Integrating emotion and cognition in the pathway from adolescent religiousness to risk taking

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ABSTRACT

Existing literature has demonstrated an association between higher adolescent religiousness and lower risk taking via higher self-regulation. However, the present study uniquely sought to elucidate whether particular dimensions of self-regulation (i.e., emotion regulation, effortful control, and executive function) play differential roles in establishing this relation. It was hypothesized in longitudinal analyses over one year that higher religiousness would be associated with higher emotion regulation, which in turn was hypothesized to be associated with higher effortful control and executive function, and, subsequently, higher effortful control and higher executive function to be associated with higher risk taking. Participants included 157 adolescents at Time 1 (mean age = 14 years, 52% male) and 140 adolescents returned for Time 2 (mean age = 15 years, 53% male). Structural equation models, including confirmatory factor analysis and path models tested significant individual paths and mediation via bias corrected bootstrapping supported hypotheses across multiple alternative models, except for hypotheses regarding mediation analyses, which received limited empirical support. The findings highlight that higher religiousness is associated with higher emotion regulation and, in turn, higher emotion regulation is associated with higher executive function and effortful control which, subsequently, are associated with lower adolescent risk taking. In light of this, religiousness is understood as a contextual protective factor for adolescents and intervention strategies targeting emotion regulation, executive function, and effortful control may be associated with lower adolescent risk taking.
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1.0 - Introduction

The developmental period of adolescence sees a marked increase in risk-taking behaviors. In line with the work of the Centers for Disease Control and Prevention (CDC) on the Youth Risk Behavior Surveillance System, adolescent risk taking is presently defined as behaviors which fit into the categories of 1) contributing to unintentional injuries and violence, 2) sexual behaviors contributing to unintended pregnancy and sexually transmitted diseases (STDs) 3) alcohol and other drug use 4) tobacco use 5) unhealthy dietary behaviors and 6) inadequate physical activity (CDC, 2015). Recent literature has identified neurobiological underpinnings for the spike in risky behaviors in adolescence. Specifically, Steinberg (2008, 2010) explored a dual systems model of adolescent risk taking which proposes two distinctly developing neurobiological systems, the socioemotional system associated with limbic and paralimbic areas of the brain and the system oriented towards control and regulation associated with the prefrontal and parietal cortices. This line of research indicates that the socioemotional system experiences a dramatic increase in dopaminergic activity which contributes to heightened reward seeking around the time of puberty, peaking around middle adolescence before declining in a curvilinear fashion. This development precedes the more gradual, linear maturation of the control system which develops over the course of adolescence. As a result, we see an earlier and more rapid development of the socioemotional system compared to a later and more gradual maturation of the cognitive control system. This distinctive period, therefore, creates an increase in vulnerability for risk taking, typically during middle adolescence, as a result of the differentially developing systems. Similarly, Casey, Jones, and Somerville (2011) proposed a neurobiological model of adolescent development with an imbalance of development between the limbic and prefrontal regions. Here too, limbic systems associated with emotion and reward
seeking mature before prefrontal regions associated with top-down control, resulting in risk susceptibility until the prefrontal regions are able to catch up in maturation later in adolescence.

These neurobiological developments are also coupled with the more normative and adjustive nature of risk taking and antisocial behavior during adolescence (Moffitt, 1993). Resultantly, it is unsurprising to find a surge in risk-taking behaviors during this developmental period. However, the consequences of such risk-taking behaviors may have lifelong consequences in the form of addiction, incarceration, and disease which pose a significant challenge to public health. For example, research indicates that substance use initiation typically begins between 13 and 14 years of age (Faden, 2006). Moreover, early initiation of substance use increases risk for later abuse (Grant & Dawson, 1997). Indeed, 75% of high school students report having engaged in addictive substance use (including alcohol, tobacco, and marijuana), with 20% of high school students already meeting the medical criteria for addiction (CDC, 2014; National Center on Addiction and Substance Abuse, 2011). Moreover, adolescents are vastly overrepresented in crime data relative to other age groups with 37% of all crimes committed by individuals between the ages of 13 and 24 (Federal Bureau of Investigation, 2013). Additionally, increased risky sexual behaviors during adolescence contribute to sexually transmitted disease and unwanted or unplanned pregnancy (CDC, 2000; Hardy & Raffaelli, 2003; Maynard, 1997).

Worse still, the developmental cascades theory (Masten & Cicchetti, 2010) indicates that these risky behaviors may have a cascading effect on health and development, contributing to even more severe and cumulative consequences, such as the impairment of neural structures and their function (e.g., Goldstein & Volkow, 2002). Taken together, the evidence has consistently indicated the crisis that adolescent risk taking poses for health and well-being. However, clear individual differences emerge in adolescent risk taking such that some adolescents are more
susceptible to risk taking than others. These differences provide a rich opportunity for researchers to identify pathways which contribute to or deter away from adolescent risk-taking behaviors. Given such an opportunity, the present study seeks to identify a pathway that deters risk taking in adolescence. As indicated by Steinberg (2014), adolescence is considered to begin earlier and end much later than previously thought, including more than just the teen years. As a result, in our review of past literature, we identify the ages of 10-25 to be inclusive of adolescence, which will therefore include most undergraduate university samples. In the current longitudinal study, we used a sample of adolescents to investigate the specific pathway involving religiousness → self-regulation → risk taking, but also uniquely elucidated the roles of specific domains of self-regulation (i.e., emotion regulation, effortful control, and executive function) based on the theoretical background established in the existing literature. By elucidating such a pathway, the findings may provide critical information for targeted prevention and intervention efforts in this vulnerable segment of the population.

1.1 - Religiousness and Risk Taking

In the present study, we define religion as the search for significance in the ways that are related to the sacred (Pargament, 2007). The nature of religiousness is best represented as a multidimensional construct typically comprised of three distinct, yet strongly correlated, dimensions, including organizational religiousness (e.g., religious service attendance), personal religiousness (e.g., importance of faith), and private practices (e.g., praying alone) (Holmes & Kim-Spoon, 2016). Previous literature in the field has made limited, yet growing, attempts to provide a theoretical framework associating adolescent religiousness with risk-taking behaviors. For example, social control theory (Hirschi & Stark, 1969; Smith, 2003) proposed that religious communities provide more oversight of children as parents and adults within the community are
familiar with each other and those who their children associate within the community. Moreover, religious communities create a more controlled environment for the child and allow him or her better access to positive adult role models of behavior, leading to a decrease in risky behaviors. Social control theory is best mapped on to the organizational dimension of religiousness, given that it requires community members to provide the social control.

In a similar way, divine interaction theory posits that believers may create a social relationship with a divine entity much in the same way as another human community member (Ellison, 1991). Rather than receiving guidance or oversight from other community members, the believer may instead seek out a divine entity for advice, comfort, meaning, and identity. As a result, the relationship functions to provide control in a way parallel to social control theory; however, the agent of control is divine rather than a human community member. In some sense, this relationship with the divine may even facilitate greater control over risky behaviors as the divine entity is usually considered all-knowing and ever-present (e.g., Norenzayan & Shariff, 2008), rather than limited in nature as are other humans in a religious community who may not always be in a position to exert social control. Divine interaction theory is most readily applicable to the personal dimension of religiousness, given that personal religiousness is most concerned with a personal relationship with a divine figure and does not necessitate other human community members. Similarly, private practices of religiousness also, to some extent, may be understood in terms of divine interaction theory, given that they represent volitional behaviors primarily seeking to promote personal relationship building with a divine figure such as prayers (i.e., communicating with the divine figure) and reading the scripture (i.e., learning about the divine figure). Moreover, they also occur outside of the context of an organized religious community. However, private practices also include aspects that may more readily be associated
with the development of self-regulatory abilities which are fostered through the self-discipline required to regularly engage in religious practices including the reading of religious texts and engaging in mindfulness rituals such as meditation (e.g., McCullough & Willoughby, 2009). Therefore, the dimensions of religiousness (organizational, personal, and private practices) stand on theoretical frameworks underpinning the relation of each with health behaviors.

Despite the relatively limited theoretical frameworks associating higher adolescent religiousness with lower risk taking, it remains that a vast amount of studies have empirically demonstrated this relation. In particular, substance use, including tobacco, alcohol, and other illicit drugs, has been identified as having a relation with religiousness across a robust range of studies (e.g., Brechting & Carlson, 2015; Desmond, Ulmer, & Bader, 2013; Jankowski, Hardy, Zamboanga, & Ham, 2013; Kim-Spoon, Longo, & Holmes, 2015; Mason & Spoth, 2011). Higher religiousness in adolescents has also been associated with lower risky sexual behaviors (for a review, see Hernadez, Mahoney, & Pargament, 2014). Additionally, higher religiousness has a demonstrated association with lower delinquent, antisocial, and criminal behaviors in adolescents (e.g., Johnson & Jang, 2010; Laird, Marks, & Marrero, 2011; Pirutinsky, 2014; Salas-Wright, Vaughn, Hodge, & Perron, 2012). Taken together, there is clear evidence showing that religiousness is negatively associated with a range of risk-taking behaviors in adolescence.

1.2 - The Mediating Role of Self-Regulation

Despite consistent findings associating higher adolescent religiousness with a broad range of risky behaviors, less can be said about how religiousness operates to deter risk taking (McCullough & Willoughby, 2009). However, recent literature has begun exploring a number of mediating factors that may play transactional roles in linking adolescent religiousness with risk taking (for a review, see Holmes & Kim-Spoon, 2016). One factor that has received increased
attention both theoretically and empirically is self-regulation. In the current study, we define self-regulation as the “primarily volitional cognitive and behavioral processes through which an individual maintains levels of emotional, motivational, and cognitive arousal that are conducive to positive adjustment and adaption” (Blair & Diamond, 2008, p. 900) and use self-regulation and self-control interchangeably. Theoretically, McCullough and Willoughby (2009) proposed that religiousness may be associated with a variety of health, well-being, and social behaviors due to religion’s influences on self-regulation. That is, religion functions to provide a critical avenue for self-regulatory development, including opportunities to engage in religious practices demanding of self-regulation such as prayer, attendance and participation at religious events, meditation, and fasting. By prescribing such obligations that require increased self-regulation, religion promotes self-regulation by training one’s self-regulatory abilities. Moreover, in accordance with social control theory and divine interaction theory, religion provides both supernatural and human agents to monitor behavior, which will further influence positive goal selection and increase motivation to accomplish these sometimes arduous, demanding goals and requirements. As such, adolescent religiousness may influence risk-taking behavior via self-regulation by providing an avenue for adolescents to develop self-regulatory abilities, which they may in turn employ to inhibit risky behaviors.

Considerable empirical evidence has supported this hypothesis. For example, a longitudinal study of adolescents demonstrated that higher self-regulation partially mediated the effect of higher religiousness on lower marijuana and alcohol use (Desmond et al., 2013). Similarly, higher religiousness was longitudinally associated with substance use through sequential mediation of religiousness → religious monitoring → self-monitoring → self-control → substance use in a sample of adolescents (Kim-Spoon, Farley, Holmes, Longo, &
McCullough, 2014). Moreover, higher religiousness had an indirect effect on lower substance use via higher self-regulation in separate samples of middle and high school students in a cross-sectional study (Walker, Ainette, Wills, & Mendoza, 2007). Higher religiousness was also associated with lower harmful and hazardous alcohol use mediated by higher self-regulation in a longitudinal sample of undergraduates (Dewall et al., 2014). The relation also extends to adolescent risk-taking behaviors beyond substance use, however. For example, Vazsonyi and Jenkins (2010) found that higher religiousness was associated with lower risky sexual behavior via higher self-regulation in a cross-sectional sample of undergraduates. Higher religiousness was also found to be longitudinally associated with lower criminal behaviors partially mediated by higher self-control in a sample of adolescents who had committed a serious criminal offense (Pirutinsky, 2014). Taken together, these and other similar studies on adolescents (e.g., Carter, McCullough, & Carver, 2012; Laird et al., 2011) consistently provide direct and indirect empirical evidence that higher religiousness in adolescence is associated with higher self-regulation which, in turn, is associated with an array of lower risk-taking behaviors.

1.3 - Untangling the Roles of Emotion Regulation, Effortful Control, and Executive Function

Despite the growing evidence for the role of self-regulation linking religiousness and risk taking in adolescence, critical questions remain in elucidating the nature of this pathway. One line of research that is ripe for future investigations is increasing the specificity of the domains of self-regulation and the different roles they play in this mediating process. To date, research exploring religiousness, self-regulation, and risk taking has focused on examining more global measures of self-regulation, reflecting a host of undifferentiated goal directed behaviors, typically including facets of emotion regulation, effortful control, and executive function mixed
together interchangeably. Although each represents a facet of self-regulation, the conceptualizations of emotion regulation, effortful control, and executive function demonstrate unique and distinguishable aspects of each which may play different roles in the overarching relation of religiousness, self-regulation, and risk taking.

Presently, emotion regulation is conceptualized as the ability to modulate one’s emotional arousal in order to engage with the environment at an optimal level (Kim & Cicchetti, 2010; Thompson, 1994). Such abilities underlie emotional self-awareness, socially appropriate emotional displays, and empathy/emotional understanding (e.g., Shields & Cicchetti, 1997). Next, effortful control carries a conceptualization distinct from emotion regulation and is defined as “temperament-based and refers to voluntary control over approach (activation) or withdrawal (inhibition) behavioral tendencies via attentional (shifting and focusing) and inhibitory control mechanisms” (Liew, 2012, p. 106; also see Eisenberg et al., 2005; Lengua, Bush, Long, Kovacs, & Trancik, 2008; Rothbart & Bates, 2006). Finally, researchers from the cognitive and neuroscience framework have described executive function as the “the ability to engage in deliberate, goal-directed thought and action via inhibitory control, attention shifting or cognitive flexibility, and working memory processes” (Liew, 2012, p. 106; also see Diamond, Barnett, Thomas & Munro, 2007; Garon, Bryson, & Smith, 2008; Miyake & Friedman, 2012; Zelazo, Craik, & Booth, 2004).

In particular, there is considerable conceptual overlap between effortful control and executive function (Bell & Deater-Deckard, 2007; Blair & Razza, 2007), leading many researchers to use the terms interchangeably. It is overtly evident that both constructs share certain fundamental properties. In particular, both constructs share elements of inhibitory control and attention, providing a clear indication that both constructs subserve similar
conceptualizations of more cognitively oriented self-regulation. However, despite this considerable amount of shared elements, there are also unshared elements making effortful control and executive function distinct. For example, although working memory is considered a primary facet of executive function, it does not possess quite the same importance in the literature on effortful control (Zhou, Chen, & Main, 2012). Given these distinctions, it is beneficial to view effortful control, executive function, and emotion regulation as separate, yet, complementary conceptualizations attempting to describe and measure an overarching construct of self-regulation.

Therefore, in the current study we consider self-regulation as emergent from emotion-regulation, effortful control and executive function with each making distinct contributions to the conceptualization of self-regulation. However, it is also important, given these unique and distinct contributions, to examine when these unique aspects of regulation create differential relations with other constructs. As such, when self-regulation is broken down into subdomains such as emotion regulation, executive function, and effortful control, there is reason to believe that religiousness is most directly associated with emotion regulation, which carries the load in the well demonstrated association between religiousness and self-regulation. As a result, when broken down into these subdomains, it may be seen that religiousness is associated only with emotion regulation and not the more cognitively oriented domains of executive function and effortful control. In turn, emotion regulation may still foster executive function and effortful control. This association may lead to indirect pathways from religiousness to executive function and effortful control through emotion regulation. Subsequently, executive function and effortful control may be the driving forces in associating higher self-regulation with lower risk taking.
Untangling this pathway requires exploring theoretical and empirical evidence for 1) religiousness → emotion regulation, 2) emotion regulation → effortful control and executive function and 3) effortful control and executive function → risk taking. First, we begin by exploring the pathway from religiousness to emotion regulation. As noted, literature to date has globally focused on more general self-regulation, but there is reason to believe this relation may be better characterized with specificity for emotion regulation. The relation between religiousness and emotion regulation extends to all three domains (i.e., private practices, organizational religiousness, and personal religiousness). For private practices, consider that prior theoretical work has proposed religion influences self-regulation through self-regulatory development via religious practices of, for example, prayer, meditation, and fasting (McCullough & Willoughby, 2009). Such practices propagate the development of emotion regulation. Prayer has been found to be used as a coping strategy for negative emotional states such as depression and anxiety in a longitudinal study (Koenig, George, & Siegler, 1988). Similarly, meditation is frequently employed to down regulate chaotic, stressful, panicked, or anxious emotions to more calming and serene emotional states and such findings have been observed in longitudinal experimental designs and clinical programs (e.g., Oman, Shapiro, Thoresen, & Plante, 2008; Peterson & Pbert, 1992). Even fasting contributes to the development of emotion regulation given the need to resist the taxing emotional state induced by hunger. Indeed, prior research has found that fasting during the Muslim period of Ramadan was associated with decreased blood glucose levels (Fazel, 1998) and observant fasters typically become more irritable and anxious during the period of Ramadan (Kadri, Tilane, El-Batal, Taltit, Tahiri, & Moussaoui, 2000), providing an ample need to develop emotion regulation. Furthermore, religious teachings and holy texts across almost all faith traditions frequently prescribe certain positive and health-
promoting emotional states such as gratitude, compassion, love, and contrition while proscribing or alleviating negative and health-demoting emotional states such as jealousy, anger, fear, and lust (e.g., Ellison & Levin, 1998).

For organizational religiousness, the attendance and participation requirements of religious services provide ministers, peers, and other members to help one cope with stressful life experiences and develop emotion regulation skills with the aid of a supportive community. Indeed, both theoretical and longitudinal empirical evidence has suggested the emotion-regulating benefits of organized religious participation (e.g., Graham & Haidt, 2010; McDougle, Konrath, Walk, & Handy, 2016). Furthermore, for personal religiousness, the highly meaningful personal relationship developed between the individual and the divine figure may act as a surrogate attachment figure or supportive entity to encourage emotion regulation development in a way similar to the function of human community members providing this support in organizational religiousness (Ellison, 1991). Taken together, it becomes evident that religiousness across the three domains of private practices, organizational religiousness, and personal religiousness particularly target the development of emotion regulation for a believer to remain in line with his or her faith.

Next we consider the pathways from emotion regulation to the more cognitively oriented domains of self-regulation, including effortful control and executive function. It is notable that extant literature has voiced a growing dissatisfaction with the hard divide created between emotional and cognitive processes (Sokol & Muller, 2007) and the lack of literature advancing the study of individual differences in self-regulation development (Blair, 2002). In light of this, more literature is beneficial to untangle and integrate these interwoven processes and, in doing so, much knowledge could be gained to inform the nature of the pathway from religiousness to
risk taking in adolescence. Previous literature has indicated that individual differences in emotion regulation directly influence cognitive regulation skills (e.g., Graziano, Reavis, Keane, & Calkins, 2007). Indeed, researchers have long acknowledged the roles of emotion and emotion-related processes in the functioning of component processes of cognitive regulation (Blair, 2002). As noted by Blair, previous literature has indicated that goal-directed activity in line with executive function and effortful control is dependent, to some degree, on emotional systems (Derryberry & Reed, 1994, 1996; Tucker & Derryberry, 1992). Specifically, Blair (2002) indicated that emotion regulation skills precede higher-order cognitive regulatory skills, such as working memory, attention, and planning, and that inefficient emotion regulation inhibits development of cognitive regulation.

This pathway from poor emotion regulation to poor cognitive regulation may stem from the individuals inability to attend to and retain tasks or information that would help develop cognitive skills, particularly when the information is presented in an emotionally arousing situation such as the classroom setting (e.g., Graziano et al., 2007). As such, higher emotion regulation would be associated with higher cognitive regulation. Graziano and colleagues supported this by demonstrating that higher parent reports on the emotion regulation subscale of the Emotion Regulation Checklist (Shields & Cicchetti, 1997) was associated with children’s higher performance on standardized tests measuring higher-order cognitive processes such as math and literacy. Taken together, there is theoretical and empirical evidence to suggest that emotion and cognitive regulatory processes are interwoven systems in need of careful integration when considering the full nature of self-regulation and that the development of cognitive regulation is to some extent subservient to the development of emotion regulation. Therefore, it
may be hypothesized that religiousness targets, specifically, emotion regulation which, in turn, promotes cognitive regulation.

Finally, we consider the pathway from cognitive regulation to risk taking in adolescence. It is evident that the ability to plan ahead, anticipate consequences, and inhibit certain behaviors is vital for the prevention of risky behaviors (e.g., Holmes & Kim-Spoon, in press B). It has been theorized by Giancola and Mezzich (2003) that poor cognitive regulation contributes to substance use problems. This has recently been supported by a study demonstrating a buffering effect of cognitive regulation between higher behavioral activation and earlier substance use onset and higher substance use severity in a sample of adolescence (Kim-Spoon et al., 2016). Similarly, a particular facet of cognitive regulation, working memory, was longitudinally associated with lower risk-taking behaviors in a sample of early adolescents (Romer et al., 2011). Poor cognitive regulation has also been linked to greater endorsement of risky activities, over-emphasis of the benefits of risky activities, and higher incidence of problems from excessive alcohol consumption in undergraduates (Magar, Phillips, & Hosie, 2008). Moreover, lower activity in the brain region implicated in cognitive regulation, the ACC, has been shown to be related to greater risk taking in adolescence (Eshel, Nelson, Blair, Pine, & Ernst, 2007). Taken together, there is robust evidence to suggest that cognitive regulation is a crucial component for the prevention of risk-taking behavior. Considering that adolescence is a developmental period with relatively immature cognitive regulatory abilities as noted previously (Casey et al., 2011; Steinberg, 2008; 2010), it is a particularly important period to consider when elucidating developmental pathways which may deter these risk-taking behaviors that may carry severe, lifelong consequences.

1.4 - The Present Study
The present longitudinal study sought to test the proposed pathway from adolescent religiousness to risk-taking behavior, mediated by self-regulation. However, the present study took a step further in trying to elucidate how particular facets of self-regulation (i.e., emotion regulation, effortful control, executive function) may function differentially. That is, prior theoretical and empirical research has indicated that religiousness primarily targets the development of emotion regulation and, in turn, emotion regulation is vital for the promotion of cognitive regulation. Subsequently, cognitive regulation underpins the ability to plan, anticipate consequences, and inhibit risky behaviors. Therefore we first tested whether emotion regulation, effortful control, and executive function can be seen as dimensions of the underlying construct of self-regulation using confirmatory factor analysis (CFA). Second, we hypothesized that higher religiousness at Time 1 would be associated with lower risk taking at Time 2 via higher self-regulation at Time 2. We tested this model first using the whole construct of self-regulation that integrates all three dimensions of emotion regulation, effortful control, and executive function. Next, we tested the three individual dimensions of the self-regulation construct (i.e., emotion regulation, executive function, and effortful control) at Time 2 to be used as parallel mediators in the pathway from religiousness at Time 1 to risk taking at Time 2 to evaluate whether the individual dimensions of self-regulation may function differentially as mediators. Given the theoretical evidence that religiousness particularly targets emotion regulation, our third hypothesis was that religiousness at Time 1 was more predominantly associated with emotion regulation at Time 2 compared to executive function at Time 2 and effortful control at Time 2.

A final model was then tested of sequential mediation of the pathways involving the following hypotheses. In light of the theoretical and empirical evidence suggesting individual differences in emotion regulation development influence development of cognitive regulation,
our fourth hypothesis was that higher religiousness at Time 1 was associated with higher emotion regulation at Time 1 and, in turn, higher emotion regulation at Time 1 was associated with higher executive function at Time 2 and higher effortful control at Time 2. Moreover, our fifth hypothesis, informed by previous literature indicating the association between more cognitively oriented self-regulation and risk taking, was that executive function at Time 2 and effortful control at Time 2 would be more predominantly related to risk taking at Time 2 compared to emotion regulation at Time 1. Taken together, we tested the pathway of religiousness at Time 1 → emotion regulation at Time 1 → executive function at Time 2 and effortful control at Time 2 → risk taking at Time 2. Finally, we sought to test supplemental models of this final model with individual dimensions of religiousness (i.e., organizational religiousness, personal religiousness, and private practices) at Time 1. Specifically, it was tested whether any particular aspect of religious attitude and behaviors was influential for self-regulation development and consequently risk taking among adolescents.
2.0 - Method

2.1 - Participants

At Time 1, participants included 157 adolescents (52% male) aged 13 to 14 years old ($M = 14.13, SD = 0.54$). Approximately 82% identified as White, 12% African American, and 6% other. For subsequent analyses, race was coded as either White (82%) or other (18%). The median family income fell in the range of $35,000 to $49,999 annually. About 67.5% identified as Protestant, 5% Catholic, 2.5% Jewish, 16% none, and 9% other. Approximately one year later for Time 2, 140 adolescents (53% male) returned aged 14 to 15 years old ($M = 15.05, SD = 0.54$). Characteristics for race/ethnicity, income, and religious affiliation were representative of the region in which the population was sampled (five counties, two cities; U.S. Census Bureau 2012).

Multivariate general linear modeling (GLM) analyses were used to determine if the 17 adolescents who did not return for Time 2 differed from the 140 adolescents who did return for Time 2 with regard to Time 1 demographic and study variables. Results indicated that adolescents who did not return for Time 2 did not significantly differ in race ($p = .56$), sex ($p = .50$), age ($p = .79$), income ($p = .51$), religiousness ($p = .29$), effortful control ($p = .77$), executive function ($p = .27$), emotion regulation ($p = .70$), or risk taking ($p = .80$) from adolescents who did return for Time 2.

2.2 - Procedures

Participants were recruited by diverse advertisement methods including flyers, recruitment letters, and e-mail distributions. Research assistants described the nature of the study to interested individuals over the telephone and invited them to participate. Data collection took place at
the university’s offices where adolescents and their primary caregivers were separately interviewed by trained research assistants and received monetary compensation for their participation in the study. All procedures were approved by the institutional review board of the university.

2.3 – Measures

**Religiousness.** Adolescents’ religiousness was measured at Time 1 and comprised of self-reports of organizational religiousness, personal religiousness, and private practices (Fetzer, 1999; Jessor & Jessor, 1977). A CFA estimated the structure of general religiousness with the three subscales of religiousness as indicators and the hypothesized model may be seen in Figure 1. The CFA was employed to generate factor scores of religiousness and these factor scores were used in the hypothesized models in order to preserve power, given the large number of parameter estimates that were required to fit the CFA. Organizational religiousness focused on formal religious participation and attendance. A typical item was “How often do you go to religious services?” and items were rated on a 6-point Likert scale ranging from “1 = More than once a week” to “6 = Never.” Personal religiousness focused on the importance of religion in one’s life. A typical item was “How important is religious faith in your life?” Items were rated on a 5-point Likert scale ranging from “1 = Very important” to “5 = Not at all important.” Finally, private practices focused on informal religious participation alone or with few other individuals. A typical item was “How often do you pray privately in places other than at church or synagogue?” and items were rated on an 8-point Likert scale ranging from “1 = More than once a day” to “8 = Never.” All responses were scored so that higher scores indicated higher religiousness. Reliability was calculated using Cronbach’s Alpha for the current sample.
Organizational religiousness had an alpha of .83, personal religiousness had an alpha of .96, and private practices had an alpha of .83.

**Emotion Regulation.** Emotion regulation was measured at Time 1 and Time 2 via self-reports on eight items from the Emotion Regulation subscale of the Emotion Regulation Checklist (Shields & Cicchetti, 1997). In order to remain consistent with the latent variable nature of the other measures, all eight items from the subscale were randomly divided into three parcels (e.g., Little, Rhemtulla, Gibson, & Schoemann, 2013) to serve as indicators of emotion regulation and the CFA may be seen in Figure 2. The CFA was used to generate factor scores for emotion regulation at Time 1 and Time 2. The purpose of this measure is to identify emotional processes that are important for adaptive regulation of the self, including socially appropriate emotional displays, empathy, and emotional self-awareness. A typical item was, “I can say when I am feeling sad, angry or mad, fearful or afraid,” and potential answers ranged from “1 = rarely/never” to “4 = always.” All responses were scored so that higher scores indicated higher emotion regulation. In the current sample, the alpha was .49 at Time 1 and .56 at Time 2 for the emotion regulation subscale.

Similarly to the methodology of Graziano and colleagues (2007), the lability/negativity subscale of the Emotion Regulation Checklist (Shields & Cicchetti, 1997) was also measured, but not included in the present study. As noted by Eisenberg and colleagues (1995, 2005), emotion regulation and reactivity/lability make unique, additive contributions to adjustment. Calkins (1994) also proposed a developmental pathway to emotion regulation that involves child’s behavioral traits, such as reactivity, and this theory has been empirically corroborated by longitudinal mediation models demonstrating that emotion regulation mediates the relation between lability and internalizing symptomatology, but that lability did not mediate the relation
between emotion regulation and internalizing symptomatology (Kim-Spoon, Cicchetti, & Rogosch, 2013). Additionally, other regulation-related measures used in the study indicated good control, whereas lability would indicate poor control, which may have different antecedents. As such, the lability subscale was not considered as an indicator of emotion regulation.

**Effortful control.** Effortful control was a latent variable at Time 2 comprised of self-reports on three subscales from the Early Adolescent Temperament Questionnaire (Capaldi & Rothbart, 1992), including activation control, inhibitory control, and attention control. A CFA was used to confirm factor structure and generate a factor score for subsequent analyses to preserve power (see Figure 3). The activation control subscale focused on the capacity to perform an action when there is a strong tendency to avoid it and a typical item was “I put off working on projects until right before they're due.” The inhibitory control subscale focused on the capacity to plan, and to suppress inappropriate responses and a typical item was “When someone tells me to stop doing something, it is easy for me to stop.” Finally, the attention control subscale focused on the capacity to focus attention and shift attention when desired and a typical item was “I find it hard to shift gears when I go from one class to another at school.” All items were answered on a Likert scale ranging from “1 = Almost always untrue,” to “5 = Almost always true.” All responses were scored so that higher scores indicated higher activation, inhibitory, or attention control. In the current sample, the alphas for adolescents’ self-reports were .75 for activation control, .51 for inhibitory control, and .60 for attention control.

**Executive function.** Executive function was a latent variable at Time 2 comprised of three behavioral indicators of working memory, updating/set shifting, and inhibitory control (i.e., Miyake & Friedman, 2012). A CFA was used to confirm factor structure and generate a factor score for subsequent analyses to preserve power (see Figure 4). First, working memory was
assessed via the Stanford-Binet Digit Span Task (Thorndike, Hagen, & Sattler, 1986). In this task, participants were audibly presented with series of increasingly long strings of digits and instructed to repeat the sequence back to the experimenter. In the first phase, the participants were instructed to repeat the sequence back to the experimenter in the same order in which they heard it. In the second phase, the participants were instructed to repeat the sequence back to the experimenter in the reverse order from which they heard it. The total score was calculated by subtracting the total number of items administered (forward plus backward) minus the total number of items failed (forward plus backward) and standardized by age. Higher scores were indicative of higher working memory.

Second, updating/set shifting was assessed via the Wisconsin Card Sort Task (WCST; Heaton & P.A.R. Staff, 2003). In this task, experimenters administered 64 computerized card sorting selections. Participants must identify the rule to properly sort the card (based on shape, color, or quantity) and successfully update and shift to the new sorting rules when they occur. Errors occur when the participant is unable to efficiently update to the new card sorting rules and perseverate with incorrect sorting rules. Higher scores were indicative of higher updating/set shifting. Third, inhibitory control was measured via the Multiple Source Interference Task (MSIT; Bush, Shin, Holmes, Rosen, & Vogt, 2003). The MSIT requires participants to indicate which of three numbers is different from the other two. In neutral conditions, target numbers were congruent with the numbers’ presented locations. In interference conditions, target numbers were incongruent with the target locations (e.g., 2 was in the third position). Consistent with previous reports (Bush et al., 2003), we found a significant MSIT interference effect (i.e., main effect of congruency) in both measures of task performance: in accuracy, $t(155) = -13.24, p < .001$, and in reaction time, $t(155) = 68.58, p < .001$. Following MacDonald, Karlsson,
Rieckmann, Nyberg, and Bäckman (2012), we used intraindividual variability in reaction time which was indexed as intraindividual standard deviations (ISDs) across correct response latency trials of interference conditions.

**Self-Regulation.** Self-regulation was a factor score at Time 2 comprised of the factors scores of effortful control, executive function, and emotion regulation. A second order CFA was attempted, however the model estimates did not converge, likely resulting from the large number of estimated parameters. However, the three latent variables were significantly correlated with one another (see Figure 5), and the CFA based on the three factor scores confirmed the common latent factor structure. Therefore, we generated a factor score for self-regulation comprised of the factor scores of emotion regulation, effortful control, and executive function and use this overall self-regulation factor score in subsequent analyses to preserve power (see Figure 6).

**Risk Taking.** Adolescent risk taking was measured at Time 1 and Time 2 via self-reports on an adaption of Things I Do (Conger & Elder, 1994). Of the 19 original items, 14 were selected that met the criteria of adolescent risk behavior as defined by the CDC (2015). These criteria included meeting one of the following six areas: 1) contributing to unintentional injuries and violence, 2) sexual behaviors contributing to unintended pregnancy and STDs 3) alcohol and other drug use 4) tobacco use 5) unhealthy dietary behaviors or 6) inadequate physical activity. Additionally, three items were removed due to a lack of variance in participant responses (item numbers 9, 10, and 17). The final 11 items may be seen in Appendix E. In order to remain consistent with the latent variable nature of the other measures, items from the subscale were randomly divided into three parcels (e.g., Little et al., 2013) to serve as indicators of risk taking. Separate CFAs were used to confirm factor structures and generate factor scores for risk taking at Time 1 and risk taking at Time 2 and these factor scores were used in subsequent analyses to
preserve power (see Figure 7). The measure focused on identifying frequency of adolescent risk-taking behaviors varying in severity. For example, typical items included “Ridden in a car without a seatbelt,” “Done something dangerous on a dare,” “Had a fist fight with another person,” and “Drunk a bottle or glass of beer or other alcohol.” The answer format was “0 = Not at all,” “1 = once or twice,” or “2 = more than twice.” All items were scored so that higher scores indicated higher risk taking. In the current sample, the alpha for was .67 at Time 1 and .62 at Time 2.

2.4 – Plan of Analysis

For all study variables, descriptive statistics were examined to determine normality of distributions and outliers. Skewness and kurtosis were examined for all variable distributions and acceptable levels were skewness less than 3 and kurtosis less than 10 (Kline, 2005) and multivariate outliers were identified via Mahalanobis Distance. Furthermore, general linear modeling was used to identify significant multivariate predictors of the endogenous variables among the demographic variables of age, sex, race, and total family income. Any demographic variables that were significant (\( p < .05 \)) using Wilks’ Lambda coefficients were used as covariates. The hypothesized models were tested via Structural Equation Modeling (SEM) using MPlus statistical software version 7.4 (Muthén & Muthén, 2012). Overall model fit indices were determined by \( \chi^2 \) value, degrees of freedom, corresponding \( p \)-value, Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI). RMSEA values of less than .05 were considered a close fit while values less than .08 were considered a reasonable fit (Browne & Cudeck, 1993), and CFI values of greater than .90 were considered an acceptable fit while values greater .95 were considered an excellent fit (Bentler, 1990). All statistical tests were two-tailed with alpha = .05. To test significance levels of mediated effects, asymptotic and
resampling strategies were used via the bootstrapping method with 1,000 iterations with bias corrected bootstrap estimations (i.e., Preacher & Hayes, 2008). Full information maximum likelihood (FIML) estimation procedures were used for missing data (Arbuckle, 1996).
3.0 - Results

3.1 - Preliminary Analyses

Descriptive statistics and bivariate correlations for individual components of the factor scores may be found in Table 1 and descriptive statistics and bivariate correlations for the factor scores may be found in Table 2. Data revealed all study variables were normally distributed with all skewness values less than three and all kurtosis values less than ten. Data also revealed seven multivariate outliers using Mahalanobis Distance; however, when models were tested with and without these cases the pattern of results did not change. As a result, no cases were removed from the final analyses. General linear modeling revealed that no demographic variables were significantly associated endogenous variables using Wilks’ Lambda (family income: Wilks’ Lambda = .65, \( p = .09 \), race: Wilks’ Lambda = .98, \( p = .51 \), age: Wilks’ Lambda = .97, \( p = .36 \), sex: Wilks’ Lambda = .66, \( p = .62 \)); therefore, no demographic variables were introduced to subsequent models as covariates. All CFAs had significant factor loadings and fully saturated fit indices (\( \chi^2 = 0.00, \ df = 0, \ p = \text{not calculated, CFI} = 1.00, \ RMSEA = \text{not calculated} \)). Additionally, the model displaying the correlation terms among the latent self-regulation dimensions of emotion regulation, executive function, and effortful control (Figure 5) had good fit (\( \chi^2 = 28.27, \ df = 24, \ p = .25, \ RMSEA = .03, \ CFI = .98 \)). Although all indicators for emotion regulation at Time 1 and risk taking at Time 1 and Time 2 loaded significantly in the CFAs, there must be a note of caution regarding the results of such analyses. That is, a random assignment parceling strategy assumes random error across the parceled items, but that may not necessarily be the case. Indeed, a close look at the correlations in Table 2 reveals that parcel 3 for risk taking at Time 2 is significantly correlated with each dimension of religiousness at Time 1, but no other
risk taking parcels are significantly correlated with these dimensions. This may indicate a systematic difference in the assumed random parceling strategy which may not be robust to further iterations of random parceling. However, for variables other than those related to religiousness at Time 1, the correlations across each parcel are more comparable. Therefore, there may be a systematic issue in the random parcels of risk taking at Time 2 and religiousness at Time 1, but this issue may not extend to other variables in the analyses. Furthermore, possible bias due to this issue with the random parceling was minimized in the current study because the factor score emerging from all three parcels was used instead of individual parcels.

Inspection of descriptive statistics indicated that levels of religiousness were relatively high and predominantly of a Protestant orientation, reflective of other studies sampling from the “Bible Belt” (e.g. Vazsonyi & Jenkins, 2010). Moreover, reports of the dimensions of self-regulation were comparable to other studies exploring the developmental period encompassing adolescence (e.g. Fitzgerald et al., 2010; Kim-Spoon et al., 2014; King, Lengua, & Monahan, 2013; Walker et al., 2007). Similar to other studies drawing from this region of Southwest Virginia (e.g. Holmes & Kim-Spoon, in press A), the current study was reflective of a low-risk community sample where clinical levels of risk taking are not typically observed. Therefore, the current findings may be primarily generalizable to populations which are similarly characterized by high religiousness and low frequencies and severity of adolescent risk taking.

3.2 - Hypothesis Testing

The preliminary model tested religiousness at Time 1 → self-regulation at Time 2 → risk taking at Time 2, such that self-regulation was the general construct comprised of the three individual domains (i.e., emotion regulation, effortful control, and executive function). This model estimated all possible pathways among study variables, thus model fit indices were fully
saturated (see Figure 8). The results indicated that higher religiousness at Time 1 was associated with higher self-regulation at Time 2 \((b = .08, SE = .03, p = .01)\). In turn, higher self-regulation at Time 2 was associated with lower risk taking at Time 2 \((b = -.04, SE = .02, p = .02)\). Higher risk taking at Time 1 was associated with higher risk taking at Time 2 \((b = .78, SE = .31, p = .01)\) and self-regulation at Time 2 \((b = -1.96, SE = 1.02, p = .05)\). Higher religiousness at Time 1 was not directly associated with lower risk taking at Time 2 \((b = -.01, SE = .01, p = .36)\) and religiousness at Time 1 and risk taking at Time 1 did not covary \((\sigma = -.01, SE = .01, p = .65)\).

Although individual mediation paths were significant, the bias corrected bootstrap test for mediation revealed that the mediation effect between religiousness at Time 1 and risk taking at Time 2 through self-regulation at Time 2, after controlling for Time 1 risk taking, was not significant \((b^* = -.03, p = .14)\).

In order to obtain fit indices of this preliminary model, non-significant paths that were not central to the current study’s hypotheses were then trimmed in line with recommendations by Little (2013). Therefore, the nonsignificant paths from religiousness at Time 1 to risk taking at Time 2 and between religiousness at Time 1 and risk taking at Time 1 were trimmed. The resulting model had excellent fit \((\chi^2 = .78, df = 1, p = .38, CFI = 1.00, RMSEA < .001)\). Moreover, the pattern of results compared to the fully saturated model did not meaningfully change and the standardized results were as follows: higher religiousness at Time 1 was associated with higher self-regulation at Time 2 \((b^* = .19, p = .01)\). In turn, higher self-regulation at Time 2 was associated with lower risk taking at Time 2 \((b^* = -.17, p = .01)\). Additionally, higher risk taking at Time 1 was associated with lower self-regulation at Time 2 \((b^* = -.18, p = .05)\) and higher risk taking at Time 2 \((b^* = .28, p = .01)\). The bias corrected bootstrap test for mediation effect between religiousness at Time 1 and risk taking at Time 2 through self-
regulation at Time 2, after controlling for Time 1 risk taking, was not significant ($b^* = -0.03, p = 0.12$).

Next, we broke down the self-regulation variable at Time 2 into its three individual indicators of emotion regulation at Time 2, effortful control at Time 2, and executive function at Time 2 and employed them as three parallel mediators between religiousness at Time 1 and risk taking at Time 2, while controlling for risk taking at Time 1 (see Figure 9). All possible pathways among study variables were tested, leaving the model fully saturated. Results indicated that higher religiousness at Time 1 was associated with higher emotion regulation at Time 2 ($b = 0.03, SE = 0.01, p = 0.01$), but it was not associated with effortful control at Time 2 ($b = 0.003, SE = 0.02, p = 0.88$), executive function at Time 2 ($b = 0.002, SE = 0.03, p = 0.94$), or risk taking at Time 2 ($b = -0.01, SE = 0.01, p = 0.22$). Higher effortful control at Time 2 was associated with lower risk taking at Time 2 ($b = -0.06, SE = 0.03, p = 0.04$) and higher executive function at Time 2 was marginally associated with lower risk taking at Time 2 ($b = -0.06, SE = 0.03, p = 0.07$). However, emotion regulation at Time 2 was not associated with risk taking at Time 2 ($b = -0.01, SE = 0.06, p = 0.87$).

Additionally, higher risk taking at Time 1 was associated with higher risk taking at Time 2 ($b = 0.75, SE = 0.30, p = 0.01$) and lower executive function at Time 2 ($b = -1.47, SE = 0.55, p = 0.01$). Risk taking at Time 1 was not associated with effortful control at Time 2 ($b = -0.40, SE = 0.53, p = 0.45$) or emotion regulation at Time 2 ($b = -0.54, SE = 0.34, p = 0.11$). Significant covariances were found between emotion regulation at Time 2 and effortful control at Time 2 ($\sigma = 0.04, SE = 0.01, p < 0.001$), emotion regulation at Time 2 and executive function at Time 2 ($\sigma = 0.04, SE = 0.01, p < 0.001$), and effortful control at Time 2 and executive function at Time 2 ($\sigma = 0.08, SE = 0.03, p = 0.001$). However, religiousness at Time 1 did not covary with risk taking at
Time 1 ($\sigma = -.01$, $SE = .01$, $p = .65$). The results of testing significance of mediation effects indicated that emotion regulation at Time 2 ($b^* = -.003$, $p = .88$), effortful control at Time 2 ($b^* = -.002$, $p = .89$), and executive function at Time 2 ($b^* = .001$, $p = .94$) did not significantly mediate the relation between religiousness at Time 1 and risk taking at Time 2 after controlling for risk taking at Time 1.

In order to obtain fit indices, non-significant paths that were not central to the current study’s hypotheses were then trimmed as previously described. Therefore, the paths from risk taking at Time 1 to effortful control at Time 1, risk taking at Time 1 to emotion regulation at Time 1, religiousness at Time 1 to risk taking at Time 2, and between religiousness at Time 1 and risk taking at Time 1 were trimmed. The resulting model had acceptable fit ($\chi^2 = 5.99$, $df = 3$, $p = .11$, CFI = .96, RMSEA = .08). Moreover, the pattern of results compared to the fully saturated model did not Meaningfully change and the standardized results were as follows: higher religiousness at Time 1 was associated with higher emotion regulation at Time 2 ($b^* = .22$, $p = .004$), but it was not associated with executive function at Time 2 ($b^* = .00$, $p = .96$) or effortful control at Time 2 ($b^* = .02$, $p = .85$). Higher effortful control at Time 2 was associated with lower risk taking at Time 2 ($b^* = -.14$, $p = .05$) and higher executive function at Time 2 was marginally associated with lower risk taking at Time 2 ($b^* = -.14$, $p = .08$). However, emotion regulation at Time 2 was not associated with risk taking at Time 2 ($b^* = -.04$, $p = .59$).

Furthermore, higher risk taking at Time 1 was associated with higher risk taking at Time 2 ($b^* = .27$, $p = .02$) and lower executive function at Time 2 ($b^* = -.16$, $p = .03$). Significant correlations were found between emotion regulation at Time 2 and effortful control at Time 2 ($r = .34$, $p < .001$), emotion regulation at Time 2 and executive function at Time 2 ($r = .29$, $p < .001$), and effortful control at Time 2 and executive function at Time 2 ($r = .29$, $p = .001$). The
results of testing significance of mediation effects indicated that emotion regulation at Time 2 ($b^* = -0.01, p = .62$), effortful control at Time 2 ($b^* = -0.002, p = .87$), and executive function at Time 2 ($b^* = .001, p = .96$) did not significantly mediate the relation between religiousness at Time 1 and risk taking at Time 2 after controlling for risk taking at Time 1.

Finally, a sequential mediation model was considered of religiousness at Time 1 → emotion regulation at Time 1 → effortful control at Time 2 and executive function at Time 2 → risk taking at Time 2 (see Figure 10). All possible pathways among study variables were tested, leaving the model fully saturated. Results indicated that higher religiousness at Time 1 was associated with higher emotion regulation at Time 1 ($b = .03, SE = .01, p = .003$). In turn, higher emotion regulation at Time 1 was associated with higher effortful control at Time 2 ($b = .50, SE = .19, p = .01$) and executive function at Time 2 ($b = .41, SE = .21, p = .05$). Subsequently, higher effortful control at Time 2 was associated with lower risk taking at Time 2 ($b = -.06, SE = .03, p = .03$) and higher executive function at Time 2 was associated with lower risk taking at Time 2 ($b = -.06, SE = .03, p = .05$). Higher religiousness at Time 1 was not associated with effortful control at Time 2 ($b = -.01, SE = .02, p = .65$), executive function at Time 2 ($b = -.01, SE = .02, p = .61$), or risk taking at Time 2 ($b = -.01, SE = .01, p = .17$). Emotion regulation at Time 1 was not associated with risk taking at Time 2 ($b = .02, SE = .09, p = .81$).

Additionally, higher risk taking at Time 1 was associated with higher risk taking at Time 2 ($b = .76, SE = .31, p = .01$) and lower executive function at Time 2 ($b = -1.33, SE = .55, p = .02$), but not associated with emotion regulation at Time 1 ($b = -.34, SE = .28, p = .22$) or effortful control at Time 2 ($b = -.23, SE = .55, p = .68$). Effortful control at Time 2 and executive function at Time 2 significantly covaried ($\sigma = .07, SE = .02, p = .003$), but religiousness at Time 1 and risk taking at Time 1 did not covary ($\sigma = -.01, SE = .01, p = .65$). Although individual
mediation paths were significant, the bias corrected bootstrap test for mediation revealed that the three-path mediation pathway involving religiousness at Time 1 → emotion regulation at Time 1 → effortful control at Time 2 → risk taking at Time 2 ($b^* = -.01, p = .16$) and the three-path mediation involving religiousness at Time 1 → emotion regulation at Time 1 → executive function at Time 2 → risk taking at Time 2 ($b^* = -.01, p = .25$) failed to reach the significance threshold.

In order to obtain fit indices, non-significant paths that were not central to the current study’s hypotheses were then trimmed as previously described. Therefore, the paths from risk taking at Time 1 to effortful control at Time 2, risk taking at Time 1 to emotion regulation at Time 2, religiousness at Time 1 to risk taking at Time 2, and between religiousness at Time 1 and risk taking at Time 1. The resulting model had acceptable fit ($\chi^2 = 4.49$, $df = 3$, $p = .21$, CFI = .97, RMSEA = .06). Moreover, the pattern of results compared to the fully saturated model did not meaningfully change and the standardized results were as follows: that higher religiousness at Time 1 was associated with higher emotion regulation at Time 1 ($b^* = .23, p = .002$). In turn, higher emotion regulation at Time 1 was associated with higher effortful control at Time 2 ($b^* = .22, p = .01$) and executive function at Time 2 ($b^* = .16, p = .05$). Subsequently, higher effortful control at Time 2 was associated with lower risk taking at Time 2 ($b^* = -.14, p = .04$) and higher executive function at Time 2 was marginally associated with lower risk taking at Time 2 ($b^* = -.15, p = .06$). Higher religiousness at Time 1 was not associated with effortful control at Time 2 ($b^* = -.04, p = .65$) or executive function at Time 2 ($b^* = -.04, p = .61$). Emotion regulation at Time 1 was not associated with risk taking at Time 2 ($b^* = .00, p = .98$).

Additionally, higher risk taking at Time 1 was associated with higher risk taking at Time 2 ($b^* = .27, p = .02$) and lower executive function at Time 2 ($b^* = -.18, p = .01$). Effortful control
at Time 2 and executive function at Time 2 were significantly correlated ($r = .27, p = .003$). The bias corrected bootstrap test for mediation revealed that the three-path mediation pathway involving religiousness at Time 1 $\rightarrow$ emotion regulation at Time 1 $\rightarrow$ effortful control at Time 2 $\rightarrow$ risk taking at Time 2 ($b^* = -.01, p = .15$) and the three-path mediation involving religiousness at Time 1 $\rightarrow$ emotion regulation at Time 1 $\rightarrow$ executive function at Time 2 $\rightarrow$ risk taking at Time 2 ($b^* = -.01, p = .24$) failed to reach the significance threshold.

Supplemental analyses of the fully saturated model of sequential mediators revealed that the significant relation between higher religiousness at Time 1 and higher emotion regulation at Time 1 held true for all three dimensions of religiousness ($b^* = .18, p = .01$ for organizational religiousness; $b^* = .19, p = .01$ for private religiousness; and $b^* = .27, p = .001$ for personal religiousness). Additionally, the nonsignificant relation between religiousness at Time 1 and effortful control at Time 2 ($b^* = -.08, p = .34$ for organizational religiousness; $b^* = .02, p = .80$ for private religiousness; and $b^* = -.09, p = .23$ for personal religiousness) and executive function at Time 2 ($b^* = -.04, p = .64$ for organizational religiousness; $b^* = -.04, p = .65$ for private religiousness; and $b^* = -.04, p = .62$ for personal religiousness) also held true across all three dimensions of religiousness. However, as with the model using general religiousness, the bias corrected bootstrap tests of mediation were nonsignificant from the individual dimensions of religiousness at Time 1 to risk taking at Time 2 ($b^* = -.004, p = .25$ through emotion regulation and executive function and $b^* = -.01, p = .16$ through emotion regulation and effortful control for organizational religiousness; $b^* = -.01, p = .29$ through emotion regulation and executive function and $b^* = -.01, p = .21$ through emotion regulation and effortful control for personal private practices; and $b^* = -.01, p = .23$ through emotion regulation and executive function and $b^* = -.01, p = .13$ through emotion regulation and effortful control for personal religiousness).
Furthermore, Fisher $r$-to-$z$ transformations were used to determine if the correlation coefficients between the individual dimensions of religiousness at Time 1 and emotion regulation at Time 1 were significantly different. Results revealed that personal religiousness at Time 1 and organizational religiousness at Time 1 were not significantly different in their respective relations with emotion regulation at Time 1 ($z = .73, p = .23$). Personal religiousness at Time 1 and private practices at Time 1 were also not significantly different in their respective relations with emotion regulation at Time 1 ($z = .71, p = .24$). Additionally, organizational religiousness at Time 1 and private practices at Time 1 were not significantly different in their respective relations with emotion regulation at Time 1 ($z = .03, p = .49$).
4.0 - Discussion

The current longitudinal study sought to untangle the relations among religiousness, self-regulation, and risk taking in adolescents. First, a general construct of self-regulation was examined comprised of emotion regulation, effortful control, and executive function and the CFA confirmed the underlying, general construct of self-regulation. This general construct was then explored in associating adolescent religiousness to risk taking behaviors. Next, the current study uniquely examined how emotion regulation, effortful control, and executive function differentially function in associating religiousness with risk taking. Indeed, this study distinctively sought to test whether religiousness was more predominantly associated with emotion regulation development and if, in turn, emotion regulation fostered cognitive regulation development (i.e., effortful control and executive function), which was subsequently associated with lower risk taking in adolescents. The present study also uniquely examined the relation of religiousness with task based cognitive-performance on measures of executive function.

Investigations such as these are particularly important to address given the need of exploring factors contributing to individual differences in self-regulation development for targeted prevention and intervention strategies of adolescent risk-taking behaviors.

The present study hypothesized that higher religiousness would be associated with lower risk taking via higher self-regulation. As seen in Figure 8, this hypothesis was partially supported given that individual path coefficients from higher religiousness to higher self-regulation and higher self-regulation to lower risk taking were independently significant. However, the bias corrected bootstrap test of mediation did not reach the conventional level of significance. This finding parallels a previous finding in which the individual pathways from higher adolescent religiousness to higher self-control and higher self-control to lower anti-social behaviors were
significant, but the overall indirect effects failed to reach significance (Laird et al., 2011). As noted by Laird and colleagues, such findings of significant individual paths but nonsignificant mediated effects may be explained by the relatively weak effect sizes in the model. Although a significant mediated effect is typically found in research exploring adolescent religiousness, self-control, and adjustment outcomes (e.g., DeWall et al., 2014; Pirutinsky, 2014; Walker et al., 2007), the discrepancy in the findings may result from differences in how self-regulation is measured. Indeed, Laird and colleagues measured poor self-control, whereas prior studies measured good self-control. Religiousness may work better at promoting good self-control rather than elevating poor self-control. Similarly, the current study measured self-regulation comprised of emotion regulation, executive function, and effortful control, whereas previous studies primarily focused on behavioral regulation skills. These differences may explain why the current study did not reach the commonly found conventional levels of significance in the mediated effects.

Another explanation may be that the current study and the study by Laird and colleagues lacked the statistical power to significantly detect the weak effects as a result of limited sample sizes ($n = 140$ in current study and $n = 166$ in the study by Laird and colleagues, 2011) and high complexity of the models tested relative to these sample sizes. Indeed, previous studies which found statistical significance for the same effects were much larger, allowing for better powered tests of complex mediated effects ($n = 582$ for Dewall and colleagues, 2014; $n = 1,354$ for Pirutinsky, 2014; and $n = 1,273$ for sample one & 812 for sample two for Walker and colleagues, 2007). Moreover, the standardized coefficients from higher religiousness to higher self-control and higher self-control to lower risk taking in the current sample closely resembled the small-to-medium effect sizes found in the studies showing statistically significant mediation effects. This
explanation is also supported by a simulation study which indicated for bias corrected bootstrap tests of mediation, individual path coefficients similar in magnitude to those in the present study would require a sample size of around 462 in order to reach the significance threshold (Fritz & MacKinnon, 2007).

Despite this discrepancy, the current study uniquely contributes to existing literature by looking at longitudinal changes in adolescent risk taking. Furthermore, the current study employed a comprehensive conceptualization of self-regulation considering its emotional and cognitive aspects. To our knowledge, no prior study has examined the link between adolescent religiousness and self-regulation dimensions involving emotion regulation, executive function, and effortful control. Additionally, the current study examined adolescent risk taking in a broader sense, including a variety of health-risk behaviors, whereas previous studies have focused exclusively on individual risk behaviors such as substance use or criminal behaviors. The current findings highlight that the role of self-regulation in linking adolescent religiousness to risk taking may depend on the aspects of self-regulation and that the mediated effects may be limited in size and thus arduous to detect without relatively large sample sizes.

Next, we hypothesized that higher religiousness was more predominantly associated with higher emotion regulation relative to effortful control or executive function. The results, as seen in Figure 9, supported this hypothesis. Indeed, higher religiousness at Time 1 was associated with higher emotion regulation at Time 2, but was not significantly associated with effortful control at Time 2 or executive function at Time 2. First, this finding that religiousness was associated with certain facets of self-regulation and not others provides discriminant validity for the separation of these constructs. Indeed, the current conceptualization of emotion regulation as underlying emotional self-awareness, socially appropriate emotional displays, and
empathy/emotional understanding (Shields & Cicchetti, 1997), clearly distinguishes itself from the other aspects of self-regulation studied, namely executive function and effortful control. Although the three aspects are moderately correlated with one another, and understandably so given that they have some degree of overlap under the umbrella of self-regulation, the present study provides evidence that the three aspects of self-regulation function differentially in the pathway from adolescent religiousness to risk taking and are thus best understood when considered individually rather than in unison.

Furthermore, the finding uniquely demonstrated in a longitudinal design which aspect of self-regulation religiousness targets, namely emotion regulation. Although, to the authors’ knowledge, this finding has not been previously demonstrated directly, many studies have provided indirect empirical and theoretical support of it. Indeed, previous studies have shown that religious private practices, such as prayer, meditation, and fasting, provide opportunity to practice and develop specifically emotion regulation skills, such as coping with depression or anxiety through prayer, down regulating stress and anxiety through meditation, or regulating irritability and anxiety while fasting (e.g., Kadri et al., 2000; Koenig et al., 1988; Oman et al., 2008; Peterson & Pbert, 1992). Similarly, organized participation in religion and development of personal, meaningful relationships with a divine entity provide sources for emotion regulation development through sharing of emotional burdens and providing supportive and nurturing attachment figures (Ellison, 1991; Graham & Haidt, 2010; McDougle et al., 2016). In light of this, our findings suggest religiousness as a critical factor for emotion regulation development. By encouraging adolescents with existing religious beliefs to fully participate in their faith, clinicians may be able to help bolster emotion regulation in adolescents with deficits in these skills. Similarly, adolescents without religious beliefs may still benefit from the knowledge
gained by this pathway, as the clinician may encourage emotional self-awareness, empathy, and socially appropriate emotional displays through quiet reflection, meditation, or participation in organized communities which do not necessarily have a religious affiliation.

The model of parallel mediators also showed that, in turn, higher effortful control at Time 2 significantly predicted lower risk taking at Time 2, higher executive function at Time 2 marginally predicted lower risk taking at Time 2, and emotion regulation did not significantly predicting risk taking at Time 2, after controlling for the direct effects from religiousness at Time 1 and risk taking at Time 1. Here, too, there may be an issue of power in which the marginally significant, small sized effect of executive function at Time 2 to risk taking at Time 2 was not large enough to be detected at the $p < .05$ threshold given the relatively limited sample size of the present study and the large number of parameter estimates in this model. Furthermore, the way in which all three facets of self-regulation at Time 2 were independently in competition for predicting variance in risk taking at Time 2, above and beyond the direct effects of religiousness at Time 1 and risk taking at Time 1, likely limited the size of the effect each of the three could have on risk taking at Time 2. Despite this, it may be interpreted that higher effortful control is associated with lower adolescent risk taking and it may be inconclusively interpreted that higher executive function is also associated with lower risk taking. The evidence, however, suggests that emotion regulation does not play a direct role in dissuading adolescent risk taking. This conclusion is corroborated by previous findings which showed more cognitively oriented self-regulation skills were associated with lower risk taking behaviors. For example, Romer and colleagues (2011) found that working memory, an indicator of executive function in the current study, was longitudinally associated with lower risk taking behavior. Taken together, it may be concluded that cognitively oriented domains of self-regulation (i.e., executive function and
effortful control) are more predominantly associated with risk taking in adolescents relative to emotion regulation.

Finally, the sequential mediators model (see Figure 10) sought to test the pathway from religiousness at Time 1 → emotion regulation at Time 1 → executive function at Time 2 and effortful control at Time 2 → risk taking at Time 2. In order to establish temporal precedence for emotion regulation development influencing executive function and effortful control development, emotion regulation was introduced in this model at Time 1 rather than Time 2, while retaining effortful control and executive function at Time 2. As with the previous model, higher religiousness at Time 1 was more predominantly associated with higher emotion regulation at Time 1 compared to executive function at Time 2 and effortful control at Time 2. This finding further corroborates the conclusion drawn from the parallel mediators model that religiousness particularly targets emotion regulation rather than more cognitively oriented facets of self-regulation.

Furthermore, this model made a unique contribution to the literature in demonstrating that higher emotion regulation at Time 1 was associated with higher executive function and higher effortful control at Time 2. This finding is consistent with the theoretical perspective that emotion regulation precedes cognitive regulation, including effortful control and executive function, and individual differences in emotion regulation promote or demote cognitive regulation development (Blair, 2002). Moreover, it corroborates the findings of Graziano and colleagues (2007) who found that individual differences in emotion regulation, conceptualized in the same way as the present study, were associated with individual differences in higher order cognitive processes underlying executive function and effortful control skills. Taken together, the present study contributes evidence in support of this extant literature in that inefficient
emotion regulation may inhibit development of cognitive regulation and thus emphasizes the
importance of emotion regulation for healthy development during adolescence given the critical
nature of executive function and effortful control for adjustment outcomes (e.g. Magar et al.,
2008; Romer et al., 2011).

Similar to the parallel mediators model, the importance of executive function and
effortful control for adjustment outcomes was seen in the sequential mediator model, as higher
executive function and higher effortful control were each independently associated with lower
risk taking. As a result, these findings support the hypothesis that the pathways linking
religiousness and risk taking through self-regulation may be best captured when accounting for
the effects of individual differences of emotion regulation on executive function and effortful
control, rather than when they are in direct competition. As noted, these findings corroborate the
work of Blair (2002) and Graziano and colleagues (2007) who indicated the role emotion
regulation plays in the later development of skills such as executive function and effortful
control.

Despite the independently significant pathways in this model, the mediation analyses of
this model similarly failed to reach the significance threshold, but were of the same direction and
comparable magnitude to similar studies exploring mediation of religiousness and adolescent
outcomes via self-regulation (e.g., DeWall et al., 2014; Pirutinsky, 2014; Walker et al., 2007). Here, too, the discrepancy between such studies and the present study may be differences in
conceptualization of self-regulation. While in the previous studies self-regulation is more
exclusively related to behavioral regulation skills, the present study included emotion regulation,
effortful control, and executive function. Moreover, these findings further demonstrate the small-
to-moderate effect that religiousness has on risk taking via emotion regulation, executive

39
function, and effortful control. Nevertheless, these moderate effects do not detract from the importance of the findings, given the highly significant clinical nature of adolescent risk taking. Indeed, even a small-to-moderate effect on behaviors with such severe consequences, including violence and substance abuse or addiction, is very important to consider for the healthy adjustment of individuals in a formative developmental period. Therefore, the current findings stresses the important roles of religiousness and self-regulation in the development of risk taking and further provide insight into factors which directly and indirectly prevent or deter adolescent risk taking (i.e., religiousness, emotion regulation, effortful control, and executive function). Moreover, effortful control and executive function were demonstrated as the proximal predictors of adolescent risk taking, indicating that prevention scientists may want to target these skills to deter risk taking among adolescents.

Finally, the supplemental analyses of this model demonstrated the relation between religiousness and emotion regulation held true no matter if the model utilized the general factor score of religiousness or any of the three domains of religiousness (organizational, personal, or private practices) independently. These findings provided yet further evidence that religiousness targets emotion regulation. Furthermore, these findings respectively support social control theory (Hirschi & Stark, 1969; Smith, 2003), divine interaction theory (Ellison, 1991), and the hypothesis that religious practices function to develop self-regulation (McCullough & Willoughby, 2009). Specifically, the association between specifically organizational religiousness and emotion regulation supports social control theory by demonstrating that religious attendance provides community support to aid in coping and emotion regulation development. Similarly, the association between specifically personal religiousness and emotion regulation supports divine interaction theory by demonstrating that a personal, meaningful
relationship with a divine entity may also function to promote emotion regulation through support of emotion regulation development via the divine entity. Finally, the association between specifically private practices and emotion regulation supports that hypothesis that religious practices promote emotion regulation by providing opportunities to practice and develop these skills. Furthermore, comparing the magnitude of the associations between self-regulation and the three individual dimensions of religiousness revealed no statistical differences, suggesting that each of the three dimensions is similarly associated with emotion regulation. As a result, it may be concluded that social control theory, divine interaction theory, and religiousness promoting practice of emotion regulation may each underlie unique qualities by which religiousness is associated with emotion regulation in a similar, positive way, with no particular dimension driving the association between overall religiousness and emotion regulation more than the others. Taken together, the current study provides evidence not only does superseding general religiousness promote emotion regulation, but each individual dimension similarly contributes to this relation.

4.1 - Limitations and Future Directions

However, the findings must be interpreted in light of the limitations of the current study. First, it is important to note that there may be some degree of method bias. Although the study as a whole uses multiple methods (self-report and behavioral tasks) to measure multiple dimensions of self-regulation, which may be seen as a strength of the current study, within each construct only one method was used (i.e., only behavioral tasks for executive function and only self-reports for the others). However, the behavioral tasks that were incorporated into the present study (i.e., MSIT, Wisconsin Card Sort Task, and Stanford-Binet Digit Span) formed a latent construct that was moderately correlated with the other self-report variables (see Table 1)
measuring expectedly related constructs (i.e., emotion regulation and effortful control), providing convergent validity. Additionally, having only two data points for testing mediation models, particularly the sequential mediation model, may be seen as leading to less rigorous inferences about these effects (Cole & Maxwell, 2003; Maxwell & Cole, 2007). While two data points certainly strengthens these inferences, the hypotheses at hand may be best tested when additional data points are available to examine change over time more fully. Moreover, because these are correlational analyses, directions of the effects could not be strictly tested. However, the present study was heavily grounded in prior theoretical and empirical work which helps mitigate this limitation. Finally, the present study lacks the ability to incorporate changes in attitudes towards risk taking, which previous studies have highlighted as playing a contributing role for adolescent risk taking (e.g., Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008). Indeed, previous literature has noted the way in which religiousness influences goal selection and sanctifies these goals to reinforce successful fulfillment of them (McCullough & Willoughby, 2009). Therefore, higher religiousness may, to some degree, be associated with lower risk taking by influencing the believers’ attitudes towards risk, rather than the behaviors in and of themselves. Future studies may therefore consider including measure of perceptions of risk taking to see how religiousness influences development and risk taking behaviors above and beyond changes in attitudes towards risk.

4.2 - Conclusions

Despite these limitations, the present makes important, unique contributions to the existing literature. For one, the current study partially corroborated previous studies which found significant or near significant mediating effects from religiousness to risk taking through self-regulation in adolescence. However, the current study did so with a distinct conceptualization of
self-regulation, including emotion regulation, executive function, and effortful control. Secondly, the current study may advance the field by uniquely showing that religiousness specifically targets emotion regulation, rather than self-regulation as a whole or other individual dimensions such as effortful control and executive function. This is an important distinction to consider when characterizing the clinical role religiousness may play in deterring adolescent risk taking. Rather than directly influencing executive function and effortful control, religiousness influences emotion regulation which, in turn, influences cognitive oriented aspects of self-regulation, including executive function and effortful control, which were subsequently associated with lower risk taking.

Moreover, the finding that higher emotion regulation is associated with higher executive function and higher effortful control helps to bolster a limited amount of existing literature positing that developmental individual differences in emotion regulation influence the development of cognitive regulation encompassing effortful control and executive function. In turn, the present study supports the hypothesis that effortful control and executive function play a role in deterring adolescent risk taking, potentially through a heightened ability to anticipate consequences, plan ahead, and inhibit risky behaviors. Taken together, the findings provide critical information for the targeted prevention and intervention efforts for adolescent risk taking by offering insight into factors, most proximally executive function and effortful control, which may deter this significant public health issue and further reduce subsequent lifelong difficulties such as addiction or incarceration.
References


Eisenberg, N., Sadovsky, A., Spinrad, T. L., Fabes, R. A., Losoya, S. H., Valiente, C., ... &


Koenig, H. G., George, L. K., & Siegler, I. C. (1988). The use of religion and other emotion-


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evidence from stroop and fluency tasks. Emotion, 2, 12-22. DOI:
10.1037/1528-3542.2.1.12

Pirutinsky, S. (2014). Does religiousness increase self-control and reduce criminal behavior?


Does adolescent risk taking imply weak executive function? A prospective study of relations between working memory performance, impulsivity, and risk taking in early adolescence. Developmental Science, 14, 1119-1133. DOI:
10.1111/j.1467-7687.2011.01061.x


10.1016/j.cogdev.2007.08.006


United States Census Bureau (2012). *American Community Survey*. Retrieved April 8,


Table 1.

Descriptive statistics and bivariate correlations of all components of study variables

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Note: T1 = Time 1, T2 = Time 2, EC = effortful control, EF = executive function

** p ≤ .01, * p ≤ .05
Table 1 (cont).

*Descriptive statistics and bivariate correlations of all components of study variables*

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Note: T1 = Time 1, T2 = Time 2, EC = effortful control, EF = executive function  
**p ≤ .01, *p ≤ .05
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Note: T1 = Time 1, T2 = Time 2, EC = effortful control, EF = executive function

** *p ≤ .01, * p ≤ .05
Table 2.

**Descriptive statistics and bivariate correlations of religiousness at Time 1, emotion regulation at Time 1, risk taking at Time 1, emotion regulation at Time 2, effortful control at Time 2, executive function at Time 2, and risk taking at Time 2.**

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<td>5. Effortful control T2</td>
<td>.02</td>
<td>.21**</td>
<td>-.06</td>
<td>.33**</td>
<td>-</td>
<td></td>
<td></td>
<td>.00 (.51)</td>
</tr>
<tr>
<td>6. Executive function T2</td>
<td>.00</td>
<td>.17*</td>
<td>-.20**</td>
<td>.30**</td>
<td>.30**</td>
<td>-</td>
<td></td>
<td>.00 (.56)</td>
</tr>
<tr>
<td>7. Risk Taking T2</td>
<td>-.11</td>
<td>-.09</td>
<td>.31**</td>
<td>-.17*</td>
<td>-.21**</td>
<td>-.25**</td>
<td>-</td>
<td>.00 (.22)</td>
</tr>
</tbody>
</table>

Note: T1 = Time 1, T2 = Time 2

** p ≤ .01, * p ≤ .05
Figure 1. Confirmatory factor analysis results of religiousness at Time 1 which was used to generate a factor score for subsequent analyses.

Note: Boldface indicates significance

** $p < .01$
Figure 2. Confirmatory factor analysis results of emotion regulation at Time 1 and Time 2 which were used to generate a factor score for subsequent analyses. 
Note: Time 1 on left, Time 2 on right, boldface indicates significance 

**p < .01
Figure 3. Confirmatory factor analysis results of effortful control at Time 2 which was used to generate a factor score for subsequent analyses.

Note: Boldface indicates significance

** p < .01
Figure 4. Confirmatory factor analysis results of executive function at Time 2 which was used to generate a factor score for subsequent analyses.

Note: Boldface indicates significance

** $p < .01$
Figure 5. Correlation terms among the latent variables of effortful control, executive function, and emotion regulation.

Note: Boldface indicates significance

** $p < .01$
Figure 6. Confirmatory factor analysis results of self-regulation at Time 2 which was used to generate a factor score for subsequent analyses.

Note: Boldface indicates significance

** p < .01
Figure 7. Confirmatory factor analysis results of emotion regulation at Time 1 and Time 2 which were used to generate a factor score for subsequent analyses.

Note: Time 1 on left, Time 2 on right, boldface indicates significance

** * p < .01
Figure 8. Structural equation modeling results of religiousness at Time 1, risk taking at Time 1, self-regulation at Time 2, and risk taking at Time 2.

Note: T1 = Time 1, T2 = Time 2, boldface indicates significance

** $p \leq .01$, * $p \leq .05$
Figure 9. Structural equation modeling results of religiousness at Time 1, risk taking at Time 1, effortful control at Time 2, emotion regulation at Time 2, executive function at Time 2, and risk taking at Time 2.

Note: T1 = Time 1, T2 = Time 2, boldface indicates significance

** $p \leq .01$, * $p \leq .05$, ^ $p = .07$
Figure 10. Structural equation modeling results of religiousness at Time 1, risk taking at Time 1, emotion regulation at Time 1, effortful control at Time 2, executive function at Time 2, and risk taking at Time 2.

Note: T1 = Time 1, T2 = Time 2, boldface indicates significance

** $p \leq .01$, * $p \leq .05$
Appendix A

Religiousness

Here are some statements that describe religious attitudes and practices. Please answer all questions as honestly as possible. For each question indicate the number that best describes your feelings and behaviors regarding religious experience.

1. What is your religion, if any?
   1) Protestant (e.g. Baptist, Methodist, Presbyterian, Lutheran)
   2) Roman Catholic
   3) Jewish
   4) Muslim
   5) None
   6) Other (Specify): ____________________________

2. To what extent do you consider yourself a religious person?
   1) Very religious
   2) Moderately religious
   3) Slightly religious
   4) Not religious at all

3. How often do you go to religious services?
   1) Several times a week
   2) Every week
   3) Nearly every week
   4) 2-3 times a month
   5) About once a month
   6) Several times a year
   7) About once or twice a year
   8) Less than once a year
   9) Never

4. Besides religious services, how often do you take part in other activities at a place of worship?
   1) Several times a week
   2) Every week
   3) Nearly every week
   4) 2-3 times a month
   5) About once a month
   6) Several times a year
   7) About once or twice a year
   8) Less than once a year
   9) Never
5. I enjoy attending activities held by my religious/spiritual group.
   1) Strongly disagree
   2) Disagree
   3) Somewhat disagree
   4) Neutral
   5) Somewhat agree
   6) Agree
   7) Strongly agree

6. How often do you pray privately in places other than at your place of worship (such as church or synagogue)?
   1) More than once a day
   2) Once a day
   3) A few times a week
   4) Once a week
   5) A few times a month
   6) Once a month
   7) Less than once a month
   8) Never

7. How often do you watch or listen to religious programs on TV, radio, or the internet?
   1) More than once a day
   2) Once a day
   3) A few times a week
   4) Once a week
   5) A few times a month
   6) Once a month
   7) Less than once a month
   8) Never

8. How often do you read your religious literature (such as the Bible)?
   1) More than once a day
   2) Once a day
   3) A few times a week
   4) Once a week
   5) A few times a month
   6) Once a month
   7) Less than once a month
   8) Never

9. How often do you pray (such as saying grace before or after meals)?
   1) At all meals
2) Once a day  
3) At least once a week  
4) Only on special occasions  
5) Never

10. How important is religious faith in your life?  
   1) Very important  
   2) Important  
   3) Somewhat important  
   4) Not too important  
   5) Not at all important

11. How important is it to believe in God?  
   1) Not at all important  
   2) A little important  
   3) Pretty important  
   4) Very important

12. How important is it to be able to rely on religious teachings when you have a problem?  
   1) Not at all important  
   2) A little important  
   3) Pretty important  
   4) Very important

13. How important is it to be able to turn to prayer when you’re facing a personal problem?  
   1) Not at all important  
   2) A little important  
   3) Pretty important  
   4) Very important

14. How important is it to rely on religious beliefs as a guide for day to day living?  
   1) Not at all important  
   2) A little important  
   3) Pretty important  
   4) Very important

15. How important is it to look to God for strength, support, and guidance when you deal with major problems in your life?  
   1) Not at all important  
   2) A little important  
   3) Pretty important  
   4) Very important
The following questions deal with the relationships you’ve had with the people at your place of worship (congregation).

16. How often do the people at your place of worship (congregation) make you feel loved or cared for?
   1) Very often
   2) Fairly often
   3) Once in a while
   4) Never
   5) Not applicable

17. How often do the people at your place of worship (congregation) listen to you talk about your private problems and concerns?
   1) Very often
   2) Fairly often
   3) Once in a while
   4) Never
   5) Not applicable

18. How often do the people at your place of worship (congregation) express interest and concerns in your well-being?
   1) Very often
   2) Fairly often
   3) Once in a while
   4) Never
   5) Not applicable
Appendix B

ERC

The following statements describe how people respond to different situations. Please select the number that best describes you. Be sure you give an answer for all the statements.

<table>
<thead>
<tr>
<th>Statement</th>
<th>1) Rarely/Never</th>
<th>2) Sometimes</th>
<th>3) Often</th>
<th>4) Almost always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am a cheerful person.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. I move quickly from a good mood to a bad mood.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I respond well (positively) to adults when they act friendly or neutral to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. I don’t get angry, worried, distressed, upset, or worked up when changing from one thing to another. I shift well from one activity to another.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. When I am emotionally upset or frustrated by something that happens, I start to feel better pretty quickly (I don’t stay sad or worried for a long time).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. I am easily frustrated.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I respond well (positively) when friends act friendly or neutral to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. It is easy for me to have an angry outburst or temper tantrums when I get angry.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I can wait to get something I really want.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. I like it when other people are upset (for example, I like teasing others or I laugh when another person gets hurt or punished).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. I don’t get carried away during exciting situations or too excited at the wrong time or place.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. I am whiny or clingy with adults.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1) Rarely/Never</td>
<td>2) Sometimes</td>
<td>3) Often</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------------------------------------</td>
<td>-----------------</td>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td>13.</td>
<td>I often bother other people because I am too active or too excited about something.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>14.</td>
<td>I get angry when adults set limits (tell me that I cannot do something).</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>15.</td>
<td>I can say when I am feeling sad, angry or mad, fearful or afraid.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>16.</td>
<td>I feel sad or I have no energy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>17.</td>
<td>I get too excited when trying to get other people to play or do things with me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>18.</td>
<td>I show very little feeling. People think I don’t have feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>19.</td>
<td>I act negatively (I get scared or speak to friends in an angry tone of voice) when my friends are acting neutral or trying to be friendly.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>20.</td>
<td>I do things without first thinking them through.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>21.</td>
<td>I show concern and understanding when others are upset or distressed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>22.</td>
<td>My excitement bothers other people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>23.</td>
<td>When friends are mean to me or treat me badly, I have normal negative feelings such as anger, fear or frustration.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>24.</td>
<td>I show negative feelings (anger, fear, or frustration) when I try to get someone to play or do something with me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Appendix C

EATQ-R

Directions

On the following page you will find a series of statements that people might use to describe themselves. The statements refer to a wide number of activities and attitudes.

For each statement, please circle the answer that best describes how true each statement is for you. There are no best answers. People are very different in how they feel about these statements. Please circle the first answer that comes to you.

You will use the following scale to describe how true or false a statement is about you:

<table>
<thead>
<tr>
<th>Circle number</th>
<th>If the statement is</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Almost always untrue of you</td>
</tr>
<tr>
<td>2</td>
<td>Usually untrue of you</td>
</tr>
<tr>
<td>3</td>
<td>Sometimes true, sometimes untrue of you</td>
</tr>
<tr>
<td>4</td>
<td>Usually true of you</td>
</tr>
<tr>
<td>5</td>
<td>Almost always true of you</td>
</tr>
</tbody>
</table>

NOTE: Please make certain to answer all questions.
<table>
<thead>
<tr>
<th>Statement</th>
<th>1: Almost always untrue</th>
<th>2: Usually untrue</th>
<th>3: Sometimes true, sometimes untrue</th>
<th>4: Usually true</th>
<th>5: Almost always true</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) It is easy for me to really concentrate on homework problems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2) I feel pretty happy most of the day.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3) I think it would be exciting to move to a new city.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4) If I’m mad at somebody, I tend to say things that I know will hurt their feelings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5) I have a hard time finishing things on time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6) I feel shy with kids of the opposite sex.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7) When I am angry, I throw or break things.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8) It's hard for me not to open presents before I’m supposed to.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9) My friends seem to enjoy themselves more than I do.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10) If I get really mad at someone, I might hit them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11) When someone tells me to stop doing something, it is easy for me to stop.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12) I feel shy about meeting new people.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13) I do something fun for a while before starting my homework, even when I’m not supposed to.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14) I wouldn’t like living in a really big city, even if it was safe.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15) It often takes very little to make me feel like crying.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16) I tend to be rude to people I don’t like.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17) It bothers me when I try to make a phone call and the line is busy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>How true is each statement for you?</td>
<td>1) Almost always untrue</td>
<td>2) Usually untrue</td>
<td>3) Sometimes true, sometimes untrue</td>
<td>4) Usually true</td>
<td>5) Almost always true</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------------------------</td>
<td>-------------------------</td>
<td>-------------------</td>
<td>------------------------------------</td>
<td>----------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>18) The more I try to stop myself from doing something I shouldn't, the more likely I am to do it.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>19) Skiing fast down a steep slope sounds scary to me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>20) I get sad more than other people realize.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>21) If I have a hard assignment to do, I get started right away.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>22) I get frightened riding with a person who likes to speed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>23) I find it hard to shift gears when I go from one class to another at school.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>24) I worry about my family when I’m not with them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>25) I get very upset if I want to do something and my parents won’t let me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>26) I get sad when a lot of things are going wrong.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>27) When trying to study, I have difficulty tuning out background noise and concentrating.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28) I finish my homework before the due date.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>29) I worry about getting into trouble.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>30) I am good at keeping track of several different things that are happening around me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>31) I would not be afraid to try a risky sport, like deep-sea diving.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>32) It’s easy for me to keep a secret.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>33) I am shy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>34) I am nervous of some of the kids at school who push people into lockers and throw your books around.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>How true is each statement for you?</td>
<td>1) Almost always untrue</td>
<td>2) Usually untrue</td>
<td>3) Sometimes true, sometimes untrue</td>
<td>4) Usually true</td>
<td>5) Almost always true</td>
</tr>
<tr>
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<td>-------------------------------</td>
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</tr>
<tr>
<td>35) I get irritated when I have to stop doing something that I am enjoying.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>36) I wouldn’t be afraid to try something like mountain climbing.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>37) I put off working on projects until right before they're due.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>38) When I’m really mad at a friend, I tend to explode at them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>39) I worry about my parent(s) dying or leaving me.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>40) I enjoy going places where there are big crowds and lots of excitement.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>41) I am not shy.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>42) I feel sad even when I should be enjoying myself, like at Christmas or on a trip.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>43) It really annoys me to wait in long lines.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>44) I feel scared when I enter a darkened room at home.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>45) I pick on people for no real reason.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>46) I pay close attention when someone tells me how to do something.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>47) I get very frustrated when I make a mistake in my school work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>48) I tend to get in the middle of one thing, then go off and do something else.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>49) It frustrates me if people interrupt me when I’m talking.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>50) I can stick with my plans and goals.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>51) I get upset if I’m not able to do a task really well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Appendix D

Respondent ID: Date: E:

TEST 8: MEMORY FOR DIGITS  (Item Book 3, Page 73)

<table>
<thead>
<tr>
<th>Entry Level</th>
<th>Sample Item</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digits Forward</td>
<td>I-Q</td>
<td>S1, S2</td>
</tr>
<tr>
<td></td>
<td>I-Q</td>
<td>S1, S2</td>
</tr>
<tr>
<td>Digits Reversed</td>
<td>I-Q</td>
<td>S1, S2</td>
</tr>
</tbody>
</table>

Record a "P" for each series repeated in correct order without error. Record an "F" for each series that is repeated incorrectly. The sample items are not counted in the raw score. Turn the page to administer Memory for Digits Reversed.

<table>
<thead>
<tr>
<th>Level</th>
<th>Item</th>
<th>Digits Forward</th>
<th>Level</th>
<th>Item</th>
<th>Digits Forward</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-Q</td>
<td>P / F</td>
<td>S1. 5-8</td>
<td>R</td>
<td>P / F</td>
<td>7. 2-8-3-5-9-4</td>
</tr>
<tr>
<td>I-Q</td>
<td>P / F</td>
<td>S2. 3-9</td>
<td>P / F</td>
<td>8. 7-1-9-5-4-3</td>
<td></td>
</tr>
<tr>
<td>I-K</td>
<td>P / F</td>
<td>1. 5-7-8</td>
<td>S</td>
<td>P / F</td>
<td>9. 3-5-9-6-8-4-7</td>
</tr>
<tr>
<td></td>
<td>P / F</td>
<td>2. 4-9-2</td>
<td>P / F</td>
<td>10. 2-8-5-1-4-6-9</td>
<td></td>
</tr>
<tr>
<td>L-M</td>
<td>P / F</td>
<td>3. 2-7-6-9</td>
<td>T</td>
<td>P / F</td>
<td>11. 7-3-9-6-8-1-4-2</td>
</tr>
<tr>
<td></td>
<td>P / F</td>
<td>4. 5-1-8-4</td>
<td>P / F</td>
<td>12. 2-5-1-7-3-5-9-6</td>
<td></td>
</tr>
<tr>
<td>N-Q</td>
<td>P / F</td>
<td>5. 3-1-8-3-9</td>
<td>U</td>
<td>P / F</td>
<td>13. 8-1-7-4-9-3-2-6-5</td>
</tr>
<tr>
<td></td>
<td>P / F</td>
<td>6. 4-8-3-7-2</td>
<td>P / F</td>
<td>14. 5-7-4-2-6-1-3-9-8</td>
<td></td>
</tr>
</tbody>
</table>

Enter item number of highest item administered.

Enter total number of attempted items failed.

Raw score (highest item minus total failed)

<table>
<thead>
<tr>
<th>Level</th>
<th>Item</th>
<th>Digits Reversed</th>
<th>Level</th>
<th>Item</th>
<th>Digits Reversed</th>
</tr>
</thead>
<tbody>
<tr>
<td>I-Q</td>
<td>P / F</td>
<td>S1. 2-4</td>
<td>S</td>
<td>P / F</td>
<td>7. 8-1-3-7-9</td>
</tr>
<tr>
<td>I-Q</td>
<td>P / F</td>
<td>S2. 7-1</td>
<td>P / F</td>
<td>8. 4-2-5-8-4</td>
<td></td>
</tr>
<tr>
<td>I-K</td>
<td>P / F</td>
<td>1. 6-3</td>
<td>T</td>
<td>P / F</td>
<td>9. 4-8-7-2-1-5</td>
</tr>
<tr>
<td></td>
<td>P / F</td>
<td>2. 4-9</td>
<td>P / F</td>
<td>10. 6-2-5-9-3-8</td>
<td></td>
</tr>
<tr>
<td>L-Q</td>
<td>P / F</td>
<td>3. 2-9-5</td>
<td>U</td>
<td>P / F</td>
<td>11. 1-8-4-2-5-9-3</td>
</tr>
<tr>
<td></td>
<td>P / F</td>
<td>4. 8-1-6</td>
<td>P / F</td>
<td>12. 4-7-3-9-6-1-2</td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>P / F</td>
<td>5. 8-5-2-6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P / F</td>
<td>6. 4-9-3-7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enter item number of highest item administered.

Total raw score (Digits Forward & Digits Reversed)

(minus) Enter total number of attempted items failed.

(equals) Raw score (highest item minus total failed)
These next questionnaires are about things you might do. Please answer truthfully. Your answers to the questions are confidential. Here is a list of things some kids might do.

After you read each statement, indicate how often you have done each thing: Never, Once or Twice, or More than Two Times IN THE PAST YEAR.

How many times in the past year have you ...

<table>
<thead>
<tr>
<th>Statement</th>
<th>Never (0)</th>
<th>Once or Twice (1)</th>
<th>More than Twice (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ridden in a car without a seatbelt</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2. Ridden on a bike without a helmet</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3. Done something dangerous on a dare</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4. Carried a weapon somewhere</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5. Threatened to beat up someone to make them do something</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6. Taken part in a gang fight</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7. Skipped school without permission</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8. Had a fist fight with another person</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9. Purposely set a fire in a building or in any other place</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10. Hurt an animal on purpose</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11. Smoked a cigarette or used tobacco</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12. Drunk a bottle or glass of beer or other alcohol</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13. Used or smoked marijuana, grass, pot, weed</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14. Taken or stolen something not yours worth a lot, like a video game</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15. Taken or stolen something not yours and worth little, like candy</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16. Gotten into someplace like a movie or game without paying</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>17. Run away from home</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18. Broken into a building to take or steal something</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19. Purposely damaged or destroyed property that wasn’t yours</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>