



Examining a new prosocial risk-taking scale in a longitudinal sample of ethnically diverse adolescents

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ABSTRACT

Introduction: This longitudinal study designed and tested the validity of a new measure of prosocial risk taking — risks that individuals take in order to help others.

Methods: The sample was racially and ethnically diverse adolescents in the rural Southeastern United States ($N = 867$; $Age = 12.82$ years, 10–14 years at Wave 1; 50% Girls, 33% White non-Latinx, 27% Latinx, 20% Black, 20% Mixed/Other race/ethnicity). Adolescents completed self-report measures of the new prosocial risk-taking scale at baseline and one- and two-year follow-ups.

Results: Confirmatory factor analysis demonstrated excellent model fit with a 6-item single factor score. Further, the scale demonstrated good test-retest reliability at one and two-year follow ups. The scale also demonstrated convergent validity, such that prosocial risk taking was positively correlated with prosocial tendencies, empathy, and sensation seeking, and negatively correlated with negative risk-taking behavior and risk tolerance. Finally, we found significant differences by race/ethnicity (but not by gender) in prosocial risk taking, which were not attributable to measurement invariance, and should be interpreted in the context of ongoing societal inequalities between youth.

Conclusions: The new Prosocial Risk-Taking Scale yielded reliable scores in our sample. It may be used in future research to investigate individual differences in adolescents' prosocial risk taking, developmental change in prosocial risk taking, and the significance of prosocial risk taking for adolescents' emotional and social adaptation.

1. Introduction

Adolescents demonstrate a remarkable capacity to help their peers — and may do so even when it involves personal risk to their own social reputation. For instance, an adolescent may speak up to defend their friend, or invite an unpopular classmate to participate in a group activity. This phenomenon — whereby adolescents take social risks in order to help others — was termed *prosocial risk taking* in a recent theoretical review paper (Do, Guassi Moreira, & Telzer, 2017). However, prosocial risk taking is only a theoretical and anecdotal construct, which researchers have suggested might exist based on observed correlations between risk taking and prosocial

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behavior (Armstrong-Carter, Do, et al., 2021; Blankenstein, Telzer, Do, Duijvenvoorde, & Crone, 2020). Prior studies have not been able to directly and empirically measure adolescents' prosocial risk taking, because there is currently no validated measure for this purpose. The current study addressed this methodological gap by designing, administering and testing the validity of a new measure of prosocial risk-taking behavior. We drew on a large, longitudinal sample of racially, ethnically, and socio-economically diverse adolescents. The new *Prosocial Risk-Taking Scale* represents added value to the field because it extends existing tools to measure risk taking (which do not capture prosocial behaviors) and prosocial behaviors (which do not capture risk taking). In this way, the new measure may facilitate empirical research to investigate the conceptual link between risk taking and prosocial behavior which has emerged in recent research (e.g., Armstrong-Carter, Do, et al., 2021; Blankenstein et al., 2020).

1.1. Theoretical foundation

Decades of research in developmental psychology have examined variability in adolescents' risk taking and prosocial behavior — two key features of adolescents' social development. Historically, risk taking and prosocial behavior were conceptualized as distinct, unrelated constructs, and examined in separate studies (Do, Moreira, & Telzer, 2017). Adolescents' risk-taking behavior was largely conceptualized as negative (e.g., compromising mental and physical health), although there is increasing recognition that risk-taking behavior can also have potential advantages and serve constructive personal functions (e.g., Duell & Steinberg, 2019; Patterson et al., 2019). In contrast, prosocial behavior has largely been conceptualized as positive, because it benefits others, with few or no drawbacks or risks.

Recently, researchers have theorized there may be entirely different form of risk taking — risk taking that is prosocial, because it is intended to help others (Do et al., 2017). Adolescents may take risks to help their peers even when doing so may pose risk to themselves in social, financial, health, or academic domains. This behavior has been termed “prosocial risk taking” (Do et al., 2017) and is distinct from positive risk taking, which focuses on individualized advantages for the self (Duell & Steinberg, 2019; Patterson et al., 2019). Recent empirical studies have shown that prosocial and risk-taking behaviors are positively associated with each other within days (Armstrong-Carter, Do, et al., 2021), within years (Blankenstein et al., 2020), and develop together over time (Armstrong-Carter et al., 2021). Given this evidence that risk taking and prosocial behavior are positively correlated, and the theoretical link between risk taking and prosocial behavior, more empirical research is needed to directly test whether prosocial risk taking is a distinct developmental construct that exhibits unique variability.

Prior studies which investigate the correlation between risk taking and prosocial behavior have been limited by existing methodology. Specifically, prior studies have not been able to directly and empirically measure prosocial risk-taking behavior, because there is currently no validated measure of prosocial risk taking. A measure which captures variability in adolescents' prosocial risk taking is a critical next step. Such a measure will equip researchers to investigate individual differences in prosocial risk taking and clarify the significance of prosocial risk taking for adolescents' adaptation and development. Further, since adolescence is a time of increased salience of peers, social reputations, and social identity development (Dahl, Allen, Wilbrecht, & Suleiman, 2018), prosocial actions which could incur social risks (e.g., risk of social reputation or standing) are perhaps particularly impactful and important to measure, compared to prosocial actions which could incur risks in other domains such as finance or academics.

1.2. Risk taking and prosocial behavior

To shed light on the validity of a new prosocial risk-taking measure, it is important to examine whether prosocial risk taking is associated with both prosocial and risk-taking behaviors. This approach can reveal important descriptive information and correlates of the new measure, and indicate the extent to which a new measure has convergent and discriminant validity with closely related constructs.

First, prosocial risk taking could be either positively or negatively correlated with general measures of prosocial behavior. On the one hand, adolescents who are more prosocial may take more prosocial risks, perhaps because they have closer relationships with their peers (Eisenberg, Spinrad, & Knafo-Noam, 2015) and are willing to help even given potential personal costs. Further, perspective-taking skills could support both prosocial behavior and prosocial risk taking, by enabling adolescents to view the situation from their peers' perspectives and identify opportunities to help their peers (Do, Prinstein, & Telzer, 2020). On the other hand, adolescents who are more prosocial in general may take fewer prosocial risks if risk-aversion supersedes their prosocial tendencies. For instance, highly prosocial adolescents may be more conscientious (Thielmann, Spadaro, & Balliet, 2020), and therefore inclined to follow social expectations and avoid risks even if those risks are prosocial. Alternatively, general prosocial behavior and prosocial risk taking could be uncorrelated with each other, if some individuals tend towards prosocial behavior when it does not involve personal risk, whereas other individuals tend towards prosocial behavior particularly when it involves risk. For instance, risk aversion may override considerations or desire to help others.

Prosocial risk taking could also be either positively or negatively associated with negative risk taking. On the one hand, adolescents who take more negative risks (e.g., alcohol use, drug use), may also take more prosocial risks, because they are highly inclined towards risk taking whether the context is negative or prosocial. Supporting this hypothesis, one study found that adolescents who took negative risks more frequently (e.g., drinking alcohol, cheating) also took more positive risks (e.g., trying new activities or a challenging new class), although the authors did not measure prosocial risk taking explicitly (Duell & Steinberg, 2020). Further, a meta-analysis revealed that dispositional risk-taking measured via laboratory tasks was positively associated with prosocial behavior (Thielmann et al., 2020). On the other hand, negative risk-taking behavior may be associated with fewer prosocial risk-taking behaviors, if adolescents are on average more motivated by their own self-interests rather than empathic concern for others.

1.3. Risk taking, prosocial behavior, empathy and sensation seeking

Investigating the extent to which prosocial risk taking is associated with other related social and emotional traits, such as empathy and sensation seeking, may further clarify the validity of a new prosocial risk-taking measure. Empathy promotes prosocial behavior (Eisenberg, VanSchyndel, & Spinrad, 2016), because youth who feel more concern for others attend more to others' emotions, attend less to their own emotions, and experience higher friendship quality (Overgaauw, Rieffe, Broekhof, Crone, & Güroğlu, 2017). Empathy could similarly promote prosocial risk taking, because adolescents are more likely to take risks in order to help others if high levels of empathy motivate them strongly.

Adolescents also differ in their levels of sensation seeking; that is their eagerness for new and novel experiences (Duell & Steinberg, 2020; Jensen, Weaver, Ivic, & Imboden, 2011). Sensation seeking has been positively linked with both risk-taking behaviors and prosocial tendencies in prior research (Crone & Dahl, 2012; Telzer, 2016; van Duijvenvoorde, Peters, Braams, & Crone, 2016). For instance, adolescents who are high in sensation seeking drink more alcohol and stay out late more often (Blankenstein et al., 2020; Braams, Peper, van der Heide, Peters, & Crone, 2016), but are also more likely to lend money to friends, help friends solve problems (Blankenstein et al., 2020) stand up for individual beliefs, and initiate new friendships (Duell & Steinberg, 2020). Further, adolescents' sensation seeking tendencies predicted negative and positive risk-taking equally strongly (Patterson et al., 2019). Sensation seeking may motivate adolescents to take risks in order to seek out new experiences, whether those risks are negative or prosocial. Together, this research suggests that adolescents who engage in more prosocial risk taking may experience greater empathy and sensation seeking tendencies.

1.4. Differences by gender, race and ethnicity

When testing any new empirical measure, it is important to investigate whether there is measurement invariance across different subsets of adolescents, including different racial/ethnic groups and genders (Boateng, Neilands, Frongillo, Melgar-Quinonez, & Young, 2018). This step is critical for identifying whether there is potential measurement bias which could yield misleading group differences (Boateng et al., 2018). Once measurement invariance has been established in a given sample, researchers can then examine mean-level differences between groups. Mean-level differences should be interpreted in the context of historical and ongoing societal processes which systematically disadvantage adolescents from historically marginalized groups (Benner et al., 2018).

Adolescents from different racial and ethnic groups may differ in their levels of prosocial risk taking due to differential socialization experiences. Specifically, prosocial risk-taking behaviors may be either encouraged or discouraged based on ongoing and historical biases. For instance, it is possible that youth from historically marginalized groups (e.g., Black and Latinx youth) engage in less prosocial risk taking because they face discrimination and may be perceived more negatively by peers and adults (Benner et al., 2018). White non-Latinx youth on average experience more societal privilege and may engage in relatively more prosocial risk taking. Alternatively, Black and Latinx youth may engage in relatively more prosocial risk taking, due to a positive cultural emphasis on community ties and the importance of close interpersonal connections and support networks (DeFreitas, 2019; Lozada, Jagers, Smith, Bañales, & Hope, 2017; Streit, Carlo, Knight, White, & Maiya, 2021; White-Johnson, 2012).

In the context of societal inequalities and processes, some prior studies suggest there may be group differences in levels of prosocial behavior and negative risk-taking behavior. Research on prosocial behavior has shown mixed results in terms of racial and ethnic differences (Armstrong-Carter & Telzer, 2021; Eisenberg et al., 2016). Some studies report higher levels of prosocial behavior among youth from historically marginalized racial and ethnic groups, whereas others do not find racial and ethnic differences in prosocial behavior (for a review, see Eisenberg et al., 2015). In terms of negative risk-taking behavior, several prior studies found higher levels of negative risk taking among White non-Latinx youth compared to Black and Latinx youth (e.g., Duell & Steinberg, 2020). In contrast, other studies found higher levels of negative risk taking among Black and Latinx compared to White non-Latinx youth, due to the stresses associated with experiencing discrimination (Benner et al., 2018). In terms of positive risk-taking behavior, one study found that White youth engaged in more positive risks compared to Black youth, who in turn engaged in more positive risks compared to Latinx youth (Duell & Steinberg, 2020). Investigating potential racial and ethnic differences in prosocial risk taking can help to shed light on inequalities between adolescents.

Societal biases may also contribute to mean-level differences in prosocial risk taking between girls and boys. Girls may be socialized to engage in more prosocial risk taking because they are expected to help peers more than boys (Rose & Asher, 2017), but girls could also be socialized to engage in less prosocial risk taking because they are expected to "behave" more compared to boys (Rose & Asher, 2017). Adolescent research has revealed significant gender differences in prosocial behavior (Eisenberg et al., 2015) and risk taking (Reniers, Murphy, Lin, Bartolomé, & Wood, 2016; Siraj, Najam, & Ghazal, 2021). Typically, adolescent girls show higher levels of prosocial behavior towards peers compared to boys (Eisenberg et al., 2015), whereas adolescent boys tend to take more risks compared to girls such as substance and alcohol use and risky driving (e.g., Reniers, et al., 2016; Siraj et al., 2021). In part, boys may show higher levels of risk taking compared to girls because most prior research on risk taking has focused on negative risk-taking behaviors (Nielson, Padilla-Walker, & Holmes, 2017). Illustrating this point, one prior study found that girls displayed higher levels of positive risk-taking behavior compared to boys (Duell & Steinberg, 2020). Given that girls tend to be more prosocial but boys tend to take more risks, this research raises the intriguing question whether girls or boys take more prosocial risks.

1.5. Current study

The goal of this study was to introduce a new measure: The *Prosocial Risk-Taking Scale* (PSRT). We focused on adolescence

specifically because it is a key developmental transition period marked by increasing risk taking behavior, and an increasing capacity to make meaningful, prosocial contributions to the lives of others (Fuligni, 2019). In our study, adolescents responded to the PSRT annually for three years starting at ages 10 to 14. First, we conducted confirmatory factor analysis with unitary and exploratory bifactor structures to establish the internal validity of this measure in our sample. Second, we established test-retest reliability using interclass correlations (ICCs) and bivariate correlations. Third, we established convergent validity via bivariate correlations with established measures of prosocial tendencies, negative risk-taking behavior, risk tolerance, empathy, and sensation seeking. Finally, we tested measurement invariance between groups of adolescents (i.e., gender, and race/ethnicity); we then examined gender and racial/ethnic differences in levels of PSRT, which should be interpreted in the context of ongoing social inequalities.

2. Methods

2.1. Participants

Participants were adolescents in three public middle schools in the U.S. rural southeast. The current study is drawn from a larger study of adolescents' social development, and focuses in particular on the PSRT measure which was administered. The original full sample had 924 participants; the current study is restricted to adolescents who completed the PSRT measure at least one year out of three years. Adolescents ($N = 867$ at Wave 1, $N = 776$ at Wave 2, $N = 743$ at Wave 3) responded to the PSRT once a year for three years, beginning in 2016. At the start of the study (Wave 1), the sample was 50.11% girls ($M_{\text{age}} = 12.82$ years; $SD = 0.52$, range 10–14) and racially and ethnically diverse (32.81% White non-Latinx, 27.21% Latinx, 19.82% Black, 20.16% Mixed or Other Race/Ethnicity). On average, students in the district came from families with low socio-economic status: 66.7%–72.1% were classified as economically disadvantaged according to school reports (Benner et al., 2018) and 69.5% were eligible for free or reduced-price lunch. Students in this district were randomly assigned to each of three middle schools.

2.2. Procedures

Data Collection. For recruitment, letters of consent were mailed to all caregivers of students, with an option to grant or deny consent for their child to participate in the study. Approximately 77% of families ($n = 1059$ families) returned signed forms; 88% ($n = 935$) of these gave consent for their child to participate, yielding a sample that represented 67.5% of the population in this diverse, low-income community. At Wave 1 (i.e., baseline; Winter 2016), assent and data were obtained using computer-assisted self-interviews administered by trained research staff in school. At wave 1, 924 adolescents attended data collection sessions. Of these participants, 867 had complete PSRT data (some participants did not complete all questionnaires due to time constraints). Accordingly, our analytical sample had 867 participants at Wave 1. Data were collected at three time points, each one year apart. 776 participated and had complete PSRT data at Wave 2, and 743 participated and had complete PSRT at Wave 3. Attrition over time was due to school absences, withdrawing from the study after parental consent, withdrawing from the school, or other unknown reasons. All procedures were approved by the university human subjects committee.

Focus Group for Survey Design. To inform the design of items for the Prosocial Risk-Taking Scale (PSRT), we conducted qualitative focus groups of adolescents before the quantitative data for this study was collected. There were two focus groups with a total of 14 adolescent boys in grades 6 to 8 (there were 7 participants in each of the two groups). All focus group participants were from diverse ethnic and cultural backgrounds: Black, Latinx, Asian. Specific numbers per group are not available because no self-report demographic measures were taken for the focus groups. Focus group participants were recruited from a local community program aimed at supporting middle school boys from ethnic minority backgrounds through graduation. Each focus group involved a 30-min facilitated discussion while participants were seated at a table. Two trained research assistants facilitated each focus group. To begin the discussion, research assistants asked general questions about how adolescents make decisions to help others. Next the research assistants asked the following questions which are most relevant for the current study: (1) "Do certain things make it harder or easier to help others? For example, being busy might be one reason that it might be harder to help"; (2) "Sometimes it might be risky to help someone else. For example, standing up to a bully who is hurting someone else can be risky for you because you might get in trouble, or look bad in front of your friends. Do you think teenagers usually help in these kinds of situations when it might be risky?" (3) "Can you think of other situations where it might be harder to help because there's some kind of risk?"; (4) "How often do you think teenagers face these kinds of situations?" Participants' verbal responses were transcribed and were used to help generate and refine the items on the PSRT, as described further in Measures. In particular, the aim was to make the items developmentally-appropriate and salient based on adolescents' voiced opinions and experiences.

2.3. Measures

Prosocial Risk Taking was measured at Waves 1, 2 and 3. Although the other variables (i.e., prosocial tendencies, negative risk-taking behavior, social risk tolerance, empathy and sensation seeking) were also administered at Waves 1, 2 and 3, this study focuses only on the Wave 1 measurements for these variables for the sake of parsimony.

Prosocial Risk Taking. Prosocial risk taking was assessed using a newly constructed measure called the Prosocial Risk-Taking Scale (PSRT). Participants were asked: "You will read about scenarios that some teenagers face and how they might act in that moment. Try to imagine what it would be like to be in their shoes. Please circle how likely you are to act in the same way for each scenario". Participants then responded to the items via a 5-point Likert-type scale ranging from "1 = Very unlikely" to "5 = Very likely". A total of 8 items were

chosen on the basis of prosocial risk-taking theory (Do et al., 2017), previously developed scales of adolescent interpersonal relationships and risk taking (Blais & Weber, 2006; LaFontana & Cillessen, 2010), and the focus group discussions with adolescents. Following the theoretical definition of PSRT (Do et al., 2017), all items had two features: (a) the action primarily benefitted another individual (i.e., peers, family, teacher) and (b) the action required incurring a cost or risk to oneself. We focused on social risks (rather than academic, health, financial or other risks) given the developmental salience of social risks and social evaluations during adolescence (Dahl et al., 2019). Pilot testing indicated that the target of help and risk domain of all items were developmentally appropriate and ecologically valid for adolescent participants. Table 1 displays the 8 items. As described in detail in the results, CFA indicated that only 6 out of the original 8 items were appropriate for inclusion in this measure. Accordingly, Table 1 is separated by “included items” (N = 6) and “excluded items” (N = 2). The measure was administered at all 3 waves and demonstrated good internal reliability at wave 1 (Omega = 0.80), wave 2 (Omega = 0.82) and wave 3 (Omega = 0.83). We used Omega to assess the internal reliability instead of Cronbach alpha because the psychometric assumptions needed to appropriately estimate Cronbach’s α are largely unrealistic in psychological self-report measures (Cortina, 1993; Graham, 2006), whereas Omega is more flexible (Hayes & Coutts, 2020).

Prosocial tendencies. To assess prosocial tendencies, we used the adolescent version of the Prosocial Tendencies Measure (Carlo, Hausmann, Christiansen, & Randall, 2003). At wave 1, participants completed 21 items by responding with a 5-point Likert-type scale ranging from “Does not describe me at all” to “Describes me greatly”. Example items included: “It is most fulfilling to me when I can comfort someone who is very distressed,” “I tend to help others particularly when they are emotionally distressed,” “One of the best things about doing charity work is that it looks good on my resume,” and “I prefer to donate money anonymously.” Negative items were reverse coded. We created a mean score of all items, with higher scores indicating that the adolescent was relatively more likely to engage in prosocial behavior (i.e., showed more prosocial tendencies); Omega = 0.87.

Negative risk-taking behavior. To assess adolescents’ negative risk-taking behavior, we used a self-report Health Risk Behavior measure adapted from the Youth Risk Behavior Surveillance System (Kann et al., 2000). At Wave 1, participants were asked “In the past year, how many days did you engage in each behavior?” Participants responded using a 10-point Likert-type scale ranging from “Zero days” to “Every day”. Specifically, there were 7 items “Smoke an e-cigarette”, “Smoke a cigarette”, “Drink at least one drink of alcohol”, “Drink enough to feel drunk”, “Smoke marijuana (pot/weed)”, “Use a prescription drug that you didn’t have a prescription for”, “Use crystal meth, cocaine, heroin, ecstasy, LSD, or PCP”. We created a mean score, with higher scores indicating more frequent negative risk-taking behavior; Omega = 0.70.

Risk tolerance. To assess adolescents’ social risk tolerance, we used the Domain Specific Risk Taking scale (DOSPRT; Blais & Weber, 2006; Figner, van Duijvenvoorde, Blankenstein, & Weber, 2015). We focused on the social and ethical risk subscales (and not the financial, health or recreation subscales) because prosocial risk-taking is inherently a social behavior which may involve ethical choices, and we wanted to isolate these features of risk tolerance. We combined several items from the social and ethical risk subscales. At Wave 1, participants were asked to indicate their “gut level assessment of how risky each situation or behavior is” for each of 6 statements using a 7-point Likert-type scale ranging from “Not at all Risky” to “Extremely Risky”. The original measure was adapted with minor language changes to clarify language for our participants. Specifically, the social risk subscale had 3 items: “Telling a friend that you disagree with their opinion”, “Telling your parent or teacher that you disagree with them about an important issue”, “Speaking out against a popular opinion at school”. The ethical subscale also had 3 items: “Dating someone else’s boyfriend or

Table 1
Items from the prosocial risk-taking scale.

Variable	Scenario
	You will read about scenarios that some teenagers face and how they might act in that moment. Try to imagine what it would be like to be in their shoes. Please circle how likely you are to act in the same way for each scenario: 1 = <i>Very unlikely</i> . 2 = <i>Unlikely</i> . 3 = <i>Somewhat likely</i> . 4 = <i>Likely</i> . 5 = <i>Very Likely</i> .
	Included items with significant factor loadings
1. Group project	You and your classmates are getting into groups for a project. An unpopular student asks you to work with her. You say yes, even though you risk your classmates judging you as uncool too.
2. Bullying	You notice some popular kids from school picking on another kid. You decide to step in and help the kid, even though you risk looking uncool or getting picked on yourself.
3. Gossiping	People at your school are talking behind another student’s back. You say that the other student might not like that and ask them to change the topic, even though they might start talking about you behind your back later.
4. Lonely classmate	You notice that a classmate always eats lunch by himself. You decide to sit with this classmate instead of your friends so he won’t feel so lonely, even though your friends might judge you.
5. Insecure friend	Your friend tells you she’s stopped eating because she feels fat. It seems serious, but no one else knows. You are very worried and you decide to let her parents know, even though you may lose your friend’s trust.
6. Teacher lecture	While in class, other students start talking and making jokes while the teacher is lecturing. You stick up for the teacher and tell the other students to quiet down, even if it makes you look uncool.
	Excluded items with non-significant factor loadings
Final exam	You are taking a final exam. Your friend has missed several classes and is worried she will fail. You let her copy your answers, even though you risk getting caught for cheating.
Dating	Your friend just started dating someone but his parents don’t approve. He lies to his parents by saying he’ll be going to your house, but will actually be going out on a date. When his parents call your house, you tell them he’s with you, even though you might get caught lying.

girlfriend”, “Passing off somebody else’s work as your own” and “Revealing a close friend’s secret to someone else”. We created a single mean score which included both social and the ethical subscales. We then reverse scored the measure, such that higher scores indicate the adolescent felt relatively more tolerant of social and ethical risks, and lower scores indicate the adolescent felt relatively more averse to social and ethical risks; Omega = 0.73.

Empathy. To assess empathy, we used the Interpersonal Reactivity Index (IRI) Empathy subscale (Davis, 1983). At Wave 1, participants were asked to indicate how well each of 7 statements described them. Participants responded via a 5-point Likert scale ranging from “Does not describe me at all” to “Describes me very well.” Specifically, the items were: “I often have tender, concerned feelings for people less fortunate than me”, “Sometimes I don’t feel very sorry for other people when they are having problems”, “When I see someone being taken advantage of, I feel kind of protective towards them”, “Other people’s troubles do not usually disturb me a great deal”, “When I see someone being treated unfairly, I sometimes do not feel very much pity for them”, “I am often quite touched by things that I see happen”, “I would describe myself as a pretty soft-hearted and sensitive person”. Negative items were reverse coded, and we created a mean score; Omega = 0.85.

Sensation seeking. To assess sensation seeking, we used the Sensation Seeking for Children scale (Jensen et al., 2011). At Wave 1, participants were asked to respond to 7 questions using a 5-point Likert-type scale ranging from “Strongly disagree” to “Strongly agree.” Example items include: “I’m the first one in my group of friends to try new things” and “If somebody dares me to do something, I do it.” We created a mean score; Omega = 0.77.

2.4. Statistical analysis

First, to establish the internal validity of the PSRT, we conducted confirmatory factor analysis (CFA) via structural equation modeling with Mplus 7 software (Muthén & Muthén, 2014). We hypothesized that there would be a single, unitary factor structure, but we tested both unitary and exploratory bifactor models to allow for both of these possibilities. Specifically, the exploratory bifactor model was designed to clarify whether there were two distinct factors associated with prosocial risk taking (e.g., prosocial risk taking which occurred in school contexts vs out of school contexts). We ran CFA models for each of the three waves separately, and found similar factor loadings for all three waves (as described further in Results). We assessed model fit by observing the chi-square significance test (significant outcomes should be noted, but allowed to continue), a comparative fit index (CFI) score above 0.90, a Tucker Lewis Index (TLI) above 0.90, and a root mean square error of approximation (RMSEA) score below 0.08 (Boateng et al., 2018). After the model fit was deemed acceptable factor loadings were assessed. Factor loadings were deemed acceptable if $b > 0.40$ (Boateng et al., 2018). As a part of the CFA, we tested measurement invariance between genders and race/ethnic groups as described further below. We ran all the remaining analyses using Stata (StataSE, Version 15.1.632).

Second, we conducted test-retest reliability using ICCs and bivariate correlations between PSRT measures at each wave. Third, we investigated convergent validity via bivariate correlations at Wave 1 between the PSRT and established measures: prosocial tendencies, negative risk-taking behavior, risk tolerance, empathy, and sensation seeking. Finally, after we established measurement invariance, we examined gender and racial/ethnic differences levels of PSRT at Wave 1. To compare mean-level values between genders and racial/ethnic groups (i.e., Black, White, and Latinx), we used a two-way ANOVA and probed significant group differences via Tukey’s Test for multiple comparisons.

3. Results

3.1. Confirmatory factor analysis

Table 1 displays the original 8 items which were administered. Our first step was to examine the content validity of the PSRT. We tested content validity using confirmatory factor analysis (CFA) via structural equation modeling with Mplus. Specifically, we ran CFA

Table 2

Standardized factor loadings for confirmatory factor analysis (CFA) at each wave. Two items were excluded at each wave due to non-significant factor loadings $b > 0.5$, $p < .05$.

		Wave 1			Wave 2			Wave 3		
		Factor Loading	SE	p	Factor Loading	SE	p	Factor Loading	SE	p
1	Group project	0.60	0.03	.00	0.61	0.04	.00	0.63	0.03	.00
2	Bullying	0.72	0.02	.00	0.73	0.03	.00	0.74	0.03	.00
3	Gossiping	0.72	0.03	.00	0.74	0.03	.00	0.74	0.03	.00
4	Lonely classmate	0.74	0.02	.00	0.74	0.02	.00	0.75	0.02	.00
5	Insecure friend	0.46	0.04	.00	0.54	0.03	.00	0.45	0.04	.00
6	Teacher lecture	0.52	0.03	.00	0.58	0.03	.00	0.52	0.04	.00
—		Value	p		Value	P		Value	p	
—		RMSEA	0.00	.99	0.02	.95		0.02	.93	
—		CFI	1.00	—	1.00	—		1.00	—	
—		TFI	1.00	—	1.00	—		0.99	—	
—		SRMR	0.01	—	0.02	—		0.02	—	

models for each of the three waves separately. We found similar factor loadings for all three waves. Accordingly, Table 2 displays the CFA results from Wave 1 as the primary results.

First, we tested a single (i.e., unitary) factor model for prosocial risk-taking behavior using the maximum likelihood parameter (MLR) estimator in Mplus. Specifically, we tested the loadings of all 8 items onto a hypothesized single latent variable. This initial model with all 8 items demonstrated poor model fit ($RMSEA = 0.09$, $CFI = 0.88$, $TLI = 0.82$). Moreover, the first two items had factor loadings $b < .10$ which were non-significant ($b = .03$, $p = .546$ and $b = .08$, $p = .082$). To improve model fit, we removed the first two items from the CFA (See Table 1 for more detail). We then tested the loadings of the 6 remaining items onto a new, single latent variable. As shown in Table 2 (with Wave 1 data), this final model demonstrated excellent fit ($RMSEA = 0.00$, $CFI = 1.00$, $TLI = 1.00$ with rounding).

Second, we tested whether removing any additional items would improve model fit. We found that removing additional items did not alter model fit ($RMSEA = 0.00$, and $CFI = 1.00$, $TLI = 1.00$ with rounding), so we retained all items to allow greater variability in the scale.

Third, we tested an exploratory bifactor model using the diagonally weighted least square (WLSMV) estimator in Mplus, using all 8 original items. We did not specify the factors a priori. The bifactor model did not improve model fit as the fit indices remained identical to the single factor model ($RMSEA = 0.00$, $CFI = 1.00$, $TLI = 1.00$). This analysis suggested that the single factor scale with 6 items produced valid scores in our sample (Boateng et al., 2018). In sum, the final model was a single factor which included 6 items (as shown in Table 1), which all had significant factor loadings ($b > .40$, $p < .05$), and demonstrated excellent fit. See Table 3 for the mean values of each item at Waves 1, 2 and 3. Fig. 1 displays the variability of the PSRT factor score at Wave 1.

3.2. Test – retest reliability

Our second goal was to establish the test-retest reliability using bivariate correlations and ICCs between PSRT measures at each wave. To provide preliminary insight about the cohesion of our items, we tested bivariate correlations between items, first *within* each wave, then *between* waves. Table 4 displays bivariate correlations between the items *within* each wave. The correlations between items ranged from $r = .22$ to $r = .56$, suggesting that items showed small to moderate correlations within each wave. Table 5 displays bivariate correlations of items *between* each wave (e.g., the extent to which adolescents’ responses on a given item was correlated in Wave 1 with their response on the same item in Wave 2). The correlations between items ranged from $r = .25$ to $r = .46$, suggesting that items also showed small to moderate correlations between years. All correlations were statistically significant at $p < .001$.

Next, we tested ICCs, first across *all three* waves, then between each wave and *one* other wave (e.g., an individual adolescents’ PSRT value in Wave 1, compared to their PSRT value in Wave 2). On average across all three waves, PSRT measurements showed adequate test-retest reliability ($ICC = 0.73$). Measurements were correlated within the same individual between Waves 1 and 2 ($ICC = 0.63$), between Waves 2 and 3 ($ICC = 0.72$), and between Waves 1 and 3 ($ICC = 0.57$). These ICCs suggest that prosocial risk taking was relatively stable across the course of three years.

3.3. Convergent validity

Our third goal was to establish the convergent validity between the PSRT and theoretically-related constructs. Specifically, we tested how PSRT at Wave 1 was correlated with prosocial tendencies, empathy, sensation seeking, risk tolerance, and negative risk-taking behavior at Wave 1. Table 6 displays bivariate correlations between the PSRT and these other measures. At Wave 1, PSRT was correlated positively with prosocial tendencies, empathy, and sensation seeking. PSRT was correlated negatively with risk tolerance and negative risk-taking behavior.

3.4. Differences by gender, race, and ethnicity

Our final goal was to examine gender and racial/ethnic differences in average levels of PSRT at Wave 1. As a necessary prerequisite before testing group differences, we tested whether there was measurement invariance, in order to determine whether the single factor was congruent across gender and race/ethnicity groups (Boateng et al., 2018). Specifically, we used a fixed factor method of configural invariance (Little, 2013), which successively compares nested models of configural, weak, and strong group invariant models. The first

Table 3
Descriptive statistics for each prosocial risk taking (PSRT) scale item by wave. Higher values are more frequent tendencies.

	Wave 1		Wave 2		Wave 3		Min	Max
	M	SD	M	SD	M	SD		
Group project	3.23	1.46	3.55	1.30	3.64	1.26	1	5
Bullying	3.45	1.36	3.60	1.26	3.54	1.20	1	5
Gossiping	2.98	1.39	3.23	1.26	3.17	1.18	1	5
Lonely classmate	2.97	1.40	3.07	1.26	3.15	1.24	1	5
Insecure friend	2.96	1.47	3.45	1.36	3.65	1.25	1	5
Teacher lecture	2.73	1.40	2.85	1.35	2.86	1.30	1	5
Observations (N)	867		798		767			

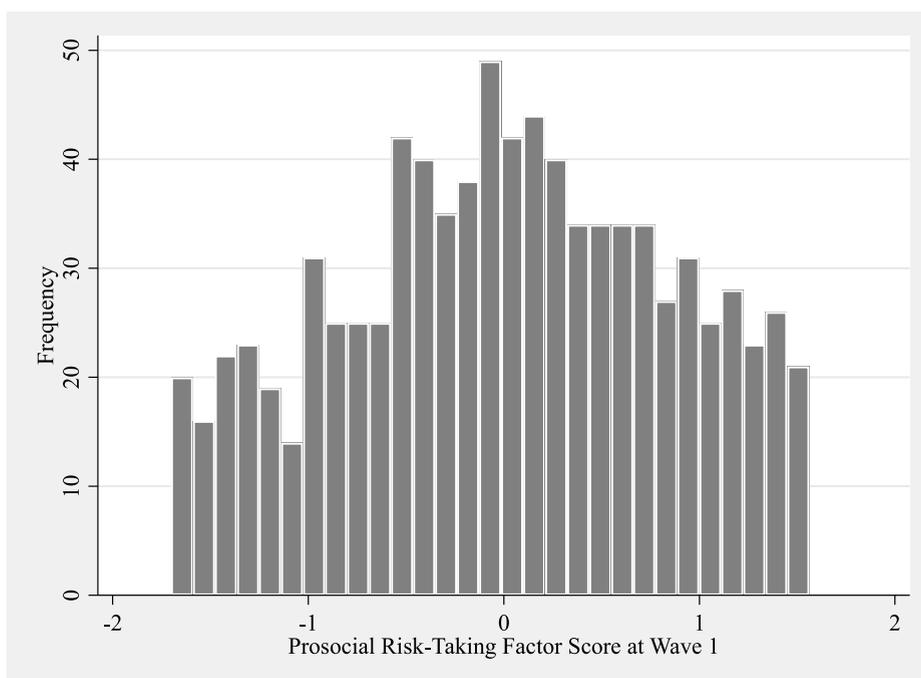


Fig. 1. Distribution of prosocial risk-taking factor scores at wave 1.

Table 4

Correlations of items within each wave.

Wave 2 (above diagonal)			1	2	3	4	5	6
Wave 1(below diagonal)	1	Group project	–	0.44**	0.44**	0.46**	0.38**	0.32**
	2	Bullying	0.43**	–	0.53**	0.56**	0.37**	0.43**
	3	Gossiping	0.44**	0.52**	–	0.55**	0.41**	0.45**
	4	Lonely classmate	0.46**	0.52**	0.52**	–	0.38**	0.40**
	5	Insecure friend	0.29**	0.32**	0.33**	0.33**	–	0.30**
	6	Teacher lecture	0.26**	0.38**	0.37**	0.39**	0.28**	–
Wave 3			1	2	3	4	5	6
Wave 3(below diagonal)	1	Group project	–					
	2	Bullying	0.45**	–				
	3	Gossiping	0.47**	0.55**	–			
	4	Lonely classmate	0.49**	0.54**	0.56**	–		
	5	Insecure friend	0.36**	0.30**	0.35**	0.34**	–	
	6	Teacher lecture	0.29**	0.42**	0.39**	0.39**	0.22**	–

Table 5

Correlations of items between each wave. All correlations in this table are statistically significant at $p < .001$.

		Correlation		
		R		
		Wave 1 & Wave 2	Wave 1 & Wave 3	Wave 2 & Wave 3
1	Group project	.33	.25	.37
2	Bullying	.26	.28	.46
3	Gossiping	.27	.27	.37
4	Lonely classmate	.38	.31	.45
5	Insecure friend	.37	.34	.40
6	Teacher lecture	.34	.28	.46

Table 6
Bivariate correlations between the prosocial risk-taking scale and other measures at Wave 1.

		1	2	3	4	5	6
1	Prosocial Risk-Taking Scale (PSRT)	1					
2	Prosocial Tendencies Subscale	0.46***	1				
3	Empathy Subscale	0.43***	0.44***	1			
4	Sensation Seeking	0.11***	0.15***	0.09***	1		
5	Risk Tolerance	−0.29***	−0.32***	−0.39***	−0.09***	1	
6	Negative Risk-Taking Behavior	−0.09**	−0.05	−0.15***	0.13***	0.11***	1

Note: ***p* < .001. ****p* < .008 because given the 6 measures, a corrected *p* value would be .008 (.05 divided by 6).

model tested invariance by race/ethnicity, and revealed that the single factor was invariant across race/ethnicity groups in our sample (*RMSEA* = 0.03, *CFI* = 0.99, *TLI* = 0.99, *p* = .20). The second model tested invariance by gender, and revealed that the single factor was invariant for boys and girls in our sample (*RMSEA* = 0.00, *CFI* = 1.00, *TLI* = 1.00; *p* = .70). These results suggest that the single factor score operated similarly across demographic groups in our sample.

Given that the CFA revealed measurement invariance between gender and race/ethnicity groups, we next examined mean-level differences between boys and girls and between White, Latinx, and Black youth. We did not examine mean-level differences with the Mixed/Other Race/Ethnicity group (*N* = 181), due to the heterogeneity of this group. Table 7 displays descriptive statistics and group differences in the mean levels of PSRT. First, we conducted a two-way ANOVA with gender and race/ethnicity as the two between-subjects factors predicting mean levels of PSRT. The two-way ANOVA indicated there was a statistically significant difference in mean levels of PSRT between at least two Race/Ethnicity groups (*F*(7,857) = [6.42], *p* = .003), but not between gender groups (*p* = .368) or in the interaction between gender and Race/Ethnicity groups (*p* = .717). Tukey’s Test for multiple comparisons revealed that the mean value of PSRT was significantly different between White non-Latinx adolescents compared to Latinx adolescents (*F*(3,863) = −0.31, *SE* = 0.08, *p* = .001), and between White non-Latinx compared to Black adolescents (*F*(3,863) = 0.23, *SE* = 0.08, *p* = .022). Specifically, White non-Latinx adolescents reported significantly higher levels of PSRT (*M* = 0.16, *SD* = 0.79) compared to Latinx (*M* = −0.15, *SD* = 0.81) and Black adolescents (*M* = −0.07, *SD* = 0.88). There were no other racial/ethnic differences.

4. Discussion

The goal of this study was to design and assess the validity of a self-report measure of prosocial risk taking that can facilitate future research on this topic. Developmental psychologists have hypothesized that adolescents take risks in order to help others — that is, they engage in prosocial risk taking. However, the field lacks a measurement tool to directly assess variability in prosocial risk taking. Prosocial risk taking as only been theorized to exist based on observed positive correlations between risk taking and prosocial behaviors (Do et al., 2017). We administered a new scale of prosocial risk taking in a large, longitudinal sample of racially and ethnically diverse adolescents in rural low socio-economic status community over the course of three years. We found that a single factor score for prosocial risk taking demonstrated excellent internal reliability and good test-retest reliability. Further, the new measure exhibited convergent validity with existing measures of related constructs (i.e., prosocial behavior, risk taking, risk tolerance, empathy, and sensation seeking), and demonstrated measurement invariance across gender and racial/ethnic groups. Together, our findings indicate this scale produced valid scores in our sample, and may be applied to future research samples to advance the empirical understanding of adolescents’ prosocial risk-taking behaviors.

4.1. The reliability and validity of prosocial risk-taking scale in our sample

First, we found that the prosocial risk-taking measure showed excellent model fit with a single factor score. This suggests that prosocial risk taking is a distinct, unified construct which yielded reliable scores in our sample (Boateng et al., 2018). This is the first known empirical measure of prosocial risk taking.

Second, the measure showed good test-retest reliability across the course of three years spanning early-to mid-adolescence (ages 10–14 years). This finding suggests that the measure captures adolescents’ trait-level prosocial risk taking, and is relatively stable across time. As such, the prosocial risk-taking scale may be useful for future longitudinal research. Importantly, although test-retest reliability for the prosocial risk-taking measure was good on average across the three years of our study, it was slightly lower than

Table 7
Descriptive statistics showing Mean and SD values of the PSRT factor score at Wave 1 for each group.

	Boys		Girls		Black		White non-Latinx		Latinx		Full Sample			
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	Min	Max
PSRT	−0.02 ¹	0.83	0.02 ¹	0.85	−0.07 ^A	0.88	0.16 ^B	0.79	−0.15 ^A	0.81	0.00	0.84	−1.70	1.56
<i>N</i>	447		448		178		294		243		896			

Note. Significant gender differences are indicated via different number superscripts. Significant race/ethnicity differences are indicated via different letter superscripts. In addition to the those in this table, there were 181 adolescents who identified as another Race/Ethnicity. Due to the heterogeneity of this group, we do not include them here.

optimal between years one and two. Variability in measurements within individuals across years could in part be due to developmental change. For instance, one study found that risk taking tendencies were negatively correlated with prosocial tendencies during early adolescence, but this association changed significantly across adolescence, such that risk taking tendencies were positively correlated with prosocial tendencies during later adolescence (Armstrong-Carter, Do, et al., 2021). This finding suggests that older adolescents might take more prosocial risks, and our new measure can be used in the future to directly test this hypothesis. Future research should further investigate developmental change in prosocial risk-taking behaviors across childhood, adolescence, and early adulthood.

Third, the new measure of prosocial risk taking showed convergent validity with existing measures of prosocial behavior, risk taking, risk tolerance, empathy, and sensation seeking. The new prosocial risk-taking measure was distinct in that it was correlated with these other traits with small to moderate magnitude, suggesting that the new measure captured unique variance in adolescents' behaviors. In addition, prosocial risk taking emerged as a related construct to these other traits. Specifically, adolescents who took more prosocial risks engaged in higher levels of prosocial behavior, and reported higher levels of empathy and higher sensation seeking. This finding is also consistent with prior evidence that prosocial behavior is positively correlated with empathy (Eisenberg et al., 2016) and both prosocial behavior and risk-taking behavior are positively correlated with sensation seeking (Armstrong-Carter, Do, et al., 2021; Blankenstein et al., 2020). We also found that adolescents who took more prosocial risks took fewer negative risks, and were more averse to taking social and ethical risks. This negative correlation suggests that adolescents may have different motivations toward negative risk taking and prosocial risk taking. For instance, negative risk taking may be more motivated by personal interests or conforming with peer pressures, whereas prosocial risk taking may be more motivated by empathic concern for others. Future research can clarify these mechanisms by examining which motivational factors uniquely predict prosocial vs negative risk taking.

Fourth, tests of measurement invariance revealed that our measure operated similarly across individual adolescents from different genders and race/ethnicity. This finding suggests that mean-level group differences are not attributed to methodological bias, although they should still be interpreted in the context of social inequalities between adolescents. Given the measurement invariance, this measure may be useful to assess variability in prosocial risk taking in future heterogeneous samples.

We found that on average, White adolescents reported higher levels of prosocial risk taking compared to Black and Latinx youth. It is crucial to interpret this finding in the context of systemic inequalities and racial bias which persist in the United States. White youth may feel more comfortable drawing attention to themselves and advocating for their peers in social settings, whereas Black and Latinx youth may face discrimination (Benner et al., 2018), or worry that they will be perceived as “acting out”, and therefore take fewer prosocial risks. A recent meta-analysis found that perceived discrimination was associated with negative risk-taking behavior (Benner et al., 2018), and future work should extend this to examine whether discrimination is similarly associated with prosocial risk-taking. In particular, future research, for example qualitative work, may help identify institutional and social barriers that Black and Latinx youth may face for prosocial risk taking.

4.2. The significance of the prosocial risk-taking measure

In contrast to prior measures of prosocial behavior (which do not measure risk taking) and risk taking (which do not measure prosocial behavior), this new measure enables researchers to directly assess the *intersection* of prosocial behavior and risk taking. By creating this new measure, we respond to recent calls from the developmental psychology research community in two key ways. First, researchers have identified a need to assess greater variability in the myriad forms of prosocial behavior that adolescents display (Armstrong-Carter & Telzer, 2021; El Mallah, 2020). For example, a recent study developed a measure of prosocial behavior that more accurately assesses the ways in which boys and young men help each other (Nielson et al., 2017). Our study contributes to the movement towards assessing greater variability in prosocial behavior (Armstrong-Carter & Telzer, 2021; El Mallah, 2020), by targeting the intersection of prosocial behavior and risk taking.

Second, researchers have highlighted a need to acknowledge and assess the positive aspects of risk taking (Duell & Steinberg, 2020; Patterson et al., 2019). For instance, two recent measures were developed in order to assess adolescents' risk-taking behaviors which can be personally advantageous (Duell & Steinberg, 2020; Patterson et al., 2019). The recognition of the “positive” sides of risk taking is also consistent with growing recognition that youths' behaviors and adaptation are not simplistic traits, and do not simply indicate individual vulnerability or success (Ellis, Bianchi, Griskevicius, & Frankenhuis, 2017). Youths' behaviors can be “positive” adaptations in some contexts but not others (Ellis et al., 2017). The extent to which a behavior is “desirable” or not varies substantially by the timing, context, measurement, and motivation. As such, risk taking is not always negative, and prosocial behavior can also have drawbacks or “risks”. Our measure can be used to directly assess part of this complexity in adolescents' behavior and development.

4.3. Limitations and future directions

Our study has limitations. The sample focused on adolescents ages 10–17 years, because the oldest adolescents were 14 at the beginning of the three-year study. Future research should replicate and extend our findings by assessing the validity of the PSRT measure in younger and older age groups below 10 and above 17 years. In addition, this new measure focused primarily on prosocial risks which could incur social risks to the self, due to the salience of peers and social evaluations during adolescence (Prinstein & Gilletta, 2020). Future research may extend this work by developing and testing the validity of prosocial risk-taking measures that assess prosocial actions which incur financial, health, or academic risk to the self. Further, the new measure is a tendency/likelihood measure because are asked to indicate how likely they are to act in that moment, but not how frequently they actually performed these behaviors. Drawing on our items and others, future research may provide less biased, immediate reports of prosocial risk-taking behaviors via daily diaries or ecological momentary assessments.

This study highlights several other directions for future research. First, future research should examine the contexts in which prosocial risk taking occurs more frequently or less frequently (e.g., in the classroom, in school, vs home settings). Such information may help researchers and practitioners to identify how to harness adolescents' risk-taking tendencies to promote prosocial development. For instance, we found that at Wave 1 and Wave 2, the most common prosocial risk-taking behavior was standing up against a peer who was bullying another student. Bystander interventions taught in middle and high schools could represent an opportunity for adolescents' to learn from their peers and mentors how to engage in prosocial risk taking to reduce bullying.

Second, future research should examine factors which predict adolescents' prosocial risk taking. For example, supportive interpersonal relationships may promote adolescents' ability to identify opportunities for prosocial risk taking, and increase their confidence and security taking prosocial risks. In particular, parents, older siblings, peers, mentors, and educators may model prosocial risk taking for adolescents. Similarly, there are likely peer networks of prosocial risk taking, given that adolescents' prosocial risk taking is likely highly influenced by those of their peers. Investigating these social influences on adolescents' prosocial risk taking may help to identify avenues for promoting prosocial risk taking. For instance, teacher- or school-based interventions or coaching may be useful for encouraging adolescents' prosocial risk taking in appropriate contexts.

Third, future research should identify the significance of individual differences in prosocial risk taking for adolescents' emotional adjustment, peer relationships, and educational outcomes. For example, adolescents who engage in more prosocial risk taking could experience more optimal mental health, because they feel strong sense of belonging, positive emotions, or connected to their peers. Alternatively, prosocial risk taking could be linked to worse mental health if adolescents experience it as taxing or stressful. In addition, adolescents who engage in more prosocial risk taking may be more popular because their peers recognize and appreciate their advocacy, but they could also be less popular because they are perceived to break social norms. Finally, prosocial risk taking could be related to either lower or higher levels of school engagement and academic achievement. On the one hand, an adolescent who invites an unpopular peer to work on a group project might learn from that student than they otherwise would not have. On the other hand, an adolescent could be punished for prosocial risk taking (e.g., if he or she is caught helping a peer cheat), which could detract from their academic success. Future research can clarify the significance of prosocial risk taking for adolescents' development by using our new prosocial risk-taking measure to investigate its emotional, social and academic correlates. Finally, our sample was drawn from a specific rural community in the Southeastern United States. To clarify the generalizability of our findings, this measure should be cross-culturally validated for use in other socio-cultural environments such as urban areas in the US, other high-income countries, and low-and-middle-income countries.

In sum, this study introduced the 6-item single factor prosocial risk-taking measure, which showed good internal validity, test-retest reliability, construct validity, and measurement invariance in our sample. We hope that this new methodological tool enables researchers to directly assess individual differences and developmental trajectories of prosocial risk taking, and the significance of prosocial risk taking for adolescents' adaptation.

Declaration of competing interest

The authors have no conflict of interest to declare. Data and syntax are available upon request.

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References

- Armstrong-Carter, E., Bibby, E., Burroughs, M., Flannery, J., Nelson, B., Duell, N., et al. (2021). The daily covariation between risk-taking and prosocial behaviors during adolescence: Individual differences by sensation seeking and social craving. *Psycharxiv*. <https://doi.org/10.17605/OSF.IO/B4H7E>
- Armstrong-Carter, E., Do, K. T., Duell, N., Kwon, S. J., Lindquist, K. A., Prinstein, M., et al. (2021). Adolescents' perceptions of social risk and prosocial tendencies: Developmental change and individual differences. *Psycharxiv*. <https://doi.org/10.17605/OSF.IO/7M24D>
- Armstrong-Carter, E., & Telzer, E. H. (2021). Understanding prosocial development in the context of systemic inequalities in the US and worldwide. *Current Research in Behavioral Sciences*, 2, 100040. <https://doi.org/10.1016/j.crbeha.2021.100040>
- Benner, A. D., Wang, Y., Shen, Y., Boyle, A. E., Polk, R., & Cheng, Y.-P. (2018). Racial/ethnic discrimination and well-being during adolescence: A meta-analytic review. *American Psychologist*, 73(7), 855–883. <https://doi.org/10.1037/amp0000204>
- Blais, A. R., & Weber, E. U. (2006). A Domain-Specific Risk-Taking (DOSPERT) scale for adult populations. *Judgment and Decision Making*, 1(1), 33–47.
- Blankenstein, N. E., Telzer, E. H., Do, K. T., Duijvenvoorde, A. C. K., & Crone, E. A. (2020). *Behavioral and neural pathways supporting the development of prosocial and risk-taking behavior across adolescence*. *Child Development*, 91(3). <https://doi.org/10.1111/cdev.13292>
- Boateng, G. O., Neilands, T. B., Frongillo, E. A., Melgar-Quinonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A primer. *Frontiers in Public Health*, 6, 149. <https://doi.org/10.3389/fpubh.2018.00149>
- Braams, B. R., Peper, J. S., van der Heide, D., Peters, S., & Crone, E. A. (2016). Nucleus accumbens response to rewards and testosterone levels are related to alcohol use in adolescents and young adults. *Developmental Cognitive Neuroscience*, 17, 83–93. <https://doi.org/10.1016/j.dcn.2015.12.014>
- Carlo, G., Hausmann, A., Christiansen, S., & Randall, B. A. (2003). Sociocognitive and behavioral correlates of a measure of prosocial tendencies for adolescents. *The Journal of Early Adolescence*, 23(1), 107–134. <https://doi.org/10.1177/0272431602239132>

- Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, 78(1), 98–104. <https://doi.org/10.1037/0021-9010.78.1.98>
- Crone, E. A., & Dahl, R. E. (2012). Understanding adolescence as a period of social–affective engagement and goal flexibility. *Nature Reviews Neuroscience*, 13(9), 636–650. <https://doi.org/10.1038/nrn3313>
- Dahl, R. E., Allen, N. B., Wilbrecht, L., & Suleiman, A. B. (2018). Importance of investing in adolescence from a developmental science perspective. *Nature*, 554(7693), 441–450. <https://doi.org/10.1038/nature25770>
- Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology*, 44(1), 113–126. <https://doi.org/10.1037/0022-3514.44.1.113>
- DeFreitas, S. C. (2019). *Black psychology: A positive psychology perspective* (1st ed.). New York, NY: Springer Publishing Company. <https://doi.org/10.1891/9780826150066>, 978–0-8261-5006-6.
- Do, K. T., Guassi Moreira, J. F., & Telzer, E. H. (2017). But is helping you worth the risk? Defining prosocial risk taking in adolescence. *Developmental Cognitive Neuroscience*, 25, 260–271. <https://doi.org/10.1016/j.dcn.2016.11.008>
- Do, K. T., Prinstein, M. J., & Telzer, E. H. (2020). Neurobiological susceptibility to peer influence in adolescence. In K. Cohen Kadosh (Ed.), *The Oxford Handbook of developmental Cognitive Neuroscience* (by K. T. Do, M. J. Prinstein, & E. H. Telzer). Oxford University Press. <https://doi.org/10.1093/oxfordhb/9780198827474.013.27>.
- Duell, N., & Steinberg, L. (2019). Positive risk taking in adolescence. *Child Development Perspectives*, 13(1), 48–52. <https://doi.org/10.1111/cdep.12310>
- Duell, N., & Steinberg, L. (2020). Differential correlates of positive and negative risk taking in adolescence. *Journal of Youth and Adolescence*, 49(6), 1162–1178. <https://doi.org/10.1007/s10964-020-01237-7>
- van Duijvenvoorde, A. C. K., Peters, S., Braams, B. R., & Crone, E. A. (2016). What motivates adolescents? Neural responses to rewards and their influence on adolescents' risk taking, learning, and cognitive control. *Neuroscience & Biobehavioral Reviews*, 70, 135–147. <https://doi.org/10.1016/j.neubiorev.2016.06.037>
- Eisenberg, N., Spinrad, T. L., & Knafo-Noam, A. (2015). *Handbook of child psychology and developmental science: Socioemotional processes*, chap. *Prosocial Development*, 610–656.
- Eisenberg, N., VanSchyndel, S. K., & Spinrad, T. L. (2016). Prosocial motivation: Inferences from an opaque body of work. *Child Development*, 87(6), 1668–1678. <https://doi.org/10.1111/cdev.12638>
- El Mallah, S. (2020). Conceptualization and measurement of adolescent prosocial behavior: Looking back and moving forward. *Journal of Research on Adolescence*, 30(S1), 15–38. <https://doi.org/10.1111/jora.12476>
- Ellis, B. J., Bianchi, J. M., Griskevicius, V., & Frankenhuis, W. E. (2017). Beyond risk and protective factors: An adaptation-based approach to resilience. *Perspectives on Psychological Science*, 12(4), 561–587. <https://doi.org/10.1177/1745691617693054>
- Figner, B., van Duijvenvoorde, A. C., Blankenstein, N., & Weber, E. U. (2015). *Risk-taking, perceived risks, and perceived benefits across adolescence: A domain-specific riskreturn approach. Presented at the flux: The society for developmental cognitive neuroscience*. Leiden, Netherlands.
- Fulgini, A. J. (2019). The need to contribute during adolescence. *Perspectives on Psychological Science*, 14(3), 331–343. <https://doi.org/10.1177/1745691618805437>
- Graham, J. M. (2006). Congeneric and (essentially) tau-equivalent estimates of score reliability: What they are and how to use them. *Educational and Psychological Measurement*, 66, 930–944. <https://doi.org/10.1177/0013164406288165>
- Hayes, A. F., & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. *But.... Communication Methods and Measures*, 14(1), 1–24. <https://doi.org/10.1080/19312458.2020.1718629>
- Jensen, J. D., Weaver, A. J., Ivic, R., & Imboden, K. (2011). Developing a brief sensation seeking scale for children: Establishing concurrent validity with video game use and rule-breaking behavior. *Media Psychology*, 14(1), 71–95. <https://doi.org/10.1080/15213269.2010.547831>
- Kann, L., Kinchen, S. A., Williams, B. I., Ross, J. G., Lowry, R., Grunbaum, J. A., et al. (2000). Youth risk behavior surveillance—United States, 1999. *Journal of School Health*, 70(7), 271–285.
- LaFontana, K. M., & Cillessen, A. H. N. (2010). Developmental changes in the priority of perceived status in childhood and adolescence. *Social Development*, 19(1), 130–147. <https://doi.org/10.1111/j.1467-9507.2008.00522.x>
- Little, T. D. (2013). *Longitudinal structural equation modeling*. New York, NY: Guilford.
- Lozada, F. T., Jagers, R. J., Smith, C. D., Bañales, J., & Hope, E. C. (2017). Prosocial behaviors of black adolescent boys: An application of a sociopolitical development theory. *Journal of Black Psychology*, 43(5), 493–516. <https://doi.org/10.1177/0095798416652021>
- Muthén, L. K., & Muthén, B. O. (2014). *Mplus (version 7.3)*. Los Angeles, CA.
- Nielson, M. G., Padilla-Walker, L., & Holmes, E. K. (2017). How do men and women help? Validation of a multidimensional measure of prosocial behavior. *Journal of Adolescence*, 56, 91–106. <https://doi.org/10.1016/j.adolescence.2017.02.006>
- Overgaauw, S., Rieffe, C., Broekhof, E., Crone, E. A., & Güroğlu, B. (2017). Assessing empathy across childhood and adolescence: Validation of the empathy questionnaire for children and adolescents (EmQue-CA). *Frontiers in Psychology*, 8, 870. <https://doi.org/10.3389/fpsyg.2017.00870>
- Patterson, M. W., Pivnick, L., Mann, F. D., Grotzinger, A. D., Monahan, K. C., Steinberg, L., et al. (2019). *Positive risk-taking: Mixed-methods validation of a self-report scale and evidence for genetic links to personality and negative risk-taking [Preprint]*. PsyArXiv. <https://doi.org/10.31234/osf.io/bq63f>
- Reniers, R. L. E. P., Murphy, L., Lin, A., Bartolomé, S. P., & Wood, S. J. (2016). *Risk perception and risk-taking behaviour during adolescence: The influence of personality and gender*. PLOS ONE, 11(4), e0153842. <https://doi.org/10.1371/journal.pone.0153842>
- Rose, A. J., & Asher, S. R. (2017). The social tasks of friendship: Do boys and girls excel in different tasks? *Child Development Perspectives*, 11(1), 3–8. <https://doi.org/10.1111/cdep.12214>
- Siraj, R., Najam, B., & Ghazal, S. (2021). Sensation seeking, peer influence, and risk-taking behavior in adolescents. *Educational Research International*, 2021, 1–8. <https://doi.org/10.1155/2021/8403024>
- Streit, C., Carlo, G., Knight, G. P., White, R. M. B., & Maiya, S. (2021). *Relations among parenting, culture, and prosocial behaviors in U.S. Mexican youth: An integrative socialization approach*. *Child Development*, cdev.13550. <https://doi.org/10.1111/cdev.13550>
- Telzer, E. H. (2016). Dopaminergic reward sensitivity can promote adolescent health: A new perspective on the mechanism of ventral striatum activation. *Developmental Cognitive Neuroscience*, 17, 57–67. <https://doi.org/10.1016/j.dcn.2015.10.010>
- Thielmann, I., Spadaro, G., & Balliet, D. (2020). Personality and prosocial behavior: A theoretical framework and meta-analysis. *Psychological Bulletin*, 146(1), 30–90. <https://doi.org/10.1037/bul0000217>
- White-Johnson, R. L. (2012). Prosocial involvement among Black young adults: Considering racial discrimination and racial identity. *Journal of Black Psychology*, 38(3), 313–341. <https://doi.org/10.1177/0095798411420429>