This construct was specifically assessed through self-report questions for each parent that were adapted from the CFC Youth Questionnaire (Child and Family Center, 2001b): How often has your son/daughter used marijuana in the last 3 months? Possible responses were 0 = absolutely no idea, 1 = never, 2 = occasionally, 3 = somewhat regularly. A measure of EA marijuana use was completed by EAs at ages 20, 21, and 22. This construct was specifically assessed through self-report questions for each child that were adapted from the CFC Youth Questionnaire (Child and Family Center, 2001a): How often did you use marijuana in the last 3 months? Possible responses were 0 = once or twice, 1 = once a month, 2 = once every 2-3 weeks, 3 = once a week, 4 = 2-3 times a day a week, and 5 = once a day, 6 = 2-3 times a day or more, 6 = never. To create a variable

called congruence, the following variables were collapsed: once a month and once every 2-3 weeks; once a week and 2-3 times a day a week; once a day and 2-3 times a day (or more). Then, the variables from each question were matched and subtracted from each other. The closer the outcome was to 0, the more congruent the responses were considered (see Figure 2). A positive value indicates the parent is underestimating their EAs marijuana use, while a negative value indicates the parent is overestimating their EAs marijuana use.
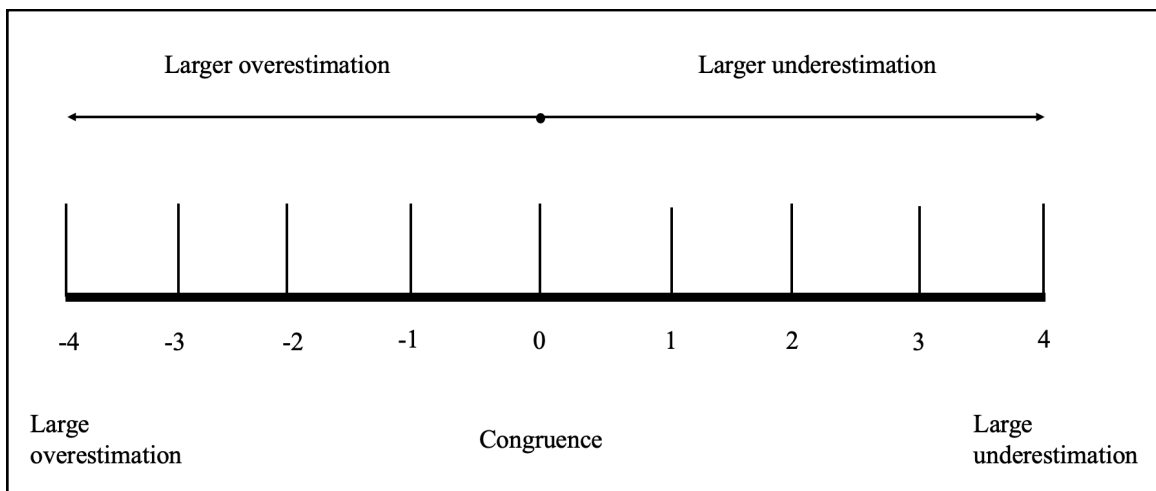
Figure 2. Illustration of overestimation, congruence, and underestimation for parent knowledge of EA marijuana use. (Scores from 0 to 4 indicate greater levels of underestimation).

Frequency of parent-child communication. A measure of parent-child communication was completed by parents at EA ages 20, 21, and 22 (Wave 6, $\alpha = .611$, Wave 7, $\alpha = .605$, Wave 8, $\alpha = .629$). This construct was specifically assessed through self-report questions for each parent that were adapted from the CFC Youth

Questionnaire (Child and Family Center, 2001b) through the following self-report questions: In the past 3 months, how often have you (a) Had in person contact with your son/daughter? (b) Talked on the phone with him/her? (c) Sent email or letters to him/he? (d) Received emails or letters from him/her? (e) text, Skyped, or communicated through social media? Possible responses were 0 = never, 1 = less than once a month, 2 = once or twice a month, 3 = 3-4 times a month, 2-3 time a week, 4 = more than 3 times a week, 5 = daily or almost daily. all measures were combined to create a composite variable of frequency of parent-child communication.

Quality of parent-child communication. A measure of quality of parent-child communication was completed by parents at EA ages 20, 21, and 22 (Wave 6, $\propto$ = 827, Wave 7, $\propto$ = .813, Wave 8, $\propto$ = .798). This construct was specifically assessed through self-report questions for each parent that were adapted from the CFC Youth Questionnaire (Child and Family Center, 2001b) through the following self-report questions: In the past 3 months, how often did the following things happen between you and your son/daughter- (a) We enjoyed spending time together (over the phone, email, telephone, Skype, Social Media, or in person. (b) I got along with my son/daughter. (c) I trusted his/her judgment. (d) I talked with my son/daughter about his/her activities and plans. (e) We visited, did an activity, or took a trip together. (f) We had a good conversation about something. Possible responses were 0 = Never, 1 = Sometimes, 2 = About half the time, 3 = Often, and 4 = Always. All measures were combined to create a composite variable of quality of parent-child communication.

EA Perceptions of risk. Measures for perceptions of risk in marijuana use that were adapted from an earlier instrument. This instrument was used to evaluate youth problem

behaviors was completed by EAs at age 22 (CTC; Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Wave 8, α = .891). This construct was specifically assessed through the following self-report questions: (a) How much do you think people risk harming themselves physically, if they use marijuana or cannabis occasionally or regularly? and (b) How much do you think people risk harming themselves psychologically-emotionally (e.g., mood, sense of well-being) or cognitively (memory, attention), if they use marijuana or cannabis occasionally or regularly?" Possible responses were 0 = no risk, 1 = slight risk, 2 = moderate risk, 3 = great risk, 4 = don't know. The value of 4 was recoded as a 0. A Pearson's correlation analysis was used to determine the association between the measures. All four measures were significantly associated at the .01 level; thus, all four measures were combined to create a composite variable of EA perceptions of risk of marijuana use.

Analytic Plan

The overarching goal of the study is to examine parental influences on marijuana use and perceptions of risk in EA. To examine these influences, this study will test three aims. Preliminary data analysis was conducted using SPSS version 25.0 for Mac (IBM Corp, 2017). Variables were screened for violation of statistical assumptions in both the raw and imputed data (e.g., normality, skewness, kurtosis). Little's Missing Completely at Random (MCAR) test was utilized to assess whether data were missing completely at random or if systematic patterns existed. All data were screened for patterns of missing data; the results from this analysis are reported below. Cook's distance (D) was used to screen for influential data points. No value was found to be greater than 1. Tolerance statistics were used to assess for potential multicollinearity. There were no issues with

multicollinearity as no tolerance value was beneath 0.20. To minimize Type I error, alpha was set at .05. Given the sample size, there is sufficient power to detect significant effects. Means, standard deviations, skew and kurtosis index and reliability of each scale were calculated; tenability of assumptions was examined.

Aim 1. The first aim of the proposed study was to test a measurement model of parental relationship quality during emerging adulthood. This test was comprised of factors identified as family cohesion, congruence in parent knowledge of marijuana use, frequency of parent–child communication, and quality of parent-child communication. Confirmatory Factor Analysis (CFA) was used to test the fit of the parental relationship quality construct based on the four indicants of family cohesion, parent knowledge of substance use, frequency of parent–child communication, and quality of parent-child communication using maximum likelihood estimation (MLE) procedures. Fit of the model was evaluated with the comparative-fit index (CFI; Bentler, 1990; acceptable fit $\geq$ .95), Tucker-Lewis index (TLI; Hu & Bentler, 1999; acceptable fit $\geq$ .95), root mean square error of approximatin (RMSEA; Browne & Cudeck, 1993; acceptable fit $\leq$ .06), and the weighted root mean square residual (WRMR; Yu, 2002; acceptable fit $\leq$ 1.0).

If the CFA model yielded a poor fit for the relationship quality latent construct, the four indicants would be treated as independent predictors in subsequent analyses. The second component of Aim 1 was to examine, using two regression analyses, the relationship between parent relationship quality, related covariates, and marijuana use in EAs at age 20. A multiple linear regression analysis was used to examine how parental relationship qualities are associated with EA marijuana use outcomes. Next, a binary logistic regression was used to further examine how parental relationship qualities

uniquely predicted membership in a cross-sectional distribution of EA marijuana use (i.e., low users versus high users). Through examining these qualities cross-sectionally, it will be possible to make inferences about possible relationships between the aforementioned parent qualities. Prior to running the regression analyses in SPSS using SPSS version 25.0 for Mac (IBM Corp, 2017), all values for EA marijuana use at Wave 6 and EA gender were recoded due to regression imputation methods. For EA marijuana use at Waves 6, 7, and 8, these values were re-coded in the following manner: -37 = 99; 1.00 to 1.99 = 1; 2.00 to 2.99 = 2; 3.00 to 3.99 = 3; 4.00 to 4.99 = 4; 5.00 to 5.99 = 5; 6.00 to 6.99 = 6; and 7.00 to 13 = 7. For EA gender at Waves 6, 7, and 8, these values were re-coded in the following manner: -4 to 2.99 = 1; 4.00 to 6.99 = 5; and 7.00 to 13 = 8.

Aim 2. The second aim of the proposed study was to examine how four parental relationship qualities (e.g., family cohesion, congruence in parent knowledge of marijuana use, frequency of parent-child communication, and quality of parent-child communication) predicted membership in distinct longitudinal EA marijuana use patterns. Data were analyzed using a Latent Class Growth Analysis (LCGA) using the SAS-based procedure, PROC TRAJ (Jones et al., 2001), to create marijuana use profiles from ages 20 to 22 using data in the sample. Trajectory models were specified using a zero-inflated Poisson model (ZIP model), which allows for the modeling of non-negative count measures of marijuana use. Models containing one- to six- groups were evaluated using the Bayesian information criterion and model adequacy diagnostics to verify the best fitting model (Nagin, 2005). As described in greater detail below, the final selected model contained 4 groups (low to non-users, moderate-decreasers, low-increasers, and high users.

Because prior research has shown that marijuana use varies by gender (Nelson, Van Ryzin, & Dishion, 2015) and alcohol use (Jackson et al., 2008), "risk factor analysis" within the Proc Traj macro was used to examine how group membership varied by gender and alcohol use. When investigating predictors of group membership, group-based modeling provides the log odds of the effect of each predictor on the probability of membership in each trajectory group in comparison to a baseline or comparison group (see Nagin, 2005). For the purposes of this study, group 1 (i.e., the "low to no use" group) was specified as the comparison group, to compare how higher marijuana use patterns were distinguished from low to no users. Next, four risk factor analyses were used to examine how marijuana group membership varied by four parenting predictors: family cohesion, congruence in parent knowledge of marijuana use, frequency of parent-child communication, and quality of parent-child communication. To characterize the unique impact of each parenting variable, these models were run in this analysis with only one predictor at a time.

Aim 3. The third aim of the proposed study was to test EA risk perception of marijuana use as a mediator between parental relationship quality and EA marijuana use at age 22.5. Given the mediator and outcome were assessed at the same time point, a quasilongitudinal, mediation analysis was used to test whether risk perceptions mediated the relationship between parental relationship quality and EA marijuana use. This analysis tested whether change in the mediating mechanisms of EA perceptions of risk mediated the association between parental relationship quality and EA marijuana use. Such mediating effects were tested using the strategies outlined by Mackinnon (2008) and Preacher and Hayes (2008) through evaluation of the joint significance of the indirect

effect using the bias-corrected bootstrap test (Fritz & MacKinnon, 2007). To perform the

bootstrap analysis, SPSS AMOS 25 (IBM, 2017) was used to examine bootstrapped

percentile and bias-corrected confidence intervals for indirect effects.

Power Analyses In regard to SEM power analyses, there are two relevant and

necessary considerations regarding sample size. First, the number of cases per parameter

estimate needs to be sufficient (Bentler, 1987; Tanaka, 1987). Bentler (1990) has

suggested the rough guideline of 5 cases to 1 parameter. Assuming this guideline, I have

sufficient sample size to estimate 469 cases / 5 parameters = 93 cases per parameter. This

far exceeds the guidelines set forth by Bentler. Second, statistical power needs to be

sufficient for assessing overall model fit. This issue is complex as overall model fit is

based on the null hypothesis and model fit is impacted inversely by sample size (Kaplan,

1995). Hancock and Freeman (2001) offered power estimates based on the Root Mean

Square of Approximation (RMSEA) and on "not close fit" as the null hypothesis

(MacCallum et al., 1996). According to the tables provided by Hancock and Freeman

(2001), with a sample size of 469, we have sufficient power (> .80) for the test of "not

close fit," RMSEA = .02, df = 40, α = .05. With regards to the regression analyses for

Aim 2, with a sample size of 469 participants, two-tailed α = .05, there is sufficient power

(> .80) to detect a moderately small effect size (Cohen's w = .16). Regarding the

mediation analysis for Aim 3 involving the bias-corrected bootstrap test for the joint test

of indirect paths α × β, with n = 469, we have sufficient power (> .80) to detect

coefficients of .20 (moderately small effects) for α and β paths (Fritz & MacKinnon,

2007).

Missing Data

The main missing data problem in any longitudinal study is related to attrition (Cumming & Goldstein, 2016). This study used the regression methods of missing data imputation to handle missing data. Using complete cases, multiple regression is used to predict missing values (Enders, 2010). Little's MCAR was run on a panel sample to test if the data is missing at random and the test converged. Little's MCAR indicated the data are not missing at random with a p-value greater than .05.

In sum, the method of this study centers on the use of a sample comprised of EA individuals and their parents from an urban, Pacific-Northwest population participating in a larger longitudinal study. All data for this study were collected using self-reported measures. The first aim of the proposed study is to test a measurement model of parental relationship quality during EA. The second aim of the proposed study is to examine how parental relationship quality impacts EA marijuana use patterns over time. The third aim of the proposed study is to test EA risk perception of marijuana use as a mediator between four parenting predictors and EA marijuana use by controlling for risk perception at age 22.

CHAPTER III

RESULTS

Preliminary Analyses

Descriptive statistics. Missing data analyses were conducted using Little's missing completely at random (MCAR) test. Little's MCAR test was significant (X^2 [129] = 258.94, p < .001) indicating missing items were not missing completely at random. Non-response items were assessed for both raw and imputed data.

Raw data. Examination of skewness and kurtosis statistics (using a cutoff value of +/-1.00), in addition to visual inspection of histograms, suggested that most distributions for several study variables approximated normal in the raw data. All values for kurtosis and skewness ranged from -1 and +1, except the kurtosis for parent knowledge of substance use at wave 8 was above the threshold (2.20). Across waves 6, 7, and 8, more participants identified as females than males. Across waves 6, 7, and 8, the modal response of participants were "never used marijuana." In contrast, the. median response of participants was "use marijuana once or twice." Of the item response (*n* = 470) for marijuana use, non-response ranged from 160-178 across the three waves. The average participant age across waves 6, 7, and 8 were 20, 21.5, 22.9 with standard deviations of 8.83, 8.35, 8.37. Of the item response (*n* = 470) for participant age, non-response ranged from 55-110 across the three waves. The average participant score of comorbid alcohol use for each emerging adult across waves 6, 7, and 8 were 4.46, 5.50, and 5.91 with standard deviations of 4.15, 4.15, and 4.17. Of the item response (*n* = 470) for comorbid alcohol use, non-response ranged from 112-135 across the three waves. The average participant score of family cohesion for parents across waves 6, 7, and 8 were 10.64,

10.53, and 10.51 with standard deviations of 3.77, 3.84, and 3.92. Of the item response (*n* = 470) for family cohesion, non-response ranged from 151-249 across the three waves. The average participant score of frequency of parent-child communication for parents across waves 6, 7, and 8 were 15.77, 15.00, and 14.48 with standard deviations of 5.65, 5.93, and 5.69. Of the item response (*n* = 470) for frequency of parent-child communication, non-response ranged from 154-250 across the three waves. The average participant score of quality of parent-child communication for parents across waves 6, 7, and 8 were 16.12, 16.41, and 16.34 with standard deviations of 4.66, 4.49, and 4.40. All values for kurtosis and skewness ranged from -1 and +1. Of the item response (*n* = 470) for quality of parent-child communication, non-response ranged from 151-248 across the three waves. The average participant score of parent knowledge of substance use for parents across waves 6, 7, and 8 were, 0.51, and 0.49, and 0.36 with standard deviations of 1.17, 1.37, and 1.17. Of the item response (*n* = 470) for parent knowledge of substance use, non-response ranged from 252-313 across the three waves.

Imputed data. All values for kurtosis and skewness ranged from -1 and +1; however the kurtosis for some variables were above the threshold: age at wave 6 (1.23), comorbid alcohol use at wave 7 (1.11), Across waves 6, 7, and 8, more participants identified as females than males in the imputed data. Across waves 6, 7, and 8, more participants identified as never using marijuana. In the imputed data, the average participant age across waves 6, 7, and 8 were 20, 21.5, 22.5 with standard deviations of 9.44, 8.78, 8.63. The average participant score of comorbid alcohol use for each emerging adult across waves 6, 7, and 8 were 4.26, 5.39, and 5.76 with standard deviations of 4.35, 4.40, and 4.50.

The average participant score of frequency of parent-child communication for parents across waves 6, 7, and 8 were 10.62, 10.45, and 10.45 with standard deviations of 4.05, 3.74, and 3.91. The average participant score of frequency of parent-child communication for parents across waves 6, 7, and 8 were 15.63, 11.09, and 14.40 with standard deviations of 5.90, 5.42, and 5.84. The average participant score of quality of parent-child communication for parents across waves 6, 7, and 8 were 16.28, 16.46, and 16.19 with standard deviations of 4.63, 4.67, and 4.28. The average participant score of parent knowledge of marijuana use across waves 6, 7, and 8 were, 0.69, and 0.60, and 0.67 with standard deviations of 1.53, 1.66, and 1.82.

Creation of Congruence Variable

A variable for parent knowledge of substance use called congruence was created. As mentioned earlier, the closer the outcome was to 0, the more congruent the responses were considered. A positive value indicates the parent is underestimating their EAs marijuana use, while a negative value indicates the parent is overestimating their EAs marijuana use. Table 1 demonstrates the distribution for categorization of congruence across Waves 6, 7, and 8.

Table 1

Distribution for Categorization of Congruence across Wave 6, Wave 7, and Wave 8

Categorization of congruence	Wave 6	Wave 7	Wave 8	Avg. Frequency (%)
Large overestimation	10	18	24	17.3 (3.68)
Near congruence overestimation	67	79	78	74.7 (15.89)
Congruence	173	166	151	163.3 (34.75)
Near congruence underestimation	148	130	126	134.7 (28.66)
Large underestimation	72	77	91	80.0 (17.02)
Total	470	470	470	470 (100.00)

Aim 1. The first aim of the proposed study was to test a measurement model of parental relationship quality during EA comprised of family cohesion, parent knowledge of substance use, frequency of parent–child communication, and quality of parent-child communication. Confirmatory Factor Analysis (CFA) was used to test the fit of the parental relationship quality construct based on the four constructs of family cohesion, parent knowledge of substance use, frequency of parent–child communication, and quality of parent-child communication, using MLE procedures. Given that parent knowledge of substance use was comprised of both parent and youth report, this measure was not included in the CFA analyses. Thus, Aim 1 tested a model comprised of family cohesion, frequency of parent–child communication, and quality of parent-child communication, using SPSS AMOS 23 (IBM, 2018). The model was fully saturated;

thus, there were no degrees of freedom for the fit statistics. To obtain 1 degree of freedom and then fit indices, I fit the residual variances to approximately its estimate. In this case, TD1 was constrained to be 7.4. Given the *p*-value for chi-square (102.31) was less than .01, chi-square results are significant (*p* < .01*)*. Therefore, there was evidence of discrepancies between variance-covariance matrices. Additionally, for the model, CFI = .45 (<.95), TLI = -.64 (<.95), RMSEA = .47 (>.05), and WRMR = 2.95 (>1.0). Thus, the model did not appear to fit well. Standardized regression weights in the .50 range indicate a weak measurement. Frequency of parent-child communication (.89) had an acceptable standardized regression weight, while family cohesion (.37) and quality of parent-child communication (.34) were both lower.

Given that the CFA model yielded a poor fit for the relationship quality latent construct, the initial four constructs were treated as independent predictors in subsequent analyses. The relationship between four independent predictors (e.g., family cohesion, congruence in parent knowledge of marijuana use, frequency of parent-child communication, and quality of parent-child communication) and marijuana use were examined at age 20. A multiple linear regression analysis was calculated to test if parenting predictors (e.g., family cohesion, congruence in parent knowledge of marijuana use, frequency of parent-child communication, and quality of parent-child communication) were significantly associated with marijuana use outcomes. Gender and comorbid alcohol use were included in the model as covariates. It was hypothesized that higher levels of family cohesion, the measure of congruence in parent knowledge of marijuana use, frequency of parent-child communication, and quality of parent-child

communication would be associated with lower levels of marijuana use during the transition to adulthood at age 20.

    After controlling for the covariates of gender and comorbid alcohol use, the results of the regression indicated the model explained 48.3% of the variance ($R^2 = .483$, $F(6, 462) = 71.80$, $p < .001$). The measure of congruence in parent knowledge of marijuana use and quality of parent-child communication were significantly associated with EA marijuana use outcomes (see Table 2 for standardized betas, t-values, and significance values). Specifically, the measure of congruence in parent knowledge of marijuana use had a significant positive regression coefficent, indicating participants with higher scores on this measure were expected to have higher EA marijuana use outcomes. Additionally, quality of parent-child communication had a significant negative regression weight, indicating participants with lower scores of quality of parent-child communication were expected to have higher EA marijuana use outcomes. The measures of family cohesion and frequency of parent-child communication did not contribute to the multiple regression model.

Table 2

Results from Multiple Linear Regression Model Using Four Variables to Predict Emerging Adult Marijuana Use Controlling for Comorbid Alcohol Use and Gender

Variable	*β*	*t*	*p*
Family cohesion	-0.03	-0.81	.42
Congruence in parent knowledge of marijuana use	0.67	20.10	<.001
Frequency of parent-child communication	-0.05	-1.39	.17
Quality of parent-child communication	-0.09	-2.38	.02
Comorbid alcohol use	0.03	0.97	.34
Gender	-0.04	-0.04	.23

Note. Standardized betas included in the results.

A binary logistic regression was used to examine how the aforementioned parental relationship qualities predicted membership in the distribution of EA marijuana use outcomes at wave 6 (i.e., low users vs. high users). For EA marijuana use at wave 6, the variable was dichotomized and values were re-coded in the following manner: "never", once or twice", "once a month", "once every 2-3 weeks", "once a week" = 0 "low users"; and "2-3 times a week," "once a day," and "2-3 times a day" = 1 "high users". After controlling for covariates, the model indicated that males are more likely to be high users. The model further indicated that higher levels of congruence in parent knowledge of marijuana use and lower levels of the quality of parent-child communication significantly predict membership in the high use group (χ^2 = 174.558, *df*

= 7, $p < .001$). The other two predictors (e.g., family cohesion and frequency of parent-child communication) and covariate (e.g., comorbid alcohol use) were not significant. The results further indicated the parenting predictors explained 45.8% of the variability of EA marijuana use outcomes. See Table 3 for the odds ratios (ORs) and confidence intervals for each predictor. The model correctly predicted 92.3% of cases where there was low EA marijuana use and 53.8% of cases where there was high marijuana use, giving an overall percentage correct prediction rate of 82.5%.

Table 3

Results from Binary Logistic Regression Model Using Four Variables to Predict Low Use or High Use Marijuana Outcomes Controlling for Comorbid Alcohol Use and Gender

	β	SE β	*Wald* χ^2	*p*	*OR*	*95% CI*
Family cohesion	<0.001	0.04	<0.001	0.98	1.00	0.93, 1.08
Congruence in parent knowledge of marijuana use	1.11	0.12	93.73	<0.001	3.04	2.43, 3.80
Frequency of parent-child communication	-0.01	0.02	0.27	.601	0.99	0.94, 1.04
Quality of parent-child communication	-0.10	0.03	8.15	<.01	0.91	0.85, 0.97
Comorbid alcohol use	0.04	0.03	1.68	.20	1.04	0.98, 1.11
Gender	0.80	0.28	8.39	<.01	2.23	1.30, 3.83

Note. OR = Odds ratio.

Aim 2. The second aim of the proposed study was to examine how four parenting

predictors (e.g., family cohesion, congruence in parent knowledge of marijuana use,

frequency of parent-child communication, and quality of parent-child communication)

predicted membership in distinct longitudinal EA marijuana use patterns. I predicted that

lower levels of parental relationship qualities would predict membership in high use and

escalating trajectories, while higher levels of parental relationship qualities would predict

membership in low use and de-escalating trajectories of marijuana use (Brook et al.,

2011; Passarotti et al., 2015). First, profiles of marijuana use from ages 20 to 22 (e.g.,

high use, increasing use, declining use, and low use) were created using Latent Class

Growth Analyses (LCGA; Jones & Nagin, 2007, Nagin & Tremblay, 2001). Next, four

risk factor analyses were used to examine the log odds ratio of the influence of each

parenting predictor (i.e., family cohesion, measure of congruence in parent knowledge of

marijuana use, quality of parent-child communication, frequency of parent-child

communication) on the probability of group membership relative to the low to no users.

Marijuana use trajectories.

The best-fitting trajectory model included 4 trajectories of marijuana use. Table 4

shows the BIC and model comparison statistics for determining the optimal number of

groups. Table 5 provides a summary of the group-based trajectory analysis conducted on

EA marijuana use. Model diagnostics suggested a well-fitting model (see Table 6),

relative to a 3 trajectory or 5 trajectory model. Visual examination of the trajectories

indicated that each of the four trajectories was indicative of a different marijuana use

pattern. These 4 trajectories, plotted in Figure 3, include low to non-users (35.3%),

moderate-decreasers (15.5%), low-increasers (14.3%), and high users (34.9%).

Table 4

Bayesian Information Criterion (BIC) and Model Comparison Statistics for Determining Optimal Number of Groups

Number of Groups	BIC($n = 469$)	Null Model	2 (Δ BIC)
2	-2888.38		
3	-2814.97	2	73.41
4	**-2766.71**	**3**	**48.26**
5	-2718.84	4	47.97
6	-2715.74	5	3

Note. A four-group solution was the best fit for EA marijuana use over three time points.

Table 5

Summary of Group-Based Trajectory Analysis on EA Marijuana Use

Group	Intercept *B* (*SE*)	Linear *B* (*SE*)	Quadratic *B* (*SE*)
1	-0.921 (0.116)***		
2	-0.947 (0.143)***	1.024 (0.254)**	-0.874 (0.177)***
3	0.318 (0.271)	-2.420 (1.530)	1.486 (0.720)*
4	1.541 (0.040)***	0.088 (0.028)**	

Note. Significant linear and quadratic parameters reflect change in EA marijuana use from Wave 6.

***$p < .001$.

** $p < .01$.

* $p < .05$.

Table 6

Diagnostics of Group-based Model Adequacy

Trajectory	AvePP$_j$	OCC$_j$	Prob$_j$	Prop$_j$	[% Dif.]
4 (high users)	0.956[a]	40.53[a]	0.349	0.345	1[b]
3 (low-increasers)	0.868[a]	36.40[a]	0.153	0.141	8
2 (moderate-decreasers)	0.823[a]	26.35[a]	0.15	0.149	1[b]
1 (low to non-users)	0.905[a]	17.85[a]	0.349	0.365	5

Note. Probabilities and proportions are presented to three decimal places.

[a] Meets or exceeds criteria presented in Nagin (2005) as evidence for a well-fitting model.

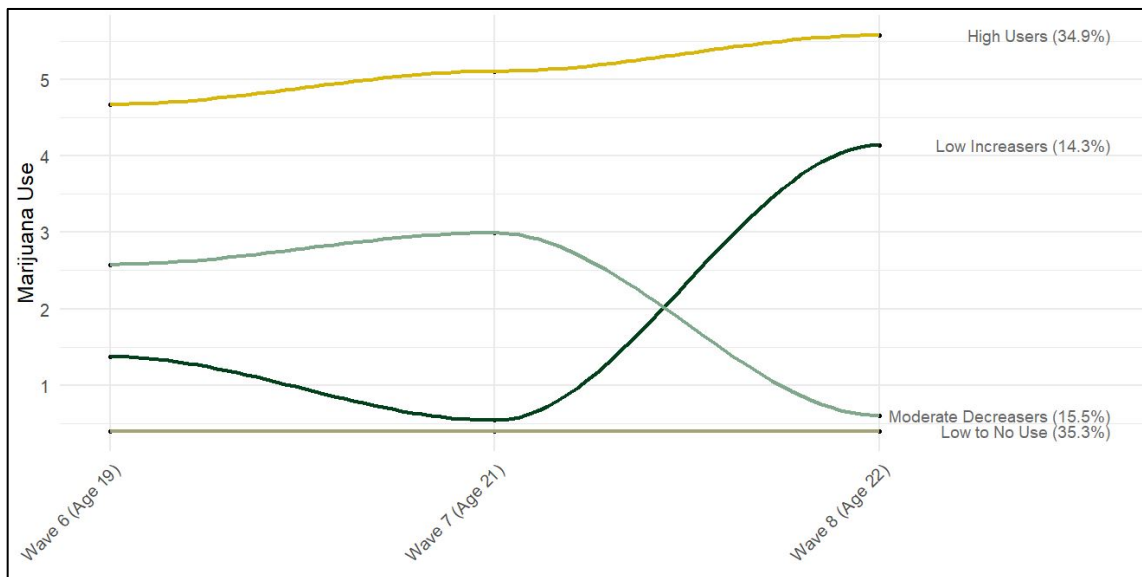[b] Groups did not exceed a minimum threshold of 5 for the odds of correct classification

Figure 3. 4 trajectories of marijuana use over waves 6, 7, and 8.

Characteristics of marijuana use trajectory groups by covariates.

Membership in marijuana groups varied by gender (see Table 7). Being male predicted membership in the moderate-decreasing, low-increasing, and high-using marijuana use trajectories in comparison to non-users. Thus, being male relative to female increased overall risk for being in a higher risk marijuana group relative to the low to no-use group. Comorbid alcohol use did not predict membership in the marijuana use trajectories, which may be likely given alcohol use was overall high.

Table 7

Predictors of Trajectory Membership for Covariates at Wave 6

	Gender	Comorbid Alcohol Use
	β (SE)	*β (SE)*
Group 1		
Group 2	-0.110(0.054)*	0.023(0.040)
Group 3	-0.116(0.050)*	-0.024(0.042)
Group 4	-0.165(0.035)*	0.013(0.028)

Note. *p* < .05. Covariates were run in the same model.

Characteristics of marijuana use trajectory groups by parenting qualities.

Membership in marijuana groups varied by levels of parental relationship qualities (see Table 8) at Wave 6. To identify the unique risk of each parental relationship quality, parenting predictors were examined independently in four different models. First, in model 1, lower levels of family cohesion predicted membership in the moderate-

decreasing and high-using marijuana use trajectories in comparison to the low to non-users. Next, in model 2, lower levels of frequency of parent-child communication predicted membership in the high using trajectory in comparison to the low to non-users. In model 3, higher levels of scores on congruence in parent knowledge of marijuana use predicted membership in the moderate-decreasing and high-using marijuana use trajectories in comparison to the low to non-users. Also, in model 3, lower levels of scores on congruence in parent knowledge of marijuana use predicted membership in the low-increasing trajectory group in comparison to the low to non-users. Finally, in model 4, lower levels of quality of parent-child communication predicted membership in the moderate-decreasing and high-using marijuana use trajectories in comparison to the low to non-users.

Table 8

Predictors of Trajectory Membership for Parenting Predictors at Wave 6

	Family Cohesion Model 1	Frequency Model 2	Congruence Model 3	Quality Model 4
	β (SE)	β (SE)	β (SE)	β (SE)
Group 1				-0.080(0.040)*
Group 2	-0.091 (0.040)*	-0.035(0.031)	1.993(0.462)*	
Group 3	0.043(0.044)*	0.031(0.029)	·0.499(0.210)*	0.052(0.038)
Group 4	-0.061(0.029)*	0.020(0.020)*	2.004(0.421)*	-0.079(0.027)*

Note. p < .05. Parenting predictors were run in separate models.

Aim 3. The third aim of the proposed study was to test EA risk perception of marijuana use as a mediator between four independent parenting predictors and EA marijuana use at age 22.0. Given the mediator and outcome were assessed at the same time point (e.g., wave 8), I used a quasilongitudinal, mediation analysis to test whether risk perceptions mediated the relationship between parental relationship quality and EA marijuana use. To investigate whether EA perceptions of risk mediates the relation between four parental relationship qualities of marijuana use and EA marijuana use, a path model was tested at waves 6, 7, and 8, using SPSS AMOS 23 (IBM, 2018). Each model controlled for gender and comorbid alcohol use at wave 8.

At wave 6, results indicated the measure of congruence in parent knowledge of marijuana use significantly predicted EA perceptions of risk at wave 8 (β = -0.11, SE = 0.05, p < .05), and EA perceptions of risk significantly predicted EA marijuana use at wave 8 (β = -0.17, SE = 0.04, p < .001). The indirect effect, tested using bootstrapped standard errors, was also significant (β = 0.27, 95% CI[.181, .358], p < .001) (see Figure 4). Additionally, comorbid alcohol use significantly predicted EA perceptions of risk (β = -0.11, SE = 0.05, p < .05) and EA marijuana use (β = 0.12, SE = 0.04, p < .05). Gender significantly predicted marijuana use (β = -0.14, SE = 0.04, p < .01).

Figure 4. Mediation model between parenting predictors at wave 6 and EA marijuana use and EA perceptions of risk at wave 8.

At wave 7, results indicated congruence in parent knowledge of marijuana use also significantly predicted EA perceptions of risk (β = -0.12, SE = 0.04, p < .01), and EA perceptions of risk significantly predicted EA marijuana use (β = -0.16, SE = 0.04, p < .01). The indirect effect, tested using bootstrapped standard errors, was also significant (β = 0.29, 95% CI[.201, .366], p < .05) (see Figure 5). Comorbid alcohol use significantly predicted EA perceptions of risk (β = -0.13, SE = 0.05, p < .01) and EA marijuana use (β = 0.11, SE = 0.04, p < .05). Gender significantly predicted marijuana use (β = -0.13, SE = 0.04, p < .01).
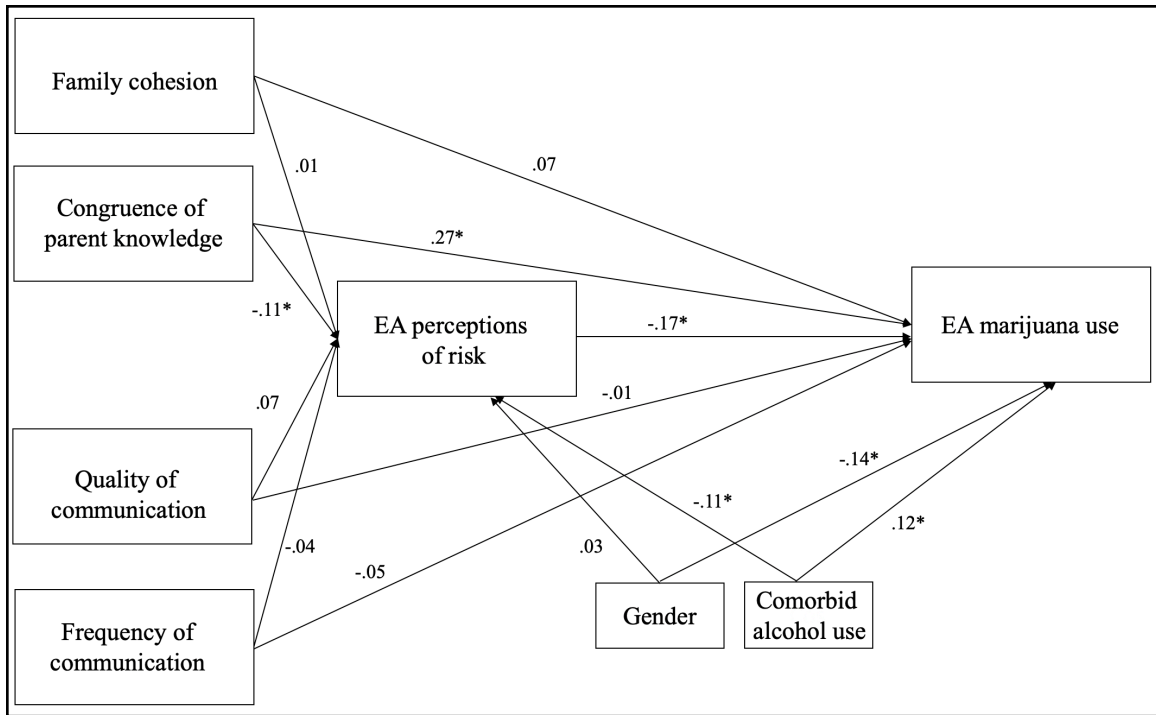
Figure 5. Mediation model between parenting predictors at wave 7 and EA marijuana use and EA perceptions of risk at wave 8.

Lastly, at wave 8, results indicated congruence in parent knowledge of marijuana use did not significantly predict EA perceptions of risk (β = -0.09, SE = 0.05, $p < .01$), and EA perceptions of risk significantly predicted EA marijuana use (β = 0.03, SE = -0.14, $p < .01$). The indirect effect, tested using bootstrapped standard errors, was also significant (β = 0.64, 95% CI[.594, .692], $p < .01$) (see Figure 6). Thus, EA perceptions of risk partially mediated the relationship between congruence in parent knowledge of marijuana use and EA marijuana use outcomes at wave 8. Comorbid alcohol use significantly predicted EA perceptions of risk (β = -0.13, SE = 0.05, $p < .01$) and EA marijuana use (β = 0.09, SE = 0.03, $p < .05$). Overall, the hypothesized mediational model was not supported at wave 8.
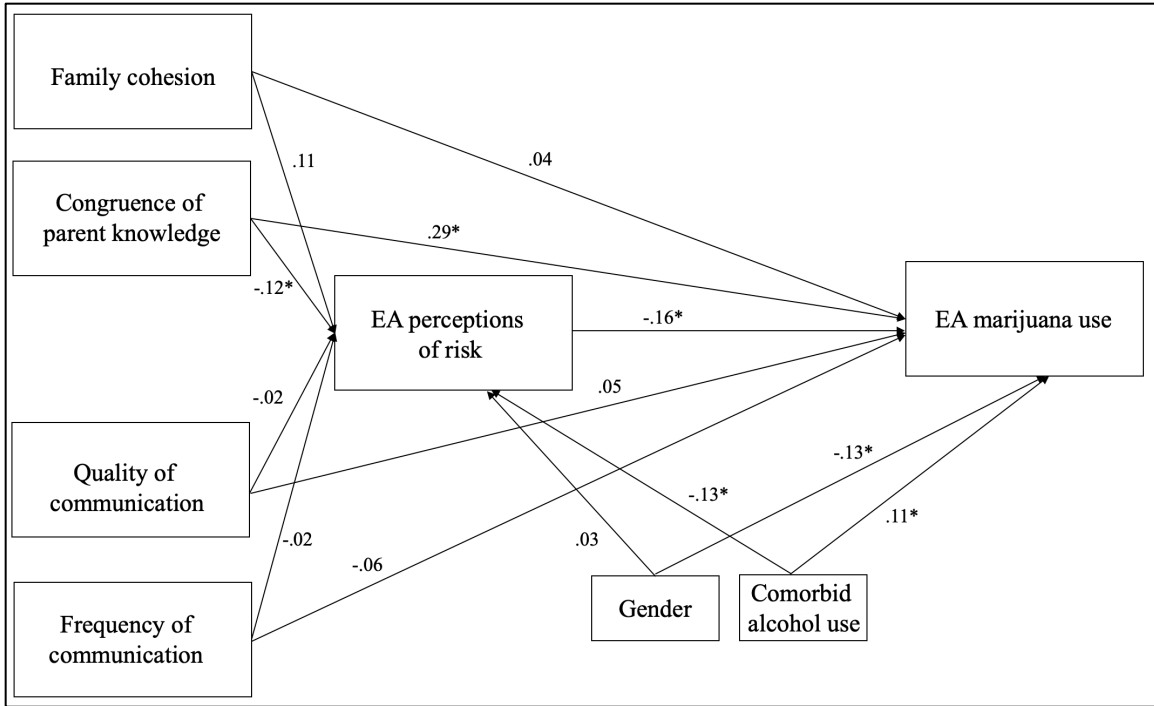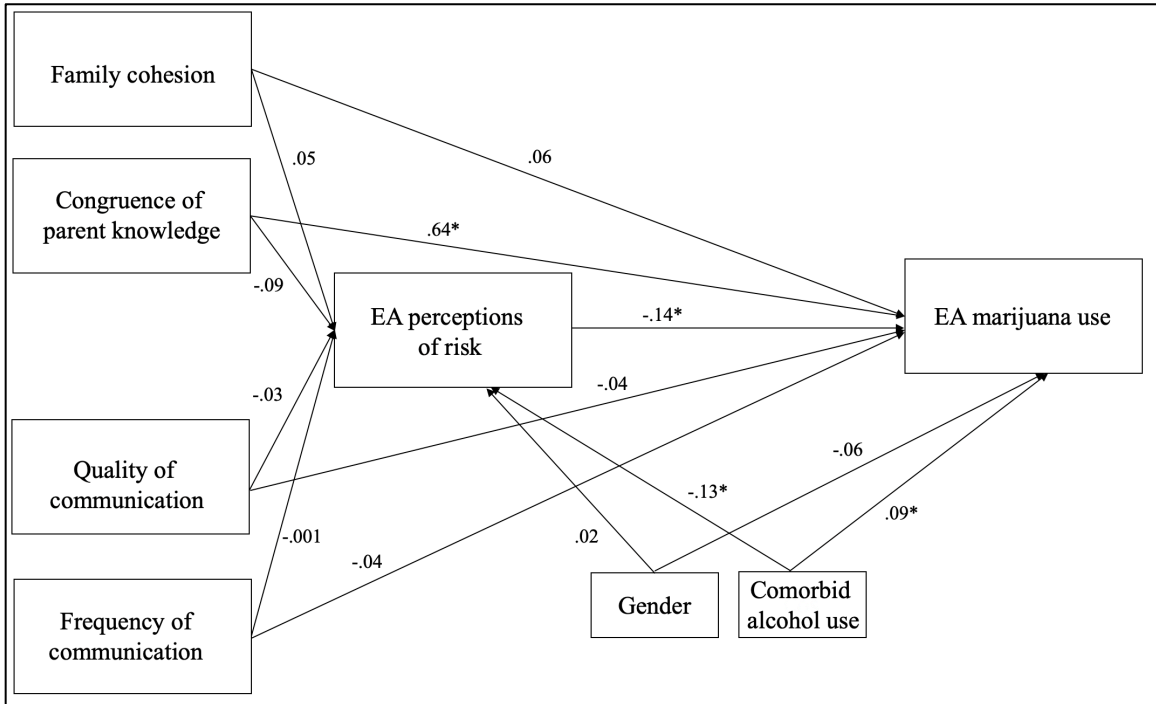
Figure 6. Mediation model between parenting predictors at wave 8 and EA marijuana use and EA perceptions of risk at wave 8.

In summary, results indicate EA perceptions of marijuana use is a significant mediator between congruence in parent knowledge of marijuana use at waves 6 and 7 and EA marijuana use outcomes at wave 8. There were no other significant indirect effects in this model.

CHAPTER IV

DISCUSSION

This chapter provides a review of the results presented in this dissertation. First, the analytic findings will be interpreted. Next, limitations of the study will be addressed with suggested future directions for research. Finally, implications of the study and overall conclusions will be discussed.

Overview of the Study

The present study aimed to expand upon the parenting and marijuana use literature EA literature by examining the following: (a) a measurement model of parental relationship quality, (b) whether parental relationship qualities were related to EA marijuana use outcomes, (c) how parental relationship qualities predicted membership in various marijuana use trajectories, and (d) whether EA perceptions of risk mediated the relationship between parental relationship qualities and EA use outcomes.

Overall, results suggest that parent relationships remain protective for problematic EA marijuana use patterns, even after accounting for covariates. While the measurement model of parental relationship quality did not converge, subsequent analyses examining parental relationship qualities independently revealed several important findings. Cross-sectional analyses showed quality of parent-child communication was negatively associated with EA marijuana use outcomes, and the measure of congruence in parent knowledge of substance use was positively associated with EA marijuana use outcomes. Further, results suggest potential differences exist between healthy and unhealthy congruence in parent knowledge of EA marijuana use and their differential effects on EA marijuana use outcomes. Next, four trajectories of marijuana use patterns were identified

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across the three waves: (a) high users, (b) low increasers, (c) moderate decreasers, and (d) low to no users. Lower levels of family cohesion, quality of parent-child communication, and frequency of parent-child communication predicted membership in higher risk groups. Congruence in parental knowledge of use and underestimation of use also predicted membership in higher risk groups. Finally, results indicate that EA perceptions of risk may act as a protective mediating mechanism between the negative effects of unhealthy congruence in parent knowledge on EA marijuana use outcomes.

Measurement model of parental relationship quality

The first component of Aim 1 was to test a measurement model of parental relationship quality during EA. This test was comprised of factors identified as family cohesion, frequency of parent–child communication, and quality of parent-child communication (note: congruence in parent knowledge of marijuana use was not included in this analysis). Results indicated that the CFA model yielded a poor fit for the relationship quality latent construct; thus, the initial four indicants were treated as independent predictors in subsequent analyses. These results were somewhat surprising in light of past literature linking these various parenting constructs to EA substance use outcomes (Madkour et al., 2017; Padilla-Walker et al., 2011; Stattin & Kerr, 2000). However, my research shows this combination does not converge as a potential latent construct of parental relationship quality. These differences may be related to issues of measurement, construct, or ecological validity.

Relationship between parenting and marijuana use outcomes at wave 6

The second component of the first aim was to examine the relationship of parental relationship quality and EA marijuana use at age 20. Based on the results of the CFA, the

initial four indicants (e.g., family cohesion, congruence in parent knowledge of marijuana use, frequency of parent–child communication, and quality of parent-child communication) were treated independently. In line with previous research (Ellickson et al., 2004; Juon et al., 2011, Silins et al., 2013), results indicated being male was linked to EA marijuana use and membership in the high-user group. As hypothesized, quality of parent-child communication was significantly associated with EA marijuana use outcomes at wave 6, with lower levels of quality of parent-child communication linked with higher levels of EA marijuana use outcomes. Additionally, lower levels of quality of parent-child communication indicated probability of membership in a high-user group of EA marijuana use. These findings support the continuing role of quality of parent-child communication beyond adolescence and into EA (Holahan et al., 1994; Kenny & Sirin, 2006; Runcan et al., 2012). These results suggest quality of parent-child communication may serve as a protective factor for EAs, suggesting the importance of strengthening these relationships to help prevent problematic marijuana use and related risks during this developmental period. However, this explanation is speculative given the inability to draw causal conclusions from cross-sectional data.

In addition to quality of parent-child communication, results indicated that higher levels of the measure of congruence in parent knowledge of marijuana use were linked to higher levels of EA marijuana use outcomes. It is important to discuss the measure of congruence in parent knowledge when interpreting these results. As individuals score higher on the measure of congruence in parent knowledge, they are more likely to be trending positively towards larger underestimation. For instance, higher scores for congruence represented either trends towards congruence for those overestimating or

towards underestimation for those in congruence (see Figure 2). Therefore, these findings indicate that congruence in parent knowledge in EA marijuana use, as well as underestimation of EA use, were linked to higher levels of EA marijuana use, along with membership in the high user group. For example, in the multiple linear regression, a one standard deviation increase on the score for parental knowledge resulted in a 0.67 increased on the score for EA marijuana use. This finding partially supports my hypothesis that lower levels of parent knowledge of marijuana use would predict higher levels of EA marijuana use. These results suggest that congruence in parental knowledge of their children's use, as well as underestimation of use, may act as risk factors during the instability of EA. Again, it is important to note the correlational design of the analyses of these aims; thus, direction of effects could not be determined for both aforementioned parenting predictors (e.g., quality of parent-child communication, parent knowledge of marijuana use).

Family cohesion and frequency of parent-child communication were not significant in both regression models when examined cross-sectionally. These findings were surprising in light of past research documenting the protective role of supportive family relationships on EA risk outcomes (Padilla-Walker et al., 2008; Sánchez-Quejia et al., 2016). These differences may be related to issues of measurement and construct validity. Regarding frequency of parent-child communication, past research supporting associations between frequency of parent-child communication and EA substance use outcomes focused on heavy episodic drinking (Madkour et al., 2017). Thus, frequency of parent-child communication may not be an important factor in relationship to EA marijuana use outcomes.

Longitudinal trajectories of marijuana use patterns

The second aim was to identify longitudinal trajectory patterns of EA marijuana use in the sample. The identification of longitudinal patterns over time provides useful theoretical and intervention implications. For example, one implication of understanding the progression of EA marijuana use patterns includes the identification of protective and risk factors that differentiate between various types of marijuana use trajectories (Ellickson et al., 2004). Using trajectory modeling, I identified longitudinal patterns of EA marijuana use over three waves that captured changing or static levels of use over time. 35.3% of participants were consistent low to no users. Membership for remaining respondents was distributed across 3 classes: one characterized by consistent high users, one characterized by participants with low use at age 20 that increased across ages 21 and 22, and one characterized by participants with moderate use at age 20 that decreased across ages 21 and 22. These results indicate the 20s may be an important developmental period for marijuana use prevention and intervention to slow the increase in use probabilities from ages 19 to 20, as well as to support use intervention in the early 20s (Terry-McElrath et al., 2017).

Characteristics of marijuana use trajectory groups by parenting predictors

This aim further provided the opportunity to expand knowledge of how parental relationship qualities differentiate classes of marijuana use. and examine how covariates (e.g., gender, comorbid alcohol use) and parental relationship qualities predicted membership in EA marijuana use patterns over time by comparing low to no users to higher marijuana use patterns. Being male relative to female increased overall risk for being in a higher risk marijuana group relative to the low to no-use group. This finding

aligns with prior research suggesting membership in heavy or increasing marijuana use

trajectories during young adulthood was more likely for males (e.g., Ellickson et al.,

2004, Silins et al., 2013).

It was hypothesized that four parental relationship qualities would impact distinct

longitudinal trajectory patterns of use. Specifically, I hypothesized that lower levels of

these predictors at age 20 would predict membership in increasing or high using

trajectories of marijuana use at ages 21 and 22. These hypotheses were mostly supported.

Lower levels of family cohesion and quality of parent-child communication were more

likely to predict membership in the high-using groups in comparison to low-to-non users.

These findings are in line with past studies indicating that family cohesion (Padilla-

Walker et al., 2008; Sánchez-Quejia et al., 2016) and quality of parent-child

communication (Holahan et al., 1994; Runcan et al., 2012) may continue to play roles in

mitigating risk behaviors in EA. Interestingly, for some participants, lower levels of

family cohesion and quality of parent-child communication predicted probability in

moderate-decreasing user groups in comparison to low to non-users. One interpretation of

this finding is that family cohesion and quality of parent-child communication are not as

influential for EA marijuana use outcomes as EAs become older and more autonomous

(Nelson & Barry, 2005).

Results also indicated that lower levels of frequency of parent-child

communication were more likely to predict membership in the high-users group

compared to the low-to-non users. In line with literature regarding the protective impact

of frequency of parent-child communication in EA alcohol use outcomes (Madkour et al,

2017), these findings suggest that levels of frequency of communication may also play a role in EA marijuana use outcomes as well.

Regarding parent knowledge of substance use, it appears that parent knowledge is associated to EA marijuana use outcomes. Specifically, findings indicate that trends towards congruence and underestimation of marijuana use predicted membership in in the high-using and moderate-decreasing groups compared to the low-to-non users. In addition, trends towards overestimation and congruence in marijuana use predicted membership in the low-increasing users compared to the low to non-users.

One interpretation of the parental knowledge finding is that once children begin the transition to adulthood, they may understand their parents' request for knowledge differently than when they were younger (Padilla-Walker et al., 2008). Given substance use peaks during EA (Arnett, 2006; Johnston et al., 2016), parents may be particularly attentive to their children's activities, engage in more parental monitoring, and subsequently have more knowledge about their children's behavior (Padilla-Walker et al., 2008). Parental monitoring is an approach by which parents track and survey their children's activities (Dishion & McMahon, 1998). In the literature, there is debate about parental monitoring as a construct and how this construct should be measured. Some studies have examined parental monitoring through parent knowledge of child activities (Abar, Jackson, Colby, & Barnett, 2014). Several studies indicate that parents who are not well informed of their children's daily activities and peer interactions, and not monitoring, are more likely to have children who engage in risk behaviors (Crouter et al., 2005). However, it has also been found that adolescents' perceptions of being controlled (e.g., monitoring and supervision) are linked to lower positive adjustment outcomes and

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depression (Kerr & Stattin, 2000). Further, some studies suggest this association between parent control and EA adjustment outcomes continues in EA. For instance, EAs who experience psychological control from parents cultivate lower emotional regulation skills (Manzeske & Stright, 2009), as well as higher levels of symptoms of depression (Kenny & Sirin, 2006). As adolescents enter EA, the interaction between children's desire for agency and autonomy and parents' continued pursuit of knowledge about their children's activities may contribute to parent-child conflict or tension (Aquilino, 2006). Thus, if a parent is more accurate about their child's marijuana use, they may be characterized as more controlling, contributing to higher levels of use (Padilla-Walker et al., 2008). Given that EAs are attempting to develop autonomy from their parents (Nelson & Barry, 2005), parental knowledge during this time period may be perceived as dominating or regulatory (Padilla-Walker et al., 2008).

Alternatively, the parental knowledge finding also indicated that parent's underestimation of EA marijuana use is also linked to higher levels of EA marijuana use. Thus, parents' lack of congruent knowledge about their EA's marijuana use may be associated with a higher likelihood of engagement in more problematic patterns of marijuana use. It is possible that the less parents know about their children's behavior, the more likely these children will engage in problematic marijuana use patterns. This finding is in line with previous literature suggesting parent knowledge of behavior contributes unique variance to risk behaviors in EA even when considering the influence of parental closeness (Padilla-Walker, et al., 2008).

Taken together, this finding points to the complexity of the role of parents during EA. While having congruent knowledge about what your children are doing may not be

protective for problematic EA marijuana use, a lack of knowledge of your child's EA use may also be a risk factor. It may be that parent knowledge of EA marijuana use is differentially associated with EA marijuana use outcomes depending on the emotional context of the parent-child relationship and how EAs characterize their parents' knowledge (Padilla-Walker, et al., 2008). Given the scope of this study, future research should consider family context as a potential moderator of how congruence in parent knowledge of EA marijuana use may impact EA marijuana use outcomes.

One important contribution of this research to the literature is an expansion of knowledge about how various parental relationship qualities may predict membership in different trajectories of EA marijuana use, highlighting the continued role parents play in EA regarding EA marijuana use outcomes (Brody et al., 2012; Patock-Peckham & Morgan-Lopez, 2009). These findings are theoretically and empirically aligned with previous EA literature. Supportive parent-child relationships bolster young adult's development of self-regulation skills (Kogan, 2017; Patock-Peckham & Morgan-Lopez, 2009). Frequent and quality communication, family cohesion, and a feeling of closeness to parents seem to be important factors for EA children when they are met with making marijuana use decisions.

EA perceptions of risk as a mediator of parenting and EA marijuana use outcomes

The third aim of the proposed study tested EA risk perception of marijuana use as a mediator between four independent parenting predictors and EA marijuana use at age 22.0. It was hypothesized that EA perceptions of risk would mediate the relationship between family cohesion, the measure of congruence in parent knowledge of marijuana

use, frequency of parent-child communication, and quality of parent-child communication and EA marijuana use outcomes. Across waves 6 and 7, EA perceptions of risk of marijuana use acted as a mediator of the relationship between the measure of congruence in parent knowledge of marijuana use and EA marijuana use outcomes, and approached significance in the same direction at wave 8. Specifically, across waves 6 and 7, trends towards congruence and underestimation of use predicted lower EA perceptions of risk at wave 8. In turn, higher perceptions of risk predicted lower levels of EA marijuana use outcomes.

Taken together, these findings suggest EA perceptions of risk can act as a protective factor when parents are congruent in or underestimating EA use. Further, these findings indicate potential differences exist between dimensions of congruence in parent knowledge of EA marijuana use. EA perceptions of risk may act as a safety mechanism between the deleterious effects of congruence in parent knowledge and underestimation of use on EA marijuana use outcomes.

Surprisingly, EA perceptions of risk did not mediate the relationship between family cohesion, quality of parent-child communication, and frequency of parent-child communication and EA marijuana use outcomes. One feasible explanation for the null findings observed in the present study is that parenting during EA does not have as strong of an influence on EA perceptions of risk. These findings are contrary to expectations and prior research pointing to the influence of the parent-child relationship on EA perceptions of risk (Denham, 2014; Napper et al., 2016). Given that in this study, higher levels of EA perceptions of risk predicts lower EA marijuana use outcomes, EA perceptions of risk of marijuana may be an important target of intervention for problematic EA marijuana use.

Future studies should examine how EA perceptions of risk may mediate the influence of other potential influences on EA marijuana use, such as peer relationships or changing marijuana laws on EA marijuana use outcomes.

Implications

This dissertation has several implications for young people's development during EA, highlighting the importance of the parent-child relationship in EA. First, research indicates that EA is a critical period during which substance use peaks (Johnston et al., 2009). Marijuana is linked with various negative risk outcomes when used problematically (Buckner et al., 2010; Hall, 2009). Thus, identifying parenting qualities as possible protective or risk factors against these outcomes during EA is an important contribution to understanding how parents, clinicians, and educators might cultivate positive development during this time period (Arnett, 2007). Next, the longitudinal component of this study indicates the parenting behaviors examined in this study are linked to probability of membership in distinct marijuana use trajectories. EAs in their early 20's may be more likely to engage in healthy decision-making regarding marijuana use in an environment that includes warm, supportive parent-child relationships where parents are aware of their EAs use without focusing on their EA's perceptions of risk of use (Kogan, 2017). These findings suggest parents may serve as protective factors for EAs and are an important source of support for fostering healthy decisions regarding marijuana use.

In summary, the findings suggest the public health importance of family relationships and parenting practices for tackling problematic EA marijuana use in a sample of non-college attending youth. Future studies should focus on underlying

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mechanisms of parental influence, especially for non-college attending youth (Kogan, 2017). It may be more difficult to connect with families for EAs who do not attend college (Oesterle, 2017); therefore, there is a need for research on how to reach families and vulnerable EAs to provide supportive intervention (Kogan, 2017).

Limitations and future directions

It is important to consider existing limitations within this study. First, levels of family cohesion, parent knowledge of substance use, frequency of parent-child communication, and quality of parent-child communication during childhood and adolescence were not included in analyses. Given findings supporting the stability of parenting over time (Loeber et al. 2000; Steinberg et al. 1994), parents who reported higher levels of parenting and family behaviors during EA may also exhibit these behaviors during childhood and adolescence. The current findings that parenting behaviors during EA impact EA marijuana use outcomes may reflect parenting stability that began during childhood or adolescence. Future research should consider examining a more longitudinal model that considers other periods of development to examine contributions to EA marijuana use of parenting behaviors over time.

Further, this study did not have a measure capturing parent-child communication specifically about marijuana, which is suggested in the EA literature to be an important factor (Napper et al., 2016). If there were access to such a measure, estimated associations may have been stronger. Another limitation of this study involves the extent of missing data, as well as the violation of Little's MCAR. Regression imputation methods were used to handle missing data which may cause bias from measurement error (Mittag, 2013; Rässler, Rubin, & Schenker, 2008). Additionally, part of the sample

received an intervention that was designed to improve the parent-child relationships; thus, it is important to consider that these groups were pooled in the analyses which may impact internal validity of the study. In the latent class growth analysis, while fit was superior for a 4-group model, one limitation is that Groups 2 and 4 did not exceed a minimum threshold of 5 for the odds of correct classification (Nagin, 2005).

In this study, parent knowledge of marijuana use encompassed congruence. Future research may focus on dividing the measurement of congruence in parent knowledge to understand the unique variance of underestimation and congruence trends of parent knowledge of marijuana use on EA marijuana use outcomes. In addition, future studies should explore how changes in parenting over time influence the change of the developmental trajectories of marijuana use by incorporating parenting as a time-varying predictor to offer precision in how parenting directly influences marijuana use across time within the trajectory groups. Also, this study examined parental relationship qualities independently. Future research might consider how the interactions of these parental relationship qualities may predict membership in various marijuana use patterns as well. For instance, it may be that parent knowledge of EA marijuana use may be differentially associated to EA's marijuana use outcomes depending on the emotional climate of the parent-child relationship and how EAs characterize their parents' knowledge (Padilla-Walker, et al., 2008). Given that the parental relationship qualities in this study are predictive of longitudinal marijuana use patterns, it is important to clarify what other variables may moderate these relationships. For example, other relationship factors, such as living with parents (Dubas & Petersen, 1996), may impact the influence of parenting factors, EA perceptions of risk, and EA marijuana use outcomes. Finally,

this study did not examine whether parenting effects vary by ethnicity. Some adolescent studies with ethnically diverse samples demonstrate similar outcomes among indicators of the quality of parent-child relationships, such as attachment and communication (Arbona & Power, 2003; Hill & Bush, 2001). However, other studies demonstrate ethnic differences in the strength of associations between parenting variables and adolescent outcomes (e.g., Gershoff, Lansford, Sexton, Davis-Kean, & Sameroff, 2012; Paschall, Ennett, & Flewelling, 1996). Future research should examine how ethnicity may moderate the associations between parental relationship qualities and EA marijuana use outcomes.

Summary and conclusions

The present study examined the effects of parenting during EA, EA perceptions of risk, and EA marijuana use outcomes. This study included the use of a longitudinal design, allowing for repeated assessments of participants across three waves of EA. Additionally, this study is one of few studies to use a racially and socioeconomically diverse sample of EAs, including non-college-attending EAs. Results indicated levels of parent knowledge of marijuana use, as well as quality of parent-child communication in EA, influence EA marijuana use outcomes cross-sectionally. Longitudinally, family cohesion, parent knowledge of marijuana use, frequency of parent-child communication, and quality of parent-child communication influence probability of membership of distinct marijuana use trajectories. Lastly, EA perceptions of risk may act as a protective factor when parents are congruent in or underestimating EA use. This research emphasizes the significance of studying parenting during EA as parenting still plays an influential role in EA substances use outcomes.

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