



Evidence from a Randomized Controlled Trial that Altruism Moderates the Effect of Prosocial Acts on Adolescent Well-being

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Received: 15 September 2020 / Accepted: 16 November 2020 / Published online: 5 December 2020
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Abstract

Despite growing public and scientific interest in the positive benefits of prosociality, there has been little research on the causal effects of performing kind acts for others on psychological well-being during adolescence. Developmental changes during adolescence, such as greater perspective taking, can promote prosociality. It was hypothesized that performing kind acts for others would improve adolescent well-being (positive and negative affect, perceived stress) and increase prosocial giving. As part of a randomized controlled trial, 97 adolescents ($M_{\text{age}} = 16.224$, $SD = 0.816$, range 14–17; 53.608% female) were assigned to either perform kind acts for others (Kindness to Others, $N = 33$), perform kind acts for themselves (Kindness to Self, $N = 34$), or report on daily activities (Daily Report, $N = 30$) three times per week for four weeks. Well-being factors were measured weekly and giving was tested post-intervention. Overall, changes over time in well-being did not differ across conditions. However, altruism emerged as a significant moderator such that altruistic adolescents in the Kindness to Others condition showed increased positive affect, decreased negative affect, and decreased stress. Increased positive affect was also linked to greater prosocial giving for Kindness to Others adolescents. These findings identify individual differences that may shape the effects of doing kind acts for others on well-being during adolescence.

Keywords Adolescents · Affect · Intervention · Prosocial

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Supplementary information The online version of this article (<https://doi.org/10.1007/s10964-020-01362-3>) contains supplementary material, which is available to authorized users.

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Introduction

The benefits of prosociality for positive development and psychological well-being are apparent in adolescence (Memmott-Elison et al. 2020). However, much of the extant work on prosociality during this developmental period is correlational. A recent intervention study in adults reported modest support for the positive effect of performing kind acts for others on psychological flourishing and positive affect (Nelson et al. 2016). Using a similar protocol, this study employed a parallel-group randomized controlled trial to test whether performing kind acts for others improved adolescents' positive affect, negative affect, and perceived stress compared to those who performed kind acts for themselves or reported on their daily activities. Extending beyond prior work in adults, this study also examined post-intervention group differences in real-world prosocial giving behavior to determine whether well-being improvements related to behavior. Additionally, this study tested whether individual differences in pre-existing altruism related to intervention efficacy, which had not been previously established.

Prosocial behavior may be associated with better psychological well-being during adolescents because it promotes social connection, provides a feeling of reward and meaning, and reduces reactivity to stress. Performing kind acts and contributing to others can promote identification with others and thereby foster a sense of social connection (Aknin et al. 2013). For instance, youth who engaged in more prosocial behavior felt a greater sense of relatedness to peers and teachers at school, which in turn promoted greater subjective well-being (Su et al. 2019). Furthermore, prosocial acts can be rewarding for youth and thereby promote positive affect. Adolescents show activation in reward-related neural regions when engaging in giving behavior (Telzer et al. 2010) and when watching prosocial interactions (Tashjian et al. 2018). Finally, adolescents report better mood on days they complete prosocial acts (Schacter & Margolin 2019), and prosocial acts reduce the impact of daily stressors on health (Han et al. 2018) and well-being throughout adulthood (Raposa et al. 2016). As a result, prosocial behavior may also improve well-being by shaping daily mood and reducing the impact daily stressors.

The current study design was based on a prior adult intervention that tested the causal nature of prosocial acts on affect and psychological flourishing (psychological, social, and emotional well-being) (Nelson et al. 2016). The kind acts intervention involves performing three acts of kindness for others each week for several weeks. Among adults, performing kind acts for others promoted psychological well-being. Positive affect was also increased for those who engaged in prosocial behavior compared to the control group at posttest, but not across the course of the intervention or at a two-week follow-up. Adults who engaged in kind acts for themselves showed no improvements in outcomes over the course of the intervention. A similar classroom-based intervention was conducted in children ages 9–11 years and improved peer acceptance but had no effect on children's well-being at posttest with respect to positive affect, life satisfaction, and happiness (Layous et al. 2012). These prior studies suggest that performing kind acts has greater positive effects than self-focused behavior for adults and pre-adolescents but leave an open question as to the efficacy of a prosocial intervention during adolescence.

The effects of performing kind acts for others on well-being have not been tested in adolescents, but adolescence may be a key time to employ such interventions. Adolescence has been posited to be a unique period when youth especially benefit from contributing to others and completing prosocial acts (Fuligni 2019). Social-cognitive maturation enables adolescents to better contextualize the benefits of giving to others (Eisenberg et al. 2015). Specifically, youth show progressively higher levels of perspective-taking across adolescence (Van der Graaff et al. 2014), and adolescents higher in these traits tend to engage

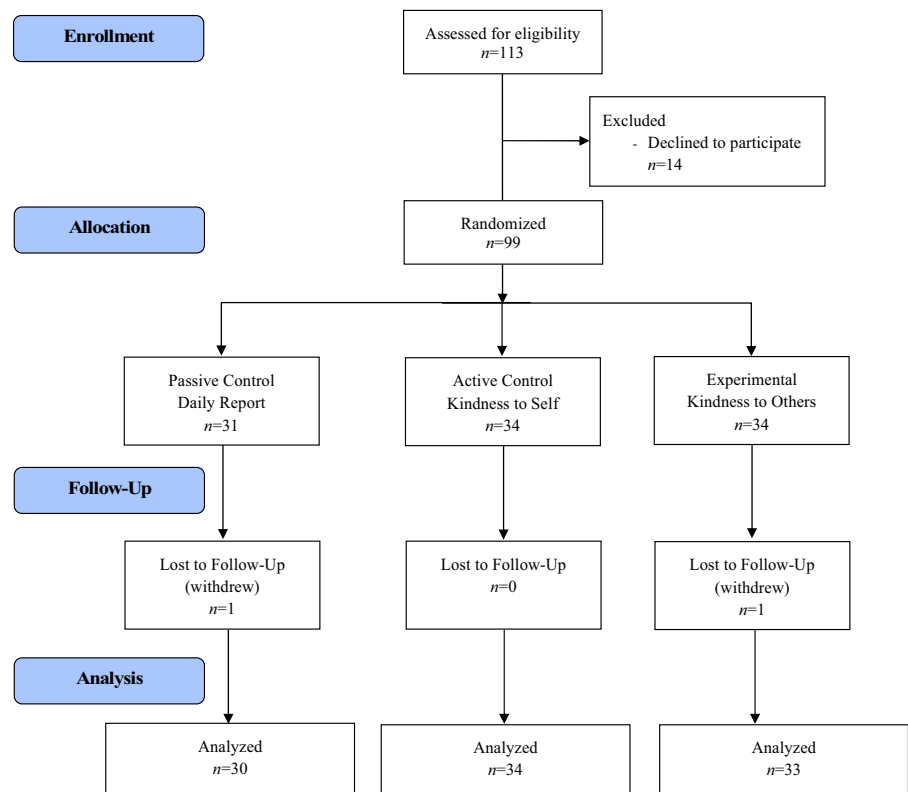
in more prosocial behaviors (van de Groep et al. 2020). Also, adolescents orient more toward peers and become especially concerned with their social relationships following puberty (Forbes and Dahl 2010). Therefore, they may value performing acts to benefit others and experience social benefits of prosociality. Indeed, several studies have found that adolescents who complete more prosocial acts (Schacter & Margolin 2019) and community service show greater well-being (van Goethem et al. 2014).

Although development may prime adolescents for the benefits of prosocial activities, there may also be individual differences in the effectiveness of prosocial interventions. Researchers have posited whether individual differences, such as differences in preexisting prosocial tendencies, can influence the effects of performing kind acts for others on health and well-being (Curry et al. 2018). For instance, individual differences in altruism have been found to predict giving behavior in childhood (Miller et al. 2015) and adolescence (Tashjian et al. 2018). Although an intervention can provide adolescents the opportunity to engage in kind acts they may not otherwise, it is possible that only more altruistic adolescents may show benefits for well-being because the behavior fits more closely with their social orientation toward others. People with higher well-being also tend to engage in more giving behavior (Otake et al. 2006), which has relevance for how well-being improvements as a result of positive interventions manifest behaviorally. Adolescents who experience improved psychological well-being as a result of performing kind acts may subsequently show long-term changes in self-motivated prosocial behaviors such as giving to others.

Current Study

The present study tested whether performing kind acts for others improved adolescents' mood and well-being using a randomized controlled trial. Adolescents were assigned to either perform kind acts for others, perform kind acts for themselves, or report on their daily activities, three times per week for four weeks. The effect of performing kind acts for others was compared with the effects of performing self-directed kind acts as an active control condition and daily reports as a passive control condition. Adolescents reported their positive affect, negative affect, and perceived stress pre-intervention, weekly throughout the intervention period, and post-intervention. It was hypothesized that adolescents in the kindness to others condition would report greater improvements in affect and reductions in perceived stress compared to adolescents in both control groups. Altruism at baseline was tested as a moderator of intervention effects on psychological well-being outcomes. Prosocial behavior was measured in the form of voluntary donations to a local charity one week post-

Fig. 1 CONSORT flow diagram. After receiving approval from the university's Institutional Review Board, participants were recruited via flyers, prior participation in laboratory studies, randomized controlled trial registration online, and as part of a local area high-school outreach. Participant eligibility was determined by a phone screening with a parent. Eligibility criteria included participant age (14–17 years) and the ability to read and write in English. Participants provided informed written assent and a parent or guardian provided informed written consent. This study complies with all relevant ethical regulations regarding human research participants



intervention. It was hypothesized that the effects of the intervention on donations would vary by the degree to which the intervention improved adolescents' well-being.

Methods

Design and Procedure

Participants volunteered to take part in a 4-week parallel-group randomized controlled trial study of daily life and health. If enrolled, participants completed two laboratory visits (Week 0 Pre-Intervention, Week 5 Post-Intervention). Enrollment dates for Pre-Intervention visits occurred starting on October 15, 2017 through January 12, 2019. The intervention period included both school and non-school (e.g., holiday) periods, but there were no differences in the occurrence of school and non-school days across conditions, $F(2, 94) = 0.108$, $p = 0.898$, or weeks within conditions, $\chi^2(4, n = 97 \text{ per week}) = 1.154$, $p = 0.886$. Participants received \$20 compensation after the Pre-Intervention laboratory visit and \$70 after the Post-Intervention laboratory visit for a total of \$90 compensation. Prior to each laboratory visit, participants completed Pre- and Post-Intervention surveys, respectively, via the web-based Qualtrics survey software platform (www.qualtrics.com). During the intervention period (Weeks 1–4),

participants were randomly assigned (see *Randomization* below) to one of three Conditions and were instructed on three days for each week during the intervention period to: perform kind acts for others (Kindness to Others; Experimental Condition; e.g., volunteering, complimenting someone), perform kind acts for themselves (Kindness to Self; Active Control Condition; e.g., meeting up with friends, listening to your favorite songs), or report on their daily activities (Daily Report; Passive Control Condition). Participants were asked to perform 12 acts total, one act per day for three days per week for four weeks. Complete instructions and examples are provided in Online Supplementary Materials Tables S1, S2.

Instructions provided to participants were adapted from a comparable intervention in adults (Nelson-Coffey et al. 2017), with examples of kind acts and daily reports modified for adolescents. Prior to the start of study recruitment, 62 18-year-olds (38 females) were recruited from Amazon's Mechanical Turk (MTurk) through TurkPrime and asked to provide three free-response examples of "acts of kindness you intentionally performed for others while in high school" and "acts of kindness you intentionally performed for yourself while in high school". These example acts were incorporated in the instructions for the current study. Instructions for Kindness to Others and Kindness to Self asked participants to engage in acts that involved some effort and were outside their normal routine, and Daily

Report instructions asked participants not to alter their routine in any way.

During the intervention period, participants were randomly assigned to perform one act per day for three days per week, either Tuesday, Thursday, and Saturday or Wednesday, Friday, and Sunday. Assigned days were counterbalanced across Conditions. At the Pre-Intervention visit, participants were notified of their assigned days and the parameters of their intervention acts to ease planning burden on the participant. Prompts to perform the acts were sent via text message at 8:00 am, evening surveys asking about the acts performed were sent at 5:00 pm, and survey reminders were sent at 9:00 pm. All text messages were programmed using EZ Texting (www.eztexting.com).

During the intervention period, participants completed weekly assessments of psychological well-being via a survey circulated on Monday of each week via the web-based Qualtrics survey software platform.

Participants

A total 113 adolescents were contacted for participation and assessed for eligibility ($M_{\text{age}} = 16.224$, $SD_{\text{age}} = 0.816$, 59 females, age data not obtained for 6 participants). Of those 113 potential participants, 14 declined to participate ($M_{\text{age}} = 15.667$, $SD_{\text{age}} = 1.225$, 6 females, age data not obtained for 6 participants). The remaining 99 participants were enrolled and 2 subsequently withdrew from participation prior to the Post-Intervention visit ($M_{\text{age}} = 17.000$, $SD_{\text{age}} = 0.000$, 1 female). The remaining 97 participants completed both visits ($M_{\text{age}} = 16.258$, $SD_{\text{age}} = 0.754$, 52 females) (Fig. 1, CONSORT diagram; See Online Supplementary Materials Table S3 for CONSORT checklist). Age, sex, and ethnicity were balanced across Conditions (Online Supplementary Materials Table S4).

Measures

Psychological well-being

Several measures of psychological well-being were measured at the Pre- and Post-Intervention visits, including negative affect, positive affect, and perceived stress.

Positive affect Positive affect (primary outcome) was assessed with the positive affect subscale of the Affect-Adjective Scale (Diener et al. 1985). Participants rated the extent to which they experienced four positive emotions (i.e., happy, joyful, fun/enjoyment, pleased) in the past week on a scale ranging from 0 (*not at all*) to 6 (*extremely much*). Cronbach's α s showed good reliability and ranged from 0.85 to 0.91 across time points. Average scores were used in analyses.

Negative affect Negative affect (secondary outcome) was assessed with the negative affect subscale of the Affect-Adjective Scale (Diener et al. 1985). Participants rated the extent to which they experienced five negative emotions (i.e., worried/anxious, angry/hostile, frustrated, depressed/blue, unhappy) in the past week on a scale ranging from 0 (*not at all*) to 6 (*extremely much*). Cronbach's α s showed good reliability and ranged from 0.91 to 0.95 across time points. Average scores were used in analyses.

Perceived stress Perceived stress (other outcome) was measured using the 10-item version of Cohen's Perceived Stress Scale (PSS-10, Cohen et al. 1983). Participants rated the extent to which they experienced stress for the past week on a scale of 0 (*never*) to 4 (*very often*). Example items include "Been upset because of something that happened unexpectedly", "Felt nervous or 'stressed'". Cronbach's α s showed good reliability and ranged from 0.85 to 0.91 across time points. Average scores were used in analyses.

Real-world giving behavior

At the end of the Post-Intervention laboratory visit, participants were handed a form that briefly described a charity for foster youth and were told that they could donate up to \$10 of their study compensation to the charity, but that they did not have to donate anything. Participants were asked to complete the form with the amount they wished to donate and to insert the form and any amount of money donated into an envelope marked "Donations". Experimenters left the room while participants completed this part of the study. At no point were participants asked how much they donated nor was the donation envelope opened in front of them. All donations were given to the California Youth Connection (CYC, <http://www.calyouthconn.org/>) at the end of the study. CYC was selected as the study charity because it helps adolescents of a similar age to the participants located in the participants' home state.

Altruism

As part of the Pre-Intervention survey, altruism was assessed using the Altruistic Personality Scale (altruism), a 20-item inventory designed to measure the frequency with which one engages in altruistic acts primarily toward strangers (Rushton et al. 1981). Participants rated the frequency with which they carried out each act from 0 (*never*) to 4 (*very often*). Example acts include "I have donated goods or clothes to a charity", "I have helped a classmate who I did not know that well with an assignment when my knowledge was greater than his or hers". Cronbach's α for altruism showed good reliability and was $\alpha = 0.82$. Average scores were used in analyses.

Sample Size

A priori sample size was set at 90 high-school adolescents ages 14–17 years with 30 adolescents assigned to each Condition. Sample size was pre-registered prior to data collection. Power analyses conducted using G*Power (Erdfeider et al. 1996; Version 3.1.9.6) indicate a sample size of 55 participants is adequate to detect a 3-way interaction at a power of 0.80 with an observed estimate of >0.20 . Additionally, the data consist of repeated measures which increases power (Lehman et al. 2015). In the event of attrition, over-enrollment was conducted on a Condition-specific basis. Multilevel models permitted for missing data such that participants were included in analyses regardless of the number of weekly surveys they completed. Sample sizes and number of observations for all analyses are reported herein. On average, participants provided data for 4.6 out of 5 timepoints across all outcomes ($N = 97$, 443 observations). One Kindness to Others participant did not report any perceived stress data across the study and was removed from perceived stress analyses as a result.

Randomization

Randomization was performed by an independent researcher from the University. Randomization was performed to Condition with assignment of participants in order of enrollment. At approximately 50% enrollment, age, sex, and ethnicity by Condition were assessed and randomization for the remaining participants was performed to stratify age, sex, and ethnicity by Condition.

Analytic Plan

Data analyses were performed using R statistical software (R Core Team 2019; version 3.6.1) using lme4 (Bates et al. 2015; version 1.1-21), lmerTest (Kuznetsova et al. 2017; version 3.1-0), and reghelper packages (Hughes 2017; version 0.3.4). P -values below 0.050 were regarded as statistically significant and p -values between 0.050 and 0.100 (inclusive) were regarded as marginally significant. Confidence intervals (CI) reported are 95%.

Psychological well-being

For each psychological well-being outcome measure, three analyses were conducted. First, change in the outcome measure over the intervention period was assessed for all participants regardless of condition. Second, changes by Condition were assessed. Models reported included Pre-Intervention baseline levels of the outcome variables as a covariate. Models excluding Pre-Intervention baseline

levels are provided for completeness in Online Supplementary Materials Table S5–S7. Third, Pre-Intervention altruism was tested as a moderator of change over time (Tables 1–3). For analyses 2 and 3, Kindness to Others was compared to each of the control conditions in separate models with Kindness to Others = 1, and Kindness to Self = 0 and Daily Report = 0.

Psychological well-being data were collected at all time points and consisted of repeated measures nested within individuals. For all models with psychological well-being data as outcomes, data were analyzed using a multi-level modeling framework. Random intercepts were included to account for individual differences in study outcomes. Linear and quadratic effects of time were tested, the latter because prior work reported quadratic effects of time on weekly psychological well-being (Nelson et al. 2016). Orthogonal quadratic polynomial models were tested using the *poly* function. All linear effects and significant quadratic effects are reported. Significance testing was conducted using Satterthwaite approximations (Kuznetsova et al. 2017). Effect sizes reported as R^2 are reported as conditional effects of variance explained by the entire model (Nakagawa et al. 2017).

Real-world giving behavior

For giving behavior, three analyses were conducted. First, differences in giving behavior by Condition were tested using ANOVA. Second, Pre-Intervention altruism was tested as a moderator of Condition and giving behavior using linear regression. Third, change in psychological well-being outcomes were tested as a moderators of Condition and giving behavior using linear regression. Difference scores for each outcome were calculated as Post-Intervention minus Pre-Intervention. For analyses 2 and 3, Kindness to Others was compared to each of the control conditions in separate models with Kindness to Others = 1, and Kindness to Self = 0 and Daily Report = 0.

Results

Pre-intervention descriptive statistics and details regarding intervention engagement are provided in Online Supplementary Materials.

Psychological Well-Being

Positive affect increased and negative affect decreased linearly across the intervention period (Table 1a). Perceived stress demonstrated quadratic change with decreases from Week 1 to Week 3 and increases from Week 3 to Post-Intervention Week 5 (Table 1a). These changes over time did not differ according to Condition (Table 1b).

Table 1 (a) Week predicting psychological well-being outcomes for the full sample. (b) Interactions between Week and Condition predicting psychological well-being outcomes

(a) Full Sample						
	Estimate	SE	95% CI	t	p	Observations
Positive Affect	0.049	0.025	0.0004 to 0.098	1.981	0.048	443
Negative Affect	−0.098	0.024	−0.146 to −0.051	−4.046	<0.001	443
Perceived Stress ¹	1.850	0.411	1.044 to 2.654	4.505	<0.001	443

(b)						
	Estimate	SE	95% CI	t	p	Observations
Kindness to Others versus Kindness to Self						
Positive Affect	−0.021	0.056	−0.131 to 0.089	−0.366	0.715	307
Negative Affect	−0.019	0.056	−0.129 to 0.092	−0.332	0.740	307
Perceived Stress ¹	−0.009	0.032	−0.071 to 0.054	−0.270	0.788	306
Kindness to Others versus Daily Report						
Positive Affect	−0.061	0.065	−0.188 to 0.066	−0.940	0.348	286
Negative Affect	−0.075	0.064	−0.050 to 0.200	−1.173	0.242	286
Perceived Stress ¹	−0.048	0.033	−0.112 to 0.016	−1.456	0.147	285

Week coded as 1–5 for weeks during the intervention period. Kindness to Others = 1 ($n = 33$), Kindness to Self = 0 ($n = 34$), Daily Report = 0 ($n = 30$). Models covary for Pre-Intervention levels of outcomes

¹quadratic change

Moderation by Altruism: Kindness to Others versus Kindness to Self

Kindness to Others Participants who were high in Pre-Intervention altruism demonstrated significantly greater increases in positive affect compared with Kindness to Self participants (Table 2; Fig. 2a). At high levels of altruism, Kindness to Others participants started lower in positive affect than Kindness to Self participants and reported significant increases over the course of the intervention. Individuals in the Kindness to Self Condition showed no significant change in positive affect at any level of altruism.

Kindness to Others participants who were high in Pre-Intervention altruism demonstrated significant reductions compared with Kindness to Self participants (Table 2; Fig. 2b). Individuals in the Kindness to Others Condition high in altruism started with higher negative affect than those in the Kindness to Self Condition and reported significant reductions in negative affect over the course of the intervention, but individuals in the Kindness to Self Condition showed no change at any level of altruism.

Perceived stress over time was not significantly moderated by Pre-Intervention altruism scores for Kindness to Others versus Kindness to Self (Table 2; Fig. 2c).

Moderation by Altruism: Kindness to Others versus Daily Report

Kindness to Others participants reporting high altruism started with lower positive affect and showed significant improvements during the intervention period compared with Daily Report participants (Table 3; Fig. 3a).

Negative affect over time was not significantly moderated by Pre-Intervention altruism scores for Kindness to Others versus Daily Report (Table 3; Fig. 3b).

Kindness to Others participants demonstrated quadratic changes in perceived stress across the intervention period at low and average levels of Pre-Intervention altruism (Table 3; Fig. 3c). Daily Report participants demonstrated significant quadratic changes at average and high levels of Pre-Intervention altruism, but no significant changes at low levels of altruism.

Real-World Giving Behavior

Overall, participants donated slightly more than \$4 out of a maximum of \$10 ($M = 4.619$, $SD = 3.206$, range = 0–10). Giving behavior did not significantly differ across the Conditions, $F(2, 94) = 0.016$, $p = 0.984$, $\eta_p^2 = 0.000$.

Altruism did not significantly moderate Condition and giving behavior. Kindness to Others versus Kindness to Self, Estimate = 2.553, $SE = 1.877$, $t = 1.360$, $p = 0.179$, 95% CI

Table 2 Significant model for the 3-way interaction between Condition (Kindness to Others versus Kindness to Self), Week, and Altruism predicting psychological well-being outcomes

	Positive Affect				Negative Affect				Perceived Stress						
	Estimate	SE	95% CI	t	p	Estimate	SE	95% CI	t	p	Estimate	SE	95% CI	t	p
(Intercept)	0.750	0.579	−0.385 to 1.885	1.295	0.195	1.166	0.546	0.096 to 2.235	2.136	0.033	0.987	0.284	0.430 to 1.543	3.473	<0.001
Pre-Intervention Outcome	0.587	0.086	0.419 to 0.755	6.838	<0.001	0.530	0.065	0.402 to 0.658	8.134	<0.001	0.602	0.085	0.436 to 0.768	7.115	<0.001
Week	0.020	0.113	−0.202 to 0.241	0.173	0.863	−0.047	0.114	−0.270 to 0.176	−0.413	0.680	0.168	1.981	−3.715 to 4.052	0.085	0.932
Condition	2.330	0.898	0.570 to 4.090	2.595	0.010	−2.017	0.859	−3.701 to −0.333	−2.348	0.020	−0.344	0.402	−1.131 to 0.443	−0.856	0.395
Altruism	0.510	0.327	−0.130 to 1.151	1.562	0.120	−0.295	0.311	−0.905 to 0.314	−0.949	0.343	−0.373	0.143	−0.654 to −0.092	−2.605	0.012
Week × Condition	−0.421	0.192	−0.798 to −0.044	−2.186	0.030	0.429	0.193	0.050 to 0.808	2.218	0.028	2.219	3.380	−4.405 to 8.844	0.657	0.512
Condition × Altruism	−1.550	0.599	−2.723 to −0.376	−2.589	0.011	1.488	0.571	0.368 to 2.608	2.603	0.010	0.155	0.267	−0.368 to 0.679	0.582	0.563
Week × Altruism	0.014	0.069	−0.122 to 0.150	0.198	0.843	−0.009	0.070	−0.146 to 0.128	−0.130	0.896	−0.633	1.218	−3.020 to 1.755	−0.519	0.604
Week × Condition × Altruism	0.288	0.128	0.036 to 0.539	2.244	0.026	−0.321	0.129	−0.574 to −0.069	−2.493	0.013	−1.817	2.252	−6.231 to 2.597	−0.807	0.420
Random Effects															
σ ²	0.48					0.49					3.151	1.989	−0.747 to 7.050	1.584	0.115
τ ₀₀ ID	0.51					0.42					2.361	3.480	−4.459 to 9.181	0.678	0.498
ICC	0.52					0.46					−0.878	1.219	−3.266 to 1.511	−0.720	0.472
Conditional R ²	0.700					0.682					−1.718	2.318	−6.262 to 2.826	−0.741	0.459
n	67					67					66				
Observations	307					307					306				

Altruism = Altruistic Personality Scale; Week coded as 1–5 for weeks during the intervention period; Kindness to Others = 1 (n = 33), Kindness to Self = 0 (n = 34)

Altruism = Altruistic Personality Scale, Week coded as 1–5 for weeks during the intervention period, Kindness to Others = 1 ($n = 33$), Kindness to Self = 0 ($n = 34$)

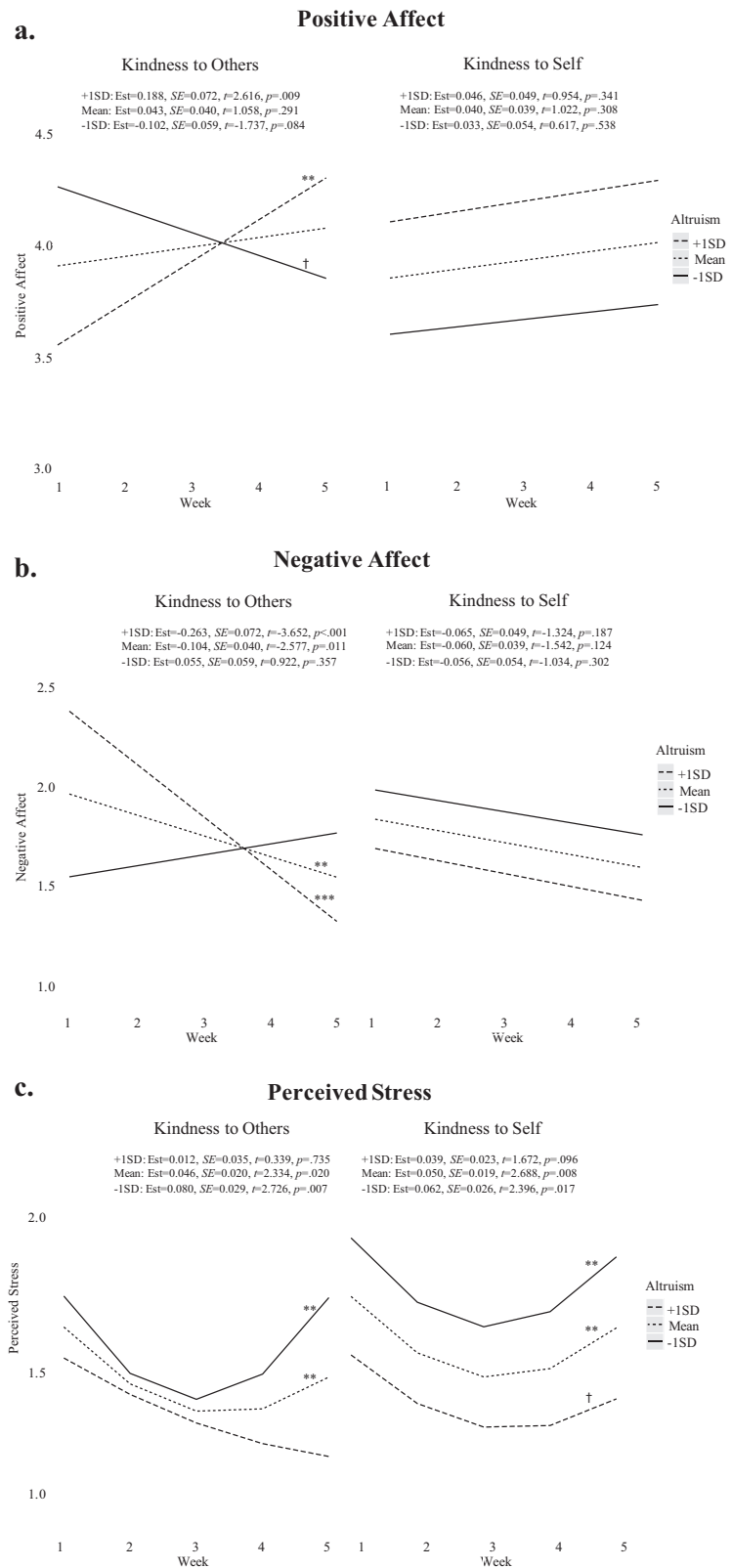
Table 3 Significant model for the 3-way interaction between Condition (Kindness to Others versus Daily Report), Week, and Altruism predicting psychological well-being outcomes

	Positive Affect				Negative Affect				Perceived Stress						
	Estimate	SE	95% CI	t	p	Estimate	SE	95% CI	t	p	Estimate	SE	95% CI	t	p
(Intercept)	0.775	0.688	−0.573 to 2.123	1.126	0.262	1.304	0.708	−0.085 to 2.692	1.841	0.068	0.660	0.340	−0.005 to 1.326	1.944	0.057
Pre-Intervention Outcome	0.476	0.080	0.319 to 0.633	5.946	<0.001	0.449	0.078	0.297 to 0.602	5.772	<0.001	0.630	0.085	0.465 to 0.796	7.459	<0.001
Week	0.248	0.155	−0.055 to 0.552	1.604	0.110	−0.031	0.153	−0.331 to 0.268	−0.205	0.837	1.153	2.390	−3.531 to 5.836	0.482	0.630
Condition	2.588	1.018	0.594 to 4.583	2.544	0.012	−1.955	1.024	−3.961 to 0.052	−1.909	0.058	−0.067	0.429	−0.909 to 0.774	−0.157	0.876
Altruism	0.773	0.466	−0.141 to 1.686	1.658	0.099	0.037	0.460	−0.865 to 0.939	0.080	0.936	−0.155	0.183	−0.514 to 0.204	−0.846	0.401
Week × Condition	−0.643	0.232	−1.099 to −0.188	−2.770	0.006	0.413	0.229	−0.035 to 0.862	1.805	0.072	1.240	3.581	−5.778 to 8.258	0.346	0.730
Condition × Altruism	−1.677	0.695	−3.040 to −0.314	−2.412	0.017	1.127	0.702	−0.248 to 2.502	1.606	0.110	−0.067	0.291	−0.638 to 0.504	−0.230	0.819
Week × Altruism	−0.120	0.105	−0.326 to 0.085	−1.150	0.251	−0.088	0.103	−0.290 to 0.115	−0.847	0.398	−0.539	1.621	−3.716 to 2.637	−0.333	0.740
Week × Condition × Altruism	0.417	0.159	0.105 to 0.730	2.621	0.009	−0.244	0.157	−0.551 to 0.064	−1.553	0.122	−1.916	2.456	−6.729 to 2.897	−0.780	0.436
Week ²											−2.984	2.464	−7.812 to 1.845	−1.211	0.227
Week ² × Condition											8.487	3.715	1.206 to 15.769	2.285	0.023
Week ² × Altruism											3.532	1.665	0.270 to 6.795	2.122	0.035
Week ² × Condition × Altruism											−6.118	2.541	−11.100 to −1.137	−2.407	0.017
Random Effects															
σ ²	0.60					0.58					0.14				
τ ₀₀ ID	0.47					0.52					0.18				
ICC	0.44					0.47					0.56				
Conditional R ²	0.619					0.619					0.732				
n	63					63					62				
Observations	286					286					285				

Altruism = Altruistic Personality Scale. Week coded as 1–5 for weeks during the intervention period. Kindness to Others = 1 (*n* = 33), Daily Report = 0 (*n* = 30)

Altruism = Altruistic Personality Scale, Week coded as 1–5 for weeks during the intervention period, Kindness to Others = 1 ($n = 33$), Daily Report = 0 ($n = 30$)

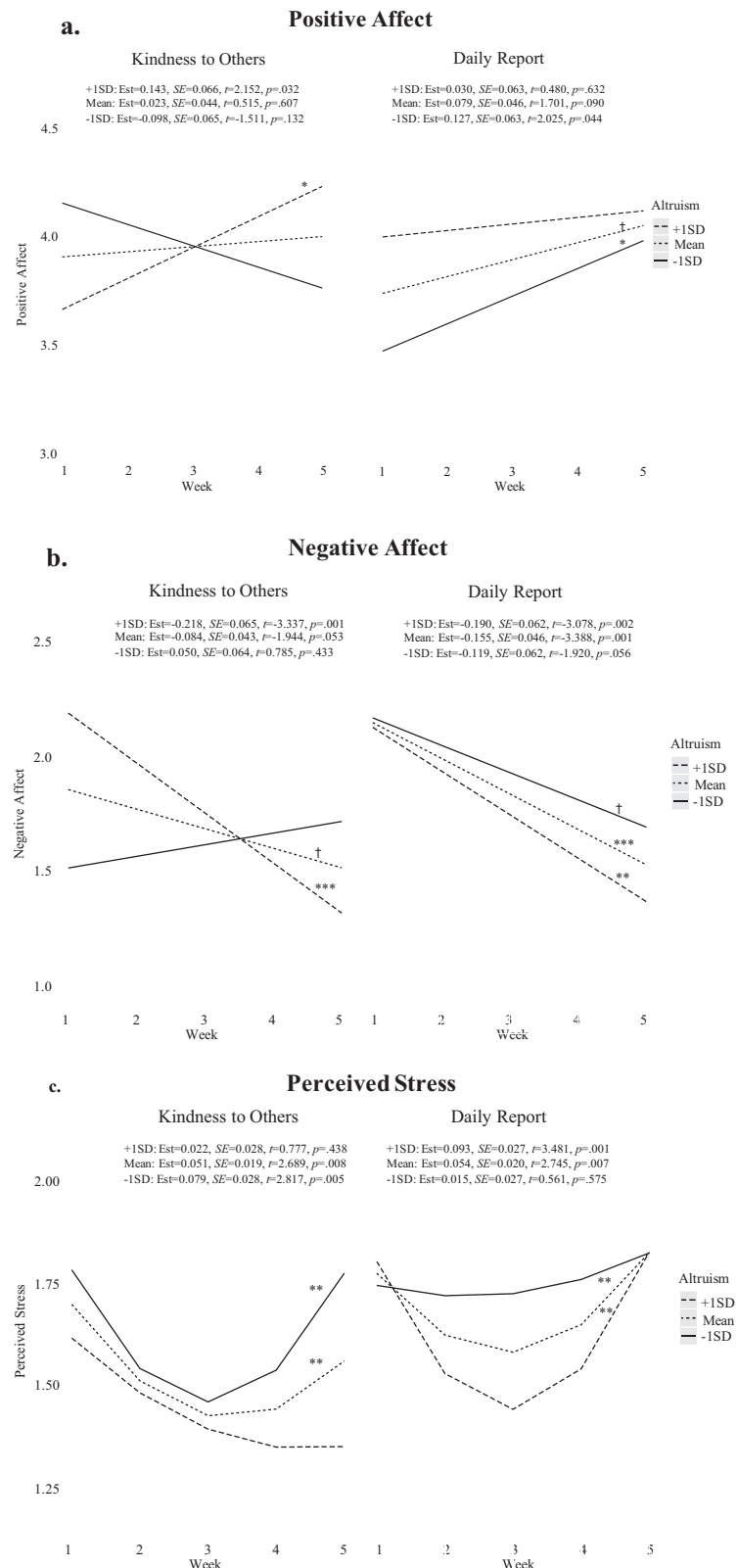
Fig. 2 Change in psychological well-being outcomes by Condition (Kindness to Others versus Kindness to Self) is moderated by Pre-Intervention altruism. Individuals in the Kindness to Others Condition compared to the Kindness to Self Condition (**a**) showed improvement in positive affect if they reported high (+1 SD) levels of altruism Pre-Intervention and marginal declines in positive affect if they reported low (−1 SD) levels of altruism Pre-Intervention. Individuals in the Kindness to Self Condition showed no significant changes in positive affect regardless of Pre-Intervention altruism. $n = 67$. **b** showed reductions in negative affect if they reported high (+1 SD) or average levels of altruism Pre-Intervention. Individuals in the Kindness to Self Condition showed no significant changes in negative affect regardless of altruism. $n = 67$. **c** showed significant quadratic change in perceived stress if they reported low (−1SD) and average (mean) levels of altruism Pre-Intervention. $n = 66$. Lines depict predicted values (marginal effects) for the regression model with 95% confidence interval bands shown in gray. Condition: Kindness to Others = 1 ($n = 33$), Kindness to Self = 0 ($n = 34$). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.10$



[−1.199, 6.304], $R^2 = 0.029$, $n = 67$. Kindness to Others versus Daily Report, Estimate = 2.444, $SE = 1.941$, $t = 1.259$, $p = 0.213$, 95% CI[−1.439, 6.327], $R^2 = 0.028$, $n = 63$.

Change in positive and negative affect from Pre- to Post-Intervention significantly moderated the association between Condition and giving behavior for Kindness to

Fig. 3 Change in psychological well-being outcomes by Condition (Kindness to Others versus Daily Report) is moderated by Pre-Intervention altruism. Individuals in the Kindness to Others Condition compared to the Daily Report Condition (**a**) showed improvement in positive affect if they reported high levels of altruism Pre-Intervention. Individuals in the Daily Report Condition showed significant improvements in positive affect at low levels of altruism. $n = 63$. **b** showed reductions in negative affect if they reported high levels of Pre-Intervention altruism. Individuals in the Daily Report condition also showed significant reductions in negative affect at average levels of altruism. $n = 63$. **c** showed significant quadratic change in perceived stress if they reported average levels of Pre-Intervention altruism with those in the Daily Report Condition also showing quadratic changes at high levels of altruism and those in the Kindness to Others Condition showing quadratic changes at low levels of altruism. $n = 62$. Lines depict predicted values (marginal effects) for the regression model with 95% confidence interval bands shown in gray. Condition: Kindness to Others = 1 ($n = 33$), Daily Report = 0 ($n = 30$). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, † $p < 0.10$

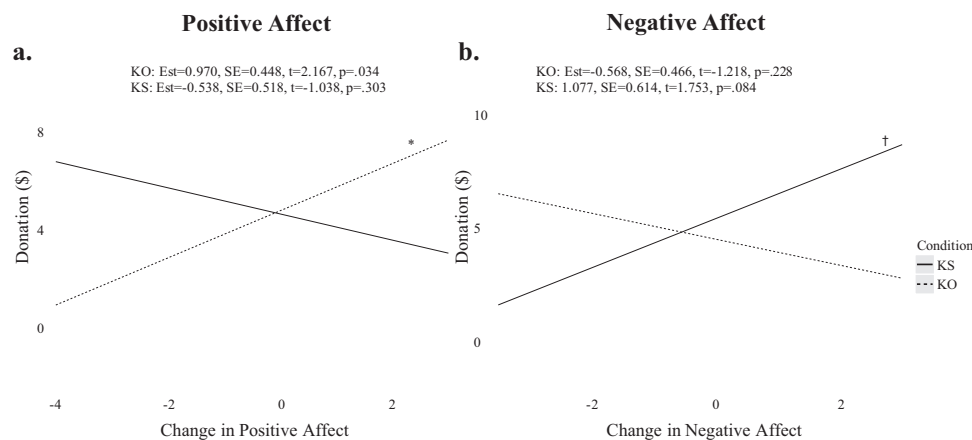


Others versus Kindness to Self (Table 4; Fig. 4a). Increase in positive affect was positively associated with increased donation for Kindness to Others. Increased negative affect

was marginally associated with increased donation for Kindness to Self (Fig. 4b). Positive and negative affect did not moderate donation for Kindness to Others versus Daily

Table 4 Interaction between Condition and pre- to post-changes in psychological well-being predicting Donations

	Estimate	SE	95% CI	<i>t</i>	<i>p</i>	<i>R</i> ²	<i>n</i>
Kindness to Others versus Kindness to Self							
Positive Affect	1.508	0.685	0.139 to 2.876	2.202	0.031	0.084	67
Negative Affect	−1.644	0.771	−3.185 to −0.104	−2.133	0.037	0.068	67
Perceived Stress	−0.945	1.103	−3.150 to 1.260	−0.856	0.395	0.013	66
Kindness to Others versus Daily Report							
Positive Affect	0.820	0.599	−0.378 to 2.018	1.369	0.176	0.081	63
Negative Affect	−0.246	0.715	−1.676 to 1.185	−0.344	0.732	0.031	63
Perceived Stress	−0.192	1.642	−3.479 to 3.096	0.117	0.907	0.009	62

Kindness to Others = 1 (*n* = 33), Kindness to Self = 0 (*n* = 34), Daily Report = 0 (*n* = 30)**Fig. 4** Giving Behavior moderated by change in affect for Kindness-to-Others versus Kindness-to-Self Conditions. **a** Individuals in the Kindness to Others Condition showed a significant positive association between change in positive affect (Post-Intervention minus Pre-Intervention) and giving behavior. Individuals in the Kindness to Self Condition showed no significant association between positive affect change and donation. **b** Individuals in the Kindness to Self Conditionshowed a marginal positive association between change in negative affect and giving behavior. Individuals in the Kindness to Others Condition showed no significant association between negative affect change and donation. Lines depict predicted values (marginal effects) for the regression model with 95% confidence interval bands shown in gray. Condition: Kindness to Others = 1 (*n* = 34), Kindness to Self = 0 (*n* = 33). ****p* < 0.001, ***p* < 0.01, **p* < 0.05, †*p* < 0.10

Report. Change in perceived stress did not significantly moderate the effect of Condition on donation for Kindness to Others versus Kindness to Self or Kindness to Others versus Daily Report.

Adherence

Greater number of acts reported was associated with improved outcomes for Kindness to Others participants above the effects of Pre-Intervention levels and time effects. Number of acts was significantly associated with positive affect and perceived stress improvements. Positive affect, Estimate = 0.244, *SE* = 0.063, *t* = 3.904, *p* < 0.001, 95% CI [0.123, 0.365], *R*² = 0.664, *σ*² = 0.482, *τ*₀₀ = 0.377, *n* = 33, observations = 150. Perceived stress, Estimate = −0.086, *SE* = 0.043, *t* = −2.031, *p* = 0.049, 95% CI [−0.168, −0.005], *R*² = 0.711, *σ*² = 0.153, *τ*₀₀ = 0.210, *n* = 32,

observations = 149. Number of acts reported was not significantly associated with negative affect reductions. Negative affect, Estimate = −0.082, *SE* = 0.072, *t* = −1.129, *p* = 0.266, *n* = 33, observations = 150. More acts reported was also associated with greater donations. Donations, Estimate = 0.541, *SE* = 0.233, *t* = 2.319, *p* = 0.027, 95% CI [0.065, 1.016], *R*² = 0.148, *n* = 33.

Discussion

Evidence suggests that prosociality is associated with psychological well-being (Memmott-Elison et al. 2020). However, extant correlational accounts are unable to establish whether engaging in kind acts boosts well-being or whether individuals with increased well-being are more likely to engage in kind acts. Understanding the utility of

encouraging prosocial behavior among adolescents is important given adolescence may be a period of opportunity for prosocial development due to social-cognitive maturation and increased social saliency (Eisenberg et al. 2015). The present study used a randomized controlled trial intervention to test the effects of performing kind acts for others on adolescent well-being. Results revealed that the effects of performing kind acts for others varied by adolescents' altruism at baseline, such that performing kind acts for others increased positive affect, decreased negative affect, and decreased stress among more altruistic adolescents. Further, among adolescents who performed kind acts for others, those who showed the greatest increases in positive affect donated more money to charity after the intervention. Taken together, performing kind acts for others improved well-being among youth who were more altruistic and promoted prosocial behavior among youth who benefited from increased positive affect.

Performing kind acts can improve well-being by promoting social acceptance from peers (Layous et al. 2012), gratitude from the recipient (Grant & Gino 2010), and a sense of fulfillment from helping others (Armstrong-Carter et al. 2020). Because adolescents generally befriend peers who are similarly prosocial (Wentzel 2014) and prosocial behavior increases after peer feedback (van Hoorn et al. 2016), more altruistic adolescents may have experienced psychological benefits because they performed kind acts for peers who value and reinforce acts of kindness. Performing kind acts can also fulfill a personal desire to contribute, which is posited to be a key need during adolescence (Fuligni 2019). In contrast, performing kind acts for others did not significantly change affect for adolescents who were less altruistic. Less altruistic adolescents may have felt that their contributions were less valued by peers and may have attached less value to performing kind acts, thereby limiting positive effects of the intervention on well-being. Future work should investigate whether differences in altruism are associated with divergent experiences of gratitude, fulfillment, and social acceptance in adolescents.

Adolescents who were more altruistic and performed kind acts for others showed sustained declines in perceived stress across the intervention period. Less altruistic adolescents showed an initial decline followed by an increase in stress toward the end of the intervention. For adolescents who performed kind acts for others and for themselves, levels of perceived stress were significantly lower post-intervention despite significant quadratic trends. Four weeks of consistent surveys may have fatigued adolescents in the passive control condition, and less altruistic adolescents may have perceived performing kind acts as burdensome. More altruistic adolescents may have also received more positive feedback from peers regarding their acts of kindness, which may have contributed to sustained reductions in

stress (van Hoorn et al. 2016). Greater ease and potentially more enjoyment performing the kind acts in this study may have contributed to continued reductions in stress during the second half of the intervention for altruistic adolescents (Layous et al. 2012). Future work should build on these findings to determine the extent to which recipient characteristics moderate the beneficial effects of prosocial behavior on stress.

This study underscores that positive psychological interventions may not equally benefit all adolescents. The effects of interventions often vary with individual differences (Antoine et al. 2018). The moderating effect of altruism was not tested when this intervention was administered to adults (Nelson et al. 2016). The current findings suggest policies geared toward increasing participation in kind acts and service may not have homogeneous effects for adolescents. Further work can more closely examine the potential pathways by which more altruistic adolescents benefit from kind acts, including through increased social acceptance, role fulfillment, and gratitude from the recipient. By better understanding mechanisms promoting well-being in altruistic adolescents, this intervention can be modified to enhance its effectiveness for other youth. For example, rather than merely performing acts, adolescents may need to actively reflect on performed acts, consistent with findings that reflection is necessary for adolescents to experience the positive benefits of community service (van Goethem et al. 2014).

Finally, performing kind acts for others promoted donating among adolescents who showed increases in positive affect across the intervention period. Changes in positive affect, as opposed to negative affect or stress, may have influenced giving because people engage in more prosocial acts when they have higher positive affect (Snippe et al. 2018). Adolescents who showed increases in positive affect throughout the intervention may derive more satisfaction from performing kind acts for others. Youth have different maturational trajectories and consequently differ in their ability to contextualize the rewards of performing kind acts for others (Flynn et al. 2015). Increased positive affect for these adolescents may reflect perceptions of prosociality as rewarding (Braams & Crone 2017), thereby contributing to continued prosocial behavior post-intervention.

Interpretation of the present results should consider specific aspects of the study design. The intervention involved completing one act per day for three days per week to ensure that participants could plan their kind acts accordingly without feeling overburdened. However, it remains to be determined whether three acts performed within a single day, as implemented in prior interventions in adults (Nelson et al. 2016), affects the overall impact of the intervention. Effects of kindness to others were compared with the active control of kindness to self and the passive

control of daily reports. All groups showed increases in positive affect, consistent with prior work in pre-adolescents (Layous et al. 2012), and reductions in negative affect. Features of the control conditions such as reflecting on one's day through daily reports and engaging in self-compassion through kind acts for self may contribute to this overall improved well-being (e.g., Cunha et al. 2016). Number of reported acts was associated with positive affect and perceived stress in the experimental condition. Thus, adherence to the study intervention was an important factor for reaping the benefits of performing kind acts for others.

Future interventions with increased restrictions on the acts performed may shed light on the psychological mechanisms contributing to improved well-being among altruistic adolescents in this study. For instance, adolescents self-reported their daily acts via text message. Although participants were encouraged to honestly note if they did not perform an act, they may not have actually performed the acts or may have interpreted the instructions loosely. Future studies may incorporate momentary assessments including photographs or more extensive reporting of time, effort, and novelty of acts performed. It is possible that more altruistic adolescents may have benefitted from the kind acts they performed because they invested more effort in these acts, despite not spending significantly more time performing the acts. Alternatively, more altruistic adolescents may have experienced the kind acts differently (i.e., perceived greater value) relative to less altruistic adolescents despite completing the acts in a similar way. Future studies should assess these potential mechanistic contributions.

Conclusion

Prior work had yet to establish whether a prosocial intervention can feasibly improve adolescent well-being. This study makes a substantial contribution to understanding the extent to which engaging in kind acts for others relates to psychological well-being and prosocial behavior during adolescence. The current findings suggest simply asking adolescents to engage in prosocial acts may not be enough. The benefit of performing kind acts for others in this study varied as a function of altruism for adolescents. Performing kind acts for others increased positive affect, reduced negative affect, and reduced stress for more altruistic adolescents. Individual differences in contextualizing the benefits of altruism may manifest prior to mid-adolescence, contributing to differences in the extent to which performing kind acts for others improved well-being. Adolescents who experienced increased positive affect as a result of engaging in kind acts for others were also more likely to engage in prosocial giving post-intervention, suggesting

these effects may have long-lasting implications for adolescents' well-being and behavior. Adolescence has been posited to be a unique developmental period offering opportunity for youth to benefit from prosocial acts. The current study elucidates important individual differences that can amplify this opportunity with regard to improved psychological well-being.

Authors' Contributions S.M.T. developed the study concept, designed the study, collected data, performed statistical analyses, and drafted the manuscript; D.R. developed the study concept, designed the study, collected data, provided input on statistical analyses, and drafted the manuscript; M.K. collected data, and provided input on statistical analysis and the manuscript; N.E. provided feedback on study design and input on the manuscript; A.G. provided feedback on study design and input on the manuscript; S.W.C. provided feedback on study design and input on the manuscript; A.J.F. developed the study concept, designed the study, and provided input on statistical analysis and the manuscript. All authors read and approved the final manuscript.

Funding This work was supported by a grant from Hope Lab to A.J.F. Preparation of this manuscript was supported in part by a National Science Foundation Graduate Fellowship to S.M.T. (2016207607).

Data Sharing and Declaration The dataset analyzed during the current study are available in the Open Science Framework repository, <https://osf.io/pg9rd>.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures in this study complied with ethical standards of the University of California, Los Angeles Institutional Review Board (IRB#17-001018).

Informed Consent Informed consent was obtained from all adult participants and child participant parents, and assent was obtained from all child participants.

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