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The Impact of Family-Centered Prevention on Self-Regulation and Subsequent Long-Term Risk in Emerging Adults

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Abstract

Emerging adulthood is characterized by opportunity and transition, but also a substantial increase in risk behaviors (Fosco, Caruthers, & Dishion, 2012; Johnston, O'Malley, Bachman, Schulenberg, & Miech, 2016). Building on prior research, we tested a mediational model hypothesizing that Family Check-Up (FCU) intervention effects on young adult risk would be mediated by increases in self-regulation, and that these changes would continue to affect risk behavior as high school youths transitioned to young adulthood. We also predicted that the intent-to-treat intervention would be associated with lower levels of risk in young adulthood and that this effect would be accounted for by intervention-induced improvements in self-regulation during early adolescence, which in turn would prevent young adult risk. Participants were 593 adolescents and their families recruited from three public middle schools and randomized either to the FCU or to a control group. Item response theory was applied to construct a measure of high-risk behavior at this age, including risk behaviors such as substance abuse, high-risk sexual behavior, and vocational risk. Results suggested that changes in children's self-regulation that occurred early during the middle school years, and that were associated with the FCU, led to reductions in risk behaviors during young adulthood. This study builds on our prior research that has suggested that effects of the FCU during middle school lead to changes in a range of risk behaviors during the transition to high school (Fosco, Frank, Stormshak, & Dishion, 2013; Stormshak, Fosco, & Dishion, 2010).

Keywords

Family intervention; risk behavior; emerging adulthood; development; prevention

The transition from adolescence to early adulthood, also known as *emerging adulthood,* is a critical period characterized by increased autonomy, identity exploration, intimate partnerships, and shifts in educational and employment pursuits (Arnett, 2006). Research suggests that this developmental period is marked by a substantial increase in risk behaviors.

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Compliance With Ethical Standards

Disclosure of potential conflicts of interest: There are no conflicts of interest, and all ethnical standards were followed in conducting this research.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all subjects and procedures were approved by the University of Oregon IRB.

Experimental drug use, for example, increases during late adolescence, peaks during emerging adulthood, and declines in young adulthood, beginning at around age 25 (Fosco, Caruthers, & Dishion, 2012; Johnston, O'Malley, Bachman, & Schulenberg, 2004; Johnston et al., 2016). Nearly 70% of 21- to 25-year-olds surveyed had used alcohol in the previous month, a percentage higher than for any other age group, and the incidence of alcohol abuse and dependence is highest among 18- to 25-year-olds (SAMHSA, 2013). Other problem behaviors, such as antisocial behavior, partner violence, risky driving, and high-risk sexual behavior, also peak during emerging adulthood and then taper off after the young adult years (Centers for Disease Control and Prevention, 2010; Arnett, 2006).

Self-Regulation

Self-regulation has been identified as a key factor of development that plays a critical role in the engagement of risk behavior and therefore is a target for preventive interventions (e.g., Crockett, Raffaelli, & Shen, 2006). *Self-regulation* is defined as an internal process that modulates behavior and internal reactivity. It is the developed ability to apply regulatory processes to behavior, emotions, and thoughts without depending on the support of others (Campos, Campos, & Barrett, 1989). Individual differences in self-regulation and temperament are key features of externalizing behavior problems, including impulsivity and risk behavior, as well as resistance to problem behaviors across the lifespan (e.g., Crockett et al., 2006; Laurent & Powers, 2007; Mullin & Hinshaw, 2007). Contextual factors, including socioeconomic status, parenting skills, and family support, also exert important influences on the development of self-regulation skills and long-term outcomes (Lengua, 2009, Zeman, Cassano, & Adrian, 2013).

Parents contribute to the development of self-regulation through socialization by shaping behavior through consistent behavioral routines and engaging in skill-based learning to support their children's social adjustment (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Effective parenting strategies support children's attention and effortful control while promoting the development of self-regulation skills from childhood through adolescence (Lengua, 2009), leading to improvements in behavior and young adult adaptation. As such, self-regulation during early and middle childhood is an important target of effective interventions.

Family-Centered Prevention

There is a strong foundation of literature about parenting skills and family-centered approaches to the prevention of children's risk behavior, with the majority of studies suggesting a prevention effect across the lifespan (Dodge, 2001; Stormshak, Connell, & Dishion, 2009; Stormshak & Dishion, 2009). That is, family-centered support at key developmental transitions reduces risk behaviors and prevents later development of problem behavior. Parent interventions have shown direct effects on the development of self-regulation during early childhood, including negative emotionality and behavioral control (Blair, 2002; Chang, Shaw, Dishion, Gardner, & Wilson, 2014). Interventions that target improvements in parenting skills have resulted in reductions in regulatory problems and

externalizing behaviors through the middle school years (e.g., Fosco et al., 2013; Sulik, Blair, Mills-Koonce, Berry, & Greenberg, 2015).

Parent- and family-centered prevention efforts show great promise for preventing children's engagement in risk behavior during late adolescence and early adulthood. Protective supports that are bolstered as a result of family-centered prevention, such as positive parenting skills, increased monitoring, and effective limit setting, reduce problem behavior that leads to later risks (Stormshak, DeVargas, & Cardenas, in press). Our own research using the Family Check-Up (FCU; Dishion & Stormshak, 2007) model has exemplified these effects from middle childhood to late adolescence. Middle school youths who received the intervention showed reductions in problem behavior, family conflict, depression, and substance use during the transition to high school (Connell, Klostermann, & Dishion, 2012; Stormshak et al., 2011; Van Ryzin, Fosco, & Dishion, 2012). Of particular note is that self-regulation was a key mediator in these models. The effects of the FCU intervention on self-regulation during the middle school years led to attenuated growth in problem behavior at later waves, including antisocial behavior, deviant peer affiliations, and substance use (Fosco et al., 2013). Improvements in self-regulation also led to improvements in school engagement during the transition to high school (Stormshak et al., 2010). However, no research has examined early changes in self-regulation as a predictor of outcomes during the young adult years.

Study Hypotheses

Our research has followed a sample of 593 boys and girls who were randomly assigned to receive the FCU intervention during the middle school years. We collected data on the sample during middle school and again during the young adult years. In the study described in this article, we tested a mediational model hypothesizing that the FCU intervention effects on young adult risk would be mediated by increases in self-regulation, and that these changes in self-regulation continued to have an impact on risk behavior as high school youths transitioned to the young adult years. We predicted that the intent-to-treat (ITT) intervention would be associated with lower levels of risk in young adulthood, and this effect would be accounted for by intervention-induced improvements in self-regulation during early adolescence, which in turn were hypothesized to prevent young adult risk. We used an ITT approach to analyses even though some families in the intervention group received no dosage of the intervention. This is the most stringent and conservative approach because it retains the full sample size for the purpose of statistical power, avoids misinterpretation of data based on noncompliance, and includes all subjects assigned to the intervention condition (Gupta, 2011). Rather than test single indicators of risk behavior, we used item response theory to build a construct that integrates multiple types of risk behavior at this age. In an examination of the impact of the FCU on early self-regulatory skills and young adult risk behavior, this study built on our prior research that has suggested that effects of the FCU intervention on self-regulation during middle school lead to changes in a range of risk behaviors during the transition to high school (Connell et al., 2012; Stormshak et al., 2011; Van Ryzin et al., 2012).

Method

Participants

The total sample comprised 593 adolescent participants and their families who were recruited from three public middle schools in an urban area in the Pacific Northwest. All three middle schools served an at-risk population, with 35%, 89%, and 39% of families across the three schools receiving free or reduced-price lunches. All three schools were Title 1 schools, and approximately 20% of the combined school population qualified for special education services. The total sample comprised 51% males, and participants were from diverse ethnic backgrounds: 36% European American, 18% Hispanic/ Latino, 15% African American, 7% Asian American, 19% biracial/ mixed identity, 2% Native American, and 2% Pacific Islander. Average age was 11 years 10 months (Time 1), 13 years 1 month (Time 2), and 20 years (Time 3).

An unbalanced approach to randomization was used to enhance the power to detect intervention effects. Thus, 386 families (65%) were randomly assigned to the intervention condition and 207 families (35%) were randomly assigned to the control condition in which families experienced “school as usual,” including regular services offered by the schools but no access to any of the selected intervention services available to families in the FCU intervention condition. Of the 386 families assigned at random to the intervention condition, 51% (n = 197) participated in the initial interview, and of these, most (n = 163) elected to receive the full FCU intervention (i.e., the family assessment and feedback session). Of the families receiving the full FCU, 80% received additional follow-up support, such as parent skills training or the development of a home-to-school plan. The average intervention family received 337 minutes (6 hours) of intervention time, which indicates that most families received some follow-up sessions related to their goals. Follow-up sessions were categorized for content and included topics such as homework completion, monitoring, grades, and attendance at school.With respect to gender, 47% (n = 76) of families who engaged in the FCU had a girl as a target of the intervention and 53% (n = 87) had a boy.

Procedures

Youths and families were recruited during sixth grade across two cohorts. Parents of all sixth grade students were invited to participate, and 80% of all parents agreed to do so. All participating parents provided signed consent forms, and youths signed child assent forms. In the spring semester of sixth and seventh grades (Times 1 and 2, respectively), students completed a questionnaire that assessed engagement in a variety of problem behaviors (Metzler, Biglan, Rusby, & Sprague, 2001). Assessments were conducted primarily in the schools unless a student moved or was absent, in which case assessments were mailed to the home. Each youth received $20 for each year he/she completed the assessment.

Participants were contacted again approximately 1 year after completing high school (M age = 20 years). Young adults were asked to complete a series of surveys measuring an array of outcomes, including achievement, behavior problems, substance use, high-risk sexual behavior, and peer and family relationship quality. Young adults received $100 for completing the questionnaire. A high degree of retention was seen across the 7 years of the

study (Time 2, $n = 525$, 89% of the sample; Time 3, $n = 441$, 74% of the sample). Retention between the control and intervention group did not vary from the last time point of data collection to age 20 ($F = .059$; $p = .80$); but did vary from age 11 (pretest) to age 20, with more families retained in the control group ($F = 5.23$; $p = .02$; 81% control vs. 71% intervention). The sample continued to be an at-risk sample from middle school to the young adult years, 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%, well above the national average of 4.6% (Center for Behavioral Health Statistics and Quality, 2015).

FCU Intervention Protocol

The FCU is a component of an ecological approach to a family intervention and treatment originally designed for adolescents at high risk for problem behavior (Dishion & Kavanagh, 2003; Dishion & Stormshak, 2007). The first level of this approach, the universal intervention, included establishment of a family resource center in each of the participating public middle schools. The resource center offered pamphlets, books, and other information about parenting and was available to all families in the school, although only those in the intervention group used the service because it was not advertised broadly. The selected intervention was the FCU, a three-session intervention modeled on the Drinker's Check-Up (Miller & Rollnick, 2002). The FCU was designed to provide strengths-based feedback to parents using norm-referenced assessments and motivational interviewing techniques that engage families in the process of change. Families who participated in the selected intervention completed three FCU sessions consisting of an initial interview, an assessment session, and a feedback session. Following the FCU, parents who needed additional support were offered adaptive, tailored interventions that targeted specific parenting skills. These components were derived from the *Everyday Parenting* curriculum (Dishion, Stormshak, & Kavanagh, 2011), an empirically validated curriculum that provides skill training for parents in areas of family management that are relevant to adolescence, including positive behavior support, monitoring, and limit setting. The sessions were adapted to each family on the basis of their goals, strengths, and areas of growth.

The parent consultants who delivered FCU services and who staffed the family resource centers were full-time employees at the University of Oregon with expertise in working with families and youths. Their education level ranged from doctoral degree to some college training. Parent consultant ethnicity was matched with family ethnicity whenever possible. Four consultants received intensive training and supervision throughout the study, including one week-long initial training and several follow-up training workshops on specific parenting skills. Ongoing supervision and fidelity monitoring were provided by the intervention developers and included watching videotaped FCUs, giving feedback to consultants, planning for the FCUs, conducting role-plays, and providing guidance for use of the family management curriculum. Fidelity monitoring included continuous support and feedback to consultants to ensure consistent delivery of the intervention. Confidentiality was maintained for families participating in FCU interventions by the parent consultants;

however, as a part of the consent process parents gave permission for interventions to be coordinated with school staff.

Measures

Young Adult Risk Scale—An original survey, the Young Adult Risk Scale (YARS), was used to create a young adult risk construct. Items assessed markers of problematic transition to young adulthood. The YARS was adapted from an earlier instrument developed by colleagues at the Oregon Research Institute (Metzler, Biglan, Ary, & Li, 1998) and from the Child and Family Center Youth Questionnaire (Child and Family Center, 2001), which was used to assess risk behavior and self-regulation at earlier waves of this longitudinal study. Items were adapted in response to developmental changes that occur in early adulthood. Additional items that assessed independence, substance use, and financial well-being were adapted from the "Monitoring the Future" survey (Johnston et al., 2016).

Dichotomous items were computed to indicate *yes* or *no* whether a risk marker was present. For example, an original yes/no substance use item was, "In the past month, did you go to work or school high on illicit drugs?" An example of a computed item was recoding a Likert-type response of 0 (*never*) to 5 (*ten or more*) to 0 (*did not occur*) and 1 (*occurred*) for the item. Participants were indexed from low to high risk. Forty-four marker items were selected based on their face validity (items shown in Table 1; item response theory analysis detailed in the "Data Analytic Strategy" subsection). *Vocational* risk items indicated unemployment, dropping out of school, or never having held a paying job. *Alcohol*, *marijuana*, and *illicit drug* risk items indicated abuse, addictive use, or interference with normative functioning. *Sexual behavior* risk items indicated unprotected sex or sex while under the influence, and *socio-emotional and behavioral* risk were measured with clinical cut scores for internalizing and externalizing on the Achenbach Adult Self-Report measure (Achenbach & Rescorla, 2001). The total YARS score involved summing the count of items endorsed; scores could thus range from 0 to 44. The Kuder-Richardson internal consistency alpha for dichotomous items was .86.

Self-regulation—Self-regulation during Grades 6 and 7 and at young adulthood was measured using an adapted version of the Early Adolescent Temperament Questionnaire (EATQ; Ellis & Rothbart, 2005), which we have published across multiple studies (Fosco et al., 2013; Stormshak et al., 2010). The EATQ is a widely used scale used to assess effortful control and has demonstrated considerable evidence of reliability and validity across longitudinal studies with samples of adolescents (e.g., Eisenberg et al., 2005; Fosco et al., 2012). Sample items include "I have a hard time finishing tasks," "It is easy for me to stop doing something when someone tells me to stop," and "I stick with my plans and goals." Response options ranged from 1 (*almost always not true*) to 5 (*almost always true*). Scale scores were computed by summing scores with higher scores indicating better regulation (α = .79 at both grades).

Control variables—Analyses controlled for relevant covariates, including biological sex coded 1 for boy, 0 for girl; minority status coded 1 for racial or ethnic minority, 0 for White European American; age in years at the 7-year follow-up; Grade 6 antisocial behavior and

depression. Antisociality was an 11-item self-report scale (Metzler et al., 2001) measured on a 6-point scale ranging from 1 (*never*) to 6 (*more than 20*) for frequency in the past month (e.g., lied to parents, skipped school, carried a weapon, got into a fight; $\alpha = .84$). Depression was measured by using a 14-item scale adapted from the Child Depression Inventory (Kovacs, 1992) on a scale ranging from 1 (*never or almost never*) to 5 (*always or almoast always*) for bothersome feelings in the past month (e.g., nervous or worried; depressed, sad, feeling down; hard to think or focus, etc.). Cronbach's $\alpha = .93$.

Data Analytic Strategy

Analyses were conducted in two primary stages: (1) psychometric evaluation of the YARS, and (2) evaluation of the preventive intervention hypotheses. In Phase 1 analyses we conducted a two-parameter (2PL) item response theory analysis (DeVellis, 2012) to evaluate the summative index.

Item Response Theory

Item response theory (IRT; Embretson & Reise, 2013; Weiss & Yoes, 1991) is a modern measurement approach that relates characteristics of items (item parameters in the model) and characteristics of an individual (their underlying latent trait ability) to the probability of endorsing a particular item (Embretson & Reise, 2013; Reise & Waller, 2003; Weiss & Yoes, 1991). IRT models assume unidimensionality of the underlying latent trait, a continuous unbounded variable designated as theta (θ). Respondents, however, vary in characteristics they ascribe to individual items. In the 2PL model, two parameters are estimated: item difficulty (the *b* parameter) and item discrimination (the *a* parameter). Item difficulty (*b*) is the point of the trait at which a respondent transitions from not endorsing to endorsing an item. That is, persons low in risk should not endorse the high-risk items; conversely, persons high in risk should endorse prior lower risk and subsequent higher risk items. A lower risk item would be "got high or buzzed when drinking in the last month," and a higher risk item would be "could not stop using illicit drugs." The *b* is also the inflection point (.50) of the probability of endorsing an item, given a certain level of risk θ.

The discrimination parameter (*a*) is the degree to which an item unambiguously classifies a response as endorsed. The lower the classification ambiguity, the higher the item discrimination. A key advantage of IRT over classic test theory approaches (e.g., factor analytic approaches) is that item and person parameters in the model are invariant and do not depend on the subset of items used or the number of items (e.g., the greater the number of items, the higher the coefficient alpha reliablity), nor is IRT dependent on the distribution of the underlying latent trait in the sample used (Embretson & Reise, 2013; Weiss & Yoes, 1991).

Mediation Model

In the second phase of analyses we tested a mediation model (MacKinnon, 2008) and hypothesized that intervention effects on young adult risk would be mediated by intervention-induced increases in self-regulation. Mediation requires a direct intervention effect on the distal young adult risk, as well as an intervention effect on the more proximal

mediator of self-regulation, and is more rigorously evaluated with longer term distal and temporally specified antecedent mediators (Kraemer, Wilson, Fairburn, & Agras, 2002). Change in self-regulation is then required to predict young adult risk and also to render the direct intervention effect as nonsignificant. Finally, indirect effects were evaluated using bias-corrected bootstrapped standard errors, and confidence intervals are recommended to address the asymptotic distribution of the multiplicative indirect term. All analyses were conducted using structural equation modeling (SEM) and the Mplus 7.31 program (Muthén & Muthén, 2015).

Missing Data

Models were estimated using full information maximum likelihood (FIML; Brown et al., 2008), which uses all available information from the observed data in the SEM analyses. FIML estimates are computed by maximizing the likelihood of a missing value on the basis of observed values in the data. Compared with mean-imputation, list-wise, or pair-wise models, FIML provides more statistically reliable standard errors (Brown et al., 2008). Individuals who have baseline data only and no follow-up data contribute nothing to the likelihood of estimates for growth and are effectively excluded from the change analyses.

Results

Young Adult Risk Scale

Table 1 shows the sample means or proportion of respondents endorsing the individual items, and the IRT parameters for item difficulty and item discrimination (−2 loglikelihood [LL] χ^2 (78) = −5274.36, Bayesian information criteria [BIC] = 11046.77). Forty-one of 44 items obtained significant difficulty and discrimination *b* and *a* in the 2PL. Three items obtained significant difficulty parameter, but nonsignificant discrimination: Items 18, 21, and 34 (i.e., can't stop using illicit drugs, problems relating to illicit drugs, and ten or more same-sex partners). We retained all 44 items because a nested model comparison of a 1PL model (−2LL χ^2 [40] = −5274.36, BIC = 10681.19) showed a significantly better fit (Δ χ^2 [38] 130.56, $p < .001$). Both item difficulty and scale information data indicated that the YARS was a reliable measure of moderate- to high-risk behavior in young adulthood. The YARS ranged from 0 to 26, with a mean value of 5.40 (*SD* = 4.33). Frequencies showed the modal counts were 13% with zero and 11% with four total items. The distribution did not violate distributional assumptions for continuous variable regression analyses with a skew statistic of 1.02 (*SE* = .12) and a kurtosis of 1.50 (*SE* = .23).

Table 2 includes correlations between our variables, including self-regulation and risk behavior in the young adult years. Antisocial, depressed, and self-identified ethnic minorities reported lower levels of self-regulation in sixth and seventh grades. Grade 6 antisocial behavior was associated with young adult risk; however, minority status and depression were not.

Intervention Effects on Young Adult Risk

In the next stage of analyses, we tested for hypothesized mediation first by testing the direct effect of the FCU intervention on young adult risk, followed by tests of indirect effects via

the hypothesized mediator, self-regulation. A path model specifying an ITT intervention effect on the YARS distal outcome did not support a direct effect controlling for sex, minority status, age, and prior risk factors ($\beta = -.05$, $p = .32$). Full mediation was not supported by the data.

Sans a direct effect, we next tested for indirect effects through changes in self-regulation. Results of the indirect effects estimated for continuous-variable and left-censored Tobit regression models are displayed in Figure 1 in the form of standardized beta coefficients. Tobit regression estimates are in brackets. The data provided evidence of an indirect effect of the FCU intervention. FCU ITT was associated with significant improvements in self-regulation from Grades 6 to 7 [$\beta = .13$, $p < .001$;Tx M = 3.63 at Grade 6 ($SD = .58$) vs 3.50 at Grade 7 ($SD = .56$)], and changes in self-regulation, in turn, predicted lower levels of young adult risk ($\beta = -.24$, $p < .001$). The continuous model explained 9% of the variance in YARS and provided excellent fit to the data (χ^2 [1] = .07, $p = .79$, CFI = 1.00, RMSEA = .00). The Tobit model explained 9% of the variance in YARS. We next evaluated the indirect effect using bootstrapped analyses and the recommended bias-corrected confidence intervals (MacKinnon, 2008; Preacher & Hayes, 2008). The bias-corrected standardized indirect effect for ITT → Δ self-regulation → YARS was −.032 ($SE = .014$, $p < .05$, 95% CI:−.05, −.01). We also note that Kenny and Judd (2014) recently showed indirect effects are attenuated in the presence of the direct effect. No indirect effects are available for the Tobit integration model. Among the control variables, minority status and Grade 6 depression were associated with reductions in self-regulation. Grade 6 antisocial behavior was also predictive of higher levels of young adult risk.

In sum, measuring a construct assessing young adult risk for this study evinced a wide range of risk factors. IRT analyses suggested a measure of moderate to high risk. Some evidence of a floor effect existed in the distribution. Both maximum likelihood continuous variable and left-censored Tobit regression models supported evidence of an indirect effect of the FCU intervention on changes in self-regulation. These earlier changes in self-regulation significantly prevented young adult risk, with self-regulation explaining 9% of the variance.

Discussion

Findings from this study build on our previous research with this sample and suggest that changes in children's self-regulation that occurred during the middle school years from Grade 6 to Grade 7, and that were associated with the FCU intervention, led to fewer reports of high-risk behavior during emerging adulthood. These findings expand our previous work, which examined changes in self-regulation as a predictor of reduced risk behavior during the transition to high school (Fosco et al., 2013; Stormshak et al., 2010). Our conservative estimates of treatment effectiveness also showed that the FCU affected moderate- to high-risk outcomes across several domains of young adult well-being, including vocational risk, socioemotional risk, sexual behavior risk, and alcohol, marijuana, and illict drug use risk. Our ability to document the long-term impact of the brief FCU on this range of risk behaviors, and during a developmental period defined by dramatic increases in risk and instability, is particularly noteworthy. Our study results underscore the importance of the middle school developmental transition period for implementing family-centered preventive

interventions, such as the FCU, that target youth behavioral regulation. Early changes in self-regulation associated with the FCU resulted in decreases in young adults' engagement in moderate- to high-risk behavior.

The significant increase in such a broad range of risk behaviors and the dramatic changes in what characterizes normative behavior during emerging adulthood make it difficult to evaluate prevention programs during this period. One problem is that the increase in normative risk taking calls into question what "risk" behavior is at this age. Furthermore, it is challenging to evaluate the impact of prevention programs on risk behavior when the rates are so high. For example, in a recent survey 37% of emerging adults (ages 18 to 25 years) reported using marijuana, and this rate is rising with new marijuana laws that have decriminalized use (Johnston et al., 2016). Similarly, the average young adult drinks alcohol quite regularly, which suggests that prevention efforts should be targeting high-risk use, such as binge drinking and driving while intoxicated, rather than quantity of use overall (SAMHSA, 2013).

These statistics illuminate the difficulties associated with assessing behaviors that constitute risk during emerging adulthood and identifying the effects of prevention efforts on any one risk behavior. As such, it may be that targeting a range of high-risk behavior during this developmental period is a more appropriate way to assess the impact of prevention programs over time. Using a risk index is consistent with what is described in the developmental literature and with empirical evidence showing that early problem behavior leads to a range of risk outcomes during the young adult years (e.g., criminal behavior, substance use, sexual risk behavior; CPPRG, 2013; Dodge, Greenberg, & Malone, 2008; Masten & Cicchetti, 2010).

Our study's IRT results showed that we measured, and had an impact on, moderate to high young adult risk. Measuring these levels of risk was necessary to identify and address the ever-changing norms of young adult alcohol and other drug use and engagement in other types of risky behavior. The risk index measured indicates that indirect FCU effects were, in fact, having an impact on a higher risk group and preventing escalations in multiple types of risk behaviors.

Study Limitations

Study findings must be interpreted in light of some limitations. First, the FCU accounted for 9% of the variance in risk outcomes. Other factors that were not measured, such as social support, emotional and physical health, access to resources, school performance, and peer affiliations, may have accounted for additional variance in young adult risk outcomes. The goal of this study was to extend our prior work on self-regulation as a predictor of long-term risk behavior. Second, the impact of the FCU on family and child factors during the high school years was not assessed (because of a break in funding), and as a result, these distal key mechanisms the FCU may have affected are not modeled. Third, this research relied on youth self-report from middle school to the young adult years. One strength of youth self-report is that the intervention was delivered to parents, not youths, and as a result the youth reports are free from bias and social desirabilty that may be associated with parent measures. However, our constructs were not multirater measures, which is also a weakness of this

research. Finally, because of the study sample size, we were not able to examine how study results may have varied for children from different socieconomic, ethnic minority, and risk backgrounds.

Conclusion

Our study was an investigation of the mechanisms by which a family-centered preventive intervention offered during the middle school years may reduce risk during the young adult years. Study results show that preventive interventions that target effective parenting increase children's self-regulation, which in turn decreases children's engagement in risk behavior during early adulthood. It is promising that the FCU, a brief, cost-effective preventive intervention, evidences a positive impact on a comprehensive measure of moderate- to high-risk behavior more than 7 years postintervention.

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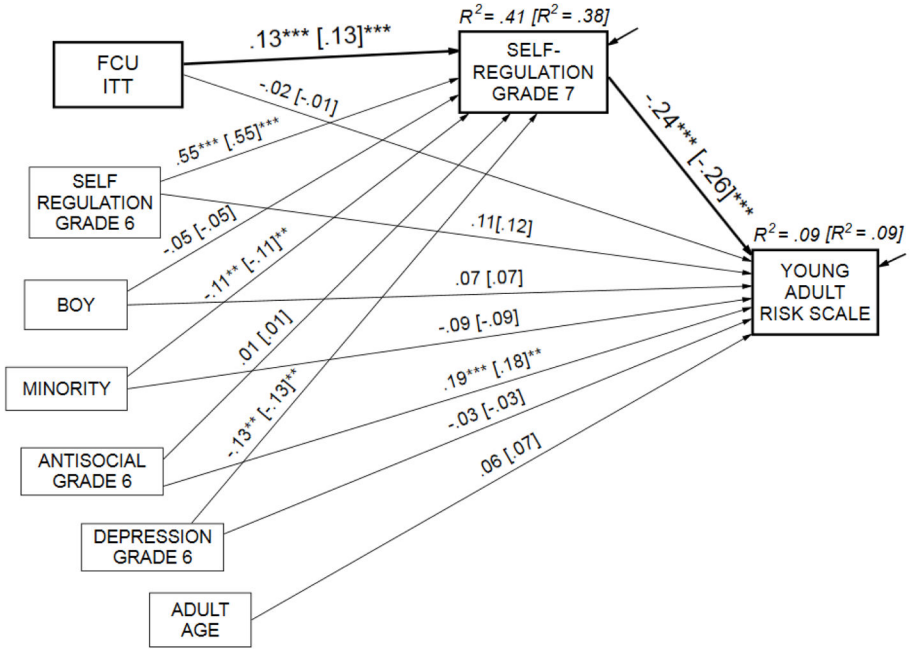

Figure 1.

Structural equation path model testing hypothesized mediation. Paths are standardized estimates. Model fit (χ^2 [1] = .07, p = .79, CFI = 1.00, RMSEA = .00. ***p < .001; **p < .01; *p < .05). The bias-corrected standardized indirect effect for ITT → Δ self-regulation → YARS was −.032 (*SE* = .014, p < .05, 95% CI:−.05,−.010. [Left-censored Tobit regression parameters in brackets].

Table 1

Young Adult Risk Index Dichotomous Items, Item Difficulty (b), and Item Discrimination (a) (n = 441). Items were reworded to reflect recoding.

	Vocational risk	*M*	*b*	*a*
1	Did not graduate high school (or GED)	.11	0.68***	0.89***
2	Not a HS graduate/GED, and not currently enrolled	.19	2.63***	0.86***
3	Never held a paying job	.19	3.04***	0.41***
4	Not in school, and not working	.10	5.83**	0.79**
5	Moved in last year	.34	3.04***	1.42***
	Alcohol risk			
6	Five drinks or more in a row	.41	0.35***	3.30***
7	Gets high or buzzed when drinking	.41	0.34***	3.55***
8	Can't get as buzzed as used to when drinking	.08	1.67***	2.55***
9	Can't stop drinking	.01	2.52***	2.49***
10	Goes to work or school drunk	.05	1.64***	4.15***
11	Ten or more drinks in row in last 2 weeks	.05	1.90***	2.66***
	Marijuana risk			
12	Gets very high	.15	1.25***	2.60***
13	Can't stop using marijuana	.05	1.91***	2.38***
14	Can't get as high as before with marijuana	.12	1.35***	2.98***
15	Goes to work or school high on marijuana	.20	0.97***	4.46***
16	Missing assignments, forgetting things due to marijuana	.06	1.74***	2.93***
	Illicit drug risk			
17	Gets very high	.08	1.41***	4.29***
18	Can't stop using illicit drugs	.01	1.96***	5.53†
19	Can't get as high as before with illicit drugs	.03	1.71***	6.25*
20	Goes to work or school high on illicit drugs	.03	1.77***	4.91**
21	Missing assignments, forgetting things due to illicit drugs	.01	1.92***	5.51†
22	Used illicit drugs in last 3 months	.21	0.99***	2.66***
23	Sought drug treatment	.02	2.17***	2.82***
	Sexual behavior risk			
24	Number of opposite sex partners greater than one	.10	1.77***	1.82***
25	Partner has sex with one or more others	.11	1.64***	1.84***
26	More than one opposite sex partner whom they don't know well	.09	1.76***	1.99***
27	More than one sex experience w/no condom	.29	1.78***	2.00***
28	Infrequent or no use of birth control during sex	.13	2.31***	0.95***
29	Condom use low	.21	1.25***	1.48***

	Vocational risk	*M*	*b*	*a*
30	Ten or more lifetime sex partners	.09	1.86***	1.75***
31	One or more same sex partners	.03	2.83***	1.59***
32	One or more same sex partner who have sex with others	.01	2.42***	2.83**
33	One or more same sex partner whom they don't know well	.01	3.90***	1.60***
34	Ten or more same sex partners lifetime	.01	3.54*	1.71
35	Condom use low with same sex partners	.01	4.44**	1.11**
36	same sex partner condom use low	.01	4.89**	0.95**
37	Do not use dental dam	.07	2.11***	1.69***
38	**Socio-emotional adjustment**			
43	Score in externalizing clinical range	.07	2.06***	1.78***
44	Score in internalizing clinical range	.14	1.77***	1.31***

Note.

*** $p < .001$;

** $p < .01$;

* $p < .05$;

† $p < .10$

Table 2

Means, Standard Deviations, Sample Size, and Bivariate Correlations Among Study Variables

Variable	1	2	3	4	5	6	7	8	9
1. Intent to Treat	---								
2. Sex (Boy)	.01	---							
3. Minority status	.01	−.05	---						
4. Depression	−.01	−.06	−.01	---					
5. Antisocial	.04	.10*	.17***	.24***	---				
6. Self-regulation G6	−.00	−.03	−.15***	−.38***	−.40***	---			
7. Self-regulation G7	.07	−.04	−.18***	−.31***	−.27***	.61***	---		
8. Young adult age	.13*	.06	.17**	.04	.11*	−.16**	−.08	---	
9. Young adult risk	−.03	.08	−.03	.06	.19***	−.10*	−.18***	.06	---
M	.65	.51	.64	1.84	1.19	3.63	3.46	20.01	5.40
SD	.48	.50	.48	.77	.37	.59	.58	.74	4.32
n	593	593	593	593	593	593	525	441	441

Note.

*** $p < .001$;

** $p < .01$;

* $p < .05$