

Intrinsic Value of Self-Disclosure Across Adolescence

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Adolescence is a critical period of development characterized by significant changes in social contexts. Amidst shifting networks of social support, adolescents' decisions about how much and with whom to develop intimacy can be critical for buffering against risks of maladjustment to these changes. Prior research indicates that one such means of developing strong interpersonal relationships is self-disclosure – or sharing information about oneself with other people. The primary goal of the present study was to investigate developmental differences in self-disclosure behavior, in particular, the differential intrinsic value accorded to sharing with specific target audiences versus others. Using a behavioral paradigm, we collected data from 112 adolescents (61 female, aged 11.8-23.0 years) on value for sharing to parents, close friends and peers. Adolescents significantly valued self-disclosure, choosing to forego 33% of potential earnings to share information about themselves with others rather than to keep it private. While the average value of self-disclosure did not vary across age groups, they did differ in valuation of self-disclosure to specific target audiences. In particular, mid-adolescents valued sharing with unfamiliar peers more highly than parents or friends. In comparison, early and late adolescents did not evidence significant differential valuation of self-disclosure across the three target audiences. Male adolescents exhibited less overall value for disclosure than females, and exploratory analyses revealed that males with greater value of disclosure to friends and peers reported less engagement in substance use and deviant peer affiliation. In summary, the findings highlight continued valuation of parents and close friends across the adolescent period, but also suggest important differences in the functional implications of disclosure to different targets. These results extend both self-report and task-based assessments of the intrinsic value of self-disclosure.

Adolescence is a critical period of self and social development in humans. Interpersonal interactions take on increased importance during the transition from childhood to adulthood (Crone & Dahl, 2012) as adolescents work to reconcile increased levels of autonomy from parents with cultivating a sense of relatedness and belonging outside of family networks (Collins & Laursen, 2013; Hill & Holmbeck, 1986; Nelson, Jarcho, & Guyer, 2016; Turner, Irwin, Tschann, & Millstein, 1993). With reduced oversight from parents, greater proportions of time spent with similar-aged peers serve as the basis upon which adolescents develop important social skills for future relationships (B. Brown, 2013; B. Brown & Larson, 2009; Connolly, Furman, & Konarski, 2000). Social context plays a key role in the development of young peoples' identities, as they use others' perspectives to help verify and develop views about themselves (Pfeifer et al., 2009).

For some adolescents, this normative process of social reorganization can be a “double-edged sword” with a range of emotional and behavioral consequences (Noom, Deković, & Meeus, 1999). This period sees a rise in certain externalizing behaviors, such as delinquency and aggression, as well as the initiation of risk-taking behaviors such as substance use, which are associated with downstream increases in criminality and addiction (Mason et al., 2010; Steinberg, 2008). These trajectories, importantly, have been shown to be moderated by peer relationships. Susceptibility to excessive risk-taking, for example, is exacerbated by affiliating with peers who regularly engage in externalizing behaviors (Elliott, Huizinga, & Ageton, 1985), whereas greater prosociality among friends is associated with reduced likelihood of violence and substance use (Prinstein, Boergers, & Spirito, 2001). Thus, the means by which adolescents choose and develop new networks of social support may serve as critical mediating and moderating processes of their social and emotional adjustment.

Self-Disclosure in Adolescence

The current paper focuses on one particular means of developing new relationships and/or deepening existing ones – *self-disclosure* – or the process of sharing information about oneself with other people. Disclosing thoughts, feelings and experiences with others fosters feelings of liking, caring, and trust, and facilitates deepening of close relationships (Altman & Taylor, 1973; Cozby, 1973). In contrast, low levels of self-disclosure behavior are associated with feelings of loneliness (Leung, 2002; Solano, Batten, & Parish, 1982; Wei, Russel, & Zakalik, 2005). The ubiquity of technology has produced additional contexts for engaging in self-disclosure during adolescence. Text messaging and social networking facilitate instantaneous, around-the-clock means of communication, and adolescents' frequent use of these mediums has been associated with increased belonging and emotional relief (Davis, 2012).

Given the complex constellation of shifting social contexts, however, it may be important to examine not only the effects of self-disclosure to close friends, but also the effects of sharing with less familiar peers or parents. For example, self-disclosure to parents is typically found to decrease across adolescence, as recently observed in a large longitudinal study using growth mixture modeling (Padilla-Walker, Son, & Nelson, 2018). The preference to disclose intimate information has also been found to shift from parents to close friends across adolescence (Papini, Farmer, Clark, Micka, & Barnett, 1990). Moreover, greater decreases in self-disclosure to parents in particular are associated with increases in delinquent behaviors such as shoplifting and petty theft (Keijsers, Frijns, Branje, & Meeus, 2009). If self-disclosure behavior is indeed a meaningful proxy for social affiliation, *to whom* adolescents self-disclose (and how much they do so) may be an important moderator of developmental trajectories.

Moreover, the role of gender in self-disclosure needs to be interrogated. Females are consistently identified as disclosing more than their male counterparts during adolescence (Finkenauer, Engels, & Meeus, 2002; Soenens, Vansteenkiste, Luyckx, & Goossens, 2006; Valkenburg, Sumter, & Peter, 2011). Consideration of the moderating role of gender may be particularly important when relating self-disclosure to emotional and behavioral outcomes such

as substance abuse and delinquency, given marked gender differences in their prevalence during the second decade of life (Bongers, Koot, Ende, & Verhulst, 2004)

Intrinsic value of self-disclosure

While research has primarily focused on the frequency of disclosures based on adolescent- or parent-reports, there is uncertainty about the extent to which these reported measures of disclosure are reliable and valid. For example, growing desires to gain emotional autonomy and independence from parents may cast doubt on the validity of these reports during adolescence (Frijns, Finkenauer, Vermulst, & Engels, 2005). In contrast, a novel line of research has used experimental paradigms to study the value of disclosure, showing that it is an intrinsically rewarding behavior. Using a forced-choice paradigm, researchers demonstrated that undergraduate students were willing to forego financial gains, up to 25% of potential earnings, in order to share even mundane, emotionally neutral self-disclosures with others (Tamir & Mitchell, 2012). Moreover, doing so recruited brain regions commonly associated with the anticipation and receipt of primary rewards such as food and sex, including the ventral striatum (Tamir & Mitchell, 2012).

The goal of the present study was to test this behavioral measure of self-disclosure across early to late adolescence. If adolescents have a strong motivation to reorient their social world from parents to peers (Nelson et al., 2016), then they should value self-disclosure to these groups differentially. Based on this theoretical prediction, we hypothesized that value for disclosure to parents would decrease with age, while that for close friends and same-aged peers would increase during this period. In other words, early adolescents were expected to value disclosure to parents more than peers, while late adolescents were expected to value disclosure to peers more than parents. In addition, given prior evidence of gender differences in frequency of self-disclosure behavior, we predicted that girls would value sharing information more highly than boys, but did not have specific hypotheses about whether gender would

interact with target audience to predict value for disclosure. Finally, the study explored whether value for self-disclosure is associated with externalizing problems during adolescence, focusing on delinquent and antisocial behavior, as well as substance use.

METHOD

Participants

122 participants were recruited into the study (62 females, 60 males, 11.8-28.4 years old, $M = 16.93$, $SD = 3.26$). Participants aged 18 years and older provided informed written consent, whereas parental consent and participant assent were obtained for minors as approved by the University of Oregon Institutional Review Board. Compensation for undergraduate students was partial course credit; all other participants received \$20. Participants received additional “earnings” from the primary task, as detailed further below.

Of the 122 participants in this study, nine were excluded from analysis for various reasons. Specifically, three participants were excluded for failing to follow instructions, three were excluded for nontraditional progression through school contexts, and another three participants were excluded as statistical outliers (as calculated by the multivariate Mahalanobis D^2 test). The final sample consisted of 113 participants (61 females, 52 males, 11.8 – 23.0 years old, $M = 16.70$, $SD = 2.96$) from three age groups (early adolescence [$N = 38$ (20F); $M = 13.52$ years old, $SD = .80$, range = 11.8-14.8], mid-adolescence [$N = 37$ (21F); $M = 16.28$ years old, $SD = .63$, range = 15.1 - 17.7], and late adolescence [$N = 38$ (20F); $M = 20.29$ years old, $SD = 1.28$, range = 18.5 - 23.0]).

The final sample size had excellent power (0.99) to detect previously reported medium effect sizes ($d = 0.47$; Tamir & Mitchell, 2012) in behavioral valuation of self-disclosure (at alpha 0.05). There was adequate power to detect such effects within each age group (0.80), as well as within each sex (females = 0.95, males = 0.92). When considering our main hypotheses, we estimated i) power to detect the interaction between age group and target to be high (1.0) based

on previously reported age differences in self-reported disclosure to parents versus best friends in adolescents ($d = 0.72$; Papini et al., 1990), and ii) power to detect gender differences to be high (0.99) based on previously reported gender differences in self-reported disclosure behaviors ($d = 0.51$; Valkenburg et al., 2011).

Procedures

We adapted an existing forced-choice self-disclosure task (Tamir & Mitchell, 2012) to allow examination of differences in intrinsic value across disclosure targets. On each of 270 trials, participants were presented with a short disclosure statement, and asked to report whether or not it accurately described them (responses were required within 4,000ms). Disclosure stimuli consisted of relatively mundane, emotionally neutral preferences, likes, and dislikes (e.g., likes spicy food, thinks wool sweaters are itchy), and avoided topics that could be controversial or embarrassing. As in the original paradigm, immediately preceding each self-disclosure statement, participants were presented with a decision to either share their answer to the (upcoming) self-disclosure statement or to keep it private (responses were required within 2,000ms). The choice to maintain privacy was always contrasted with only one disclosure target: share with *friend* vs. keep it *private*, share with *parent* vs. keep it *private*, or share with the *next participant* vs. keep it *private*. Participants were told that by choosing to share with the *next participant* (hereafter referred to as an '*unfamiliar peer*'), their answer to the associated disclosure statement would be shared with the next same-sex, same-age participant in the study. Each of the two choices (to share or to keep private) was associated with a small monetary payoff between \$0.01 and \$0.04, depicted by images of pennies. Payoff amounts for each choice randomly varied across trials such that on some trials, keeping information private resulted in a larger payoff, on other trials, sharing resulted in a larger payoff, and occasionally, the payoffs were equal (see Figure 1). Depending on their decision-making strategy,

participants could earn up to \$4 in bonus payment in addition to baseline compensation.

Participants were presented 90 trials of each of the three conditions.

Prior to the experiment, participants provided experimenters with the email address of a parent. For the 'friend' trials, participants were asked to provide an email address of their closest same-sex friend. There were a few instances in which younger participants were only able to obtain email addresses of opposite-sex friends. Participants were told that any self-disclosures that the participant decided to share would be automatically emailed by the computer program to each of the respective recipients immediately after the experiment. In addition, as part of their orientation to the task, participants were shown a set of disclosures that the "last participant" ostensibly chose to share with them to help them see how benign the statements were, as well as to facilitate their belief that their disclosures would be shared with the next participant. In reality, all participants saw the same disclosures from a fictitious "last participant." Post-experimental manipulation checks indicated that all participants explicitly believed that their decisions of whether to share self-disclosures would be executed.

After receiving instructions, participants completed a set of 20 practice trials (10 under no time constraints; 10 under the time constraints of the actual task) to acclimate to the nature of self-disclosure statements and the relatively rapid pace of stimuli presentation. Participants were debriefed and compensated for their participation after completing the study.

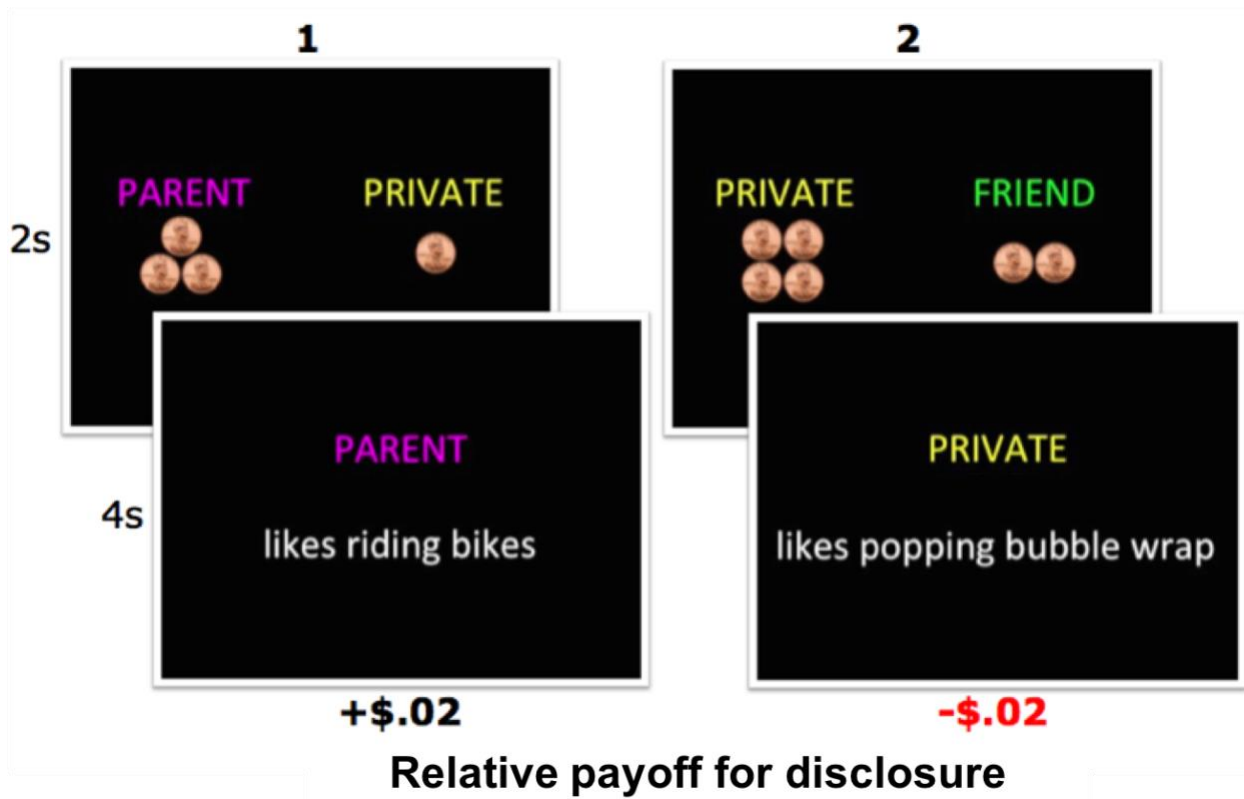


Figure 1. Task design, illustrated by two example trials.

Measures

Substance use, affiliation with deviant peers, and antisocial behavior were assessed using several self-report questionnaires (collected specifically for exploratory analyses). These measures were developed by the Oregon Research Institute (Metzler, Biglan, Rusby, & Sprague, 2001) and subsequently employed in several longitudinal studies tracking adolescent risk-taking behavior (e.g., Stormshak et al., 2011). Substance use was assessed using 6 items for cigarette, alcohol, marijuana, and other drug use within the past month. Deviant peer affiliation was assessed with 19 items, and asked about participants' friends who engaged in behavior such as fighting, using illegal substances, carrying a weapon, or getting arrested. Adolescents reported the number of times they spent time with these friends within the past

month (e.g., 0 = never, 6 = more than 7 times), as well as the number of their closest friends who have engaged in these behaviors within the same time period (e.g., 0 = none, 4 = more than 3). To measure antisocial behavior, adolescents rated 11 items for occurrence during the past month (e.g., 0 = never, 5 = more than 20 times). This scale includes items such as lying to parents about where they had been, skipping school, stealing, getting into fights, carrying weapons, or purposefully damaging or trying to damage property.

Statistical analyses

For each participant, the relative value of self-disclosing to each of the three disclosure targets (friend, parent, unfamiliar peer) was determined by calculating the point of subjective equivalence (PSE) between sharing information and keeping it private. Specifically, for each trial, the relative payoff associated with sharing was calculated as the difference between the values for sharing and private choices, ranging from -3 to 3 cents by 1 cent increments. For each of these 7 data points (per condition), we calculated the percentage of trials in which a participant chose to share the information. Cumulative normal curves were fit to these values by implementing a Nelder-Mead simplex search algorithm in Matlab. Cumulative normal distributions were defined on the basis of the following probability density function:

$$\frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

Starting values for this estimation were set at a mean of 0 and an SD of 1, and the search continued for 100,000 iterations, or until a solution was achieved. In situations when participants had highly skewed behavior (e.g. always or almost always chose to disclose regardless of the relative payoff for sharing), a solution was not appropriately estimable (N = 27 for unfamiliar peers, 29 for parents, and 27 for friends). To deal with these situations, the final solutions of PSE were winsorized to a meaningful range (based on study design) of -3 and +3.

A negative PSE indicates a willingness to forego up to \$0.03 to self-disclose, thus reflecting its intrinsic value. Herein, we discuss the “Relative Disclosure Value” defined as the inverse of the PSE.

A single sample t-test examined whether the Relative Disclosure Value for all items were significantly different from zero. Next linear mixed models were used to examine the *i*) main effect of target condition, *ii*) main effect of age group, *iii*) interaction between age group and target condition, *iv*) main effect of gender, *v*) interaction between gender and target condition. These models were run with the nlme package (Pinheiro, Bates, DebRoy, Sarkar, & R Core Team, 2018) in R (R Core Team, 2013), with observations in all models nested within participants using random intercepts. A significant effect was determined based on a *p* value < 0.05 for the Likelihood Ratio Test comparing two models. Main effects models were compared to a null model (e.g. $Y = B1 + B2target + RE + error$ vs. $Y = B1 + RE + error$), while the interaction model was compared to a main effects model (e.g. $Y = B1 + B2target + B3age + B4target*age + RE + error$ vs. $Y = B1 + B2target + RE + error$). Post-hoc analyses of interactions with target condition were undertaken within each age group or gender. Three-way interactions between target condition, age group, and gender were not examined given lowered power (~ 0.50) to detect previously reported effect sizes in behavioral valuation within each combination of gender and age group. Supplementary analyses replaced age group with continuous age, and found the pattern of results remained consistent (see Table S2 for further details).

Next, exploratory analyses examined whether externalizing behaviors were related to Relative Disclosure Value. Separate linear mixed models were run for each of the externalizing behaviors. These analyses were conducted within each gender, given significant gender effects identified in Relative Disclosure Value (see Results). Moreover, we used residual externalizing

behaviors after accounting for age group (within each sex) given significant developmental trends in these behaviors (see Table S1). Linear mixed models compared i) null model, ii) main effect of externalizing behavior, and iii) interaction between externalizing behavior and target condition. Again, we did not explore age effects given the small sample sizes when conducting analyses within each gender.

RESULTS

Self-Disclosure vs. Privacy

Consistent with the hypothesis that self-disclosure is valuable, participants demonstrated significant positive value of self-disclosure across all disclosure targets ($M = 1.02$, $SD = 1.39$), $t(112) = 7.76$, $p < .001$, $d = 0.73$, foregoing approximately \$0.01 per trial, or 33% of potential earnings, to share information about themselves over keeping disclosures private. Given the randomization of payoff amounts, participants were sometimes presented with trials in which disclosing information was worth the same amount as keeping disclosures private; in these cases, participants chose to share 68% of the time versus keeping disclosures private ($M = .68$, $SD = .28$), $t(112) = 25.73$, $p < .001$).

Effects of Target Audience

Across age groups and gender, there was a significant positive valuation of self-disclosure to parents ($M = 0.94$, $SD = 1.14$, $t(112) = 7.05$, $p < 0.001$, $d = 0.66$), friends ($M = 0.99$, $SD = 1.48$, $t(112) = 7.11$, $p < 0.001$, $d = 0.67$), and unfamiliar peers ($M = 1.12$, $SD = 1.27$, $t(112) = 9.42$, $p < 0.001$, $d = 0.89$). Analyses also revealed that the main effect of target audience (Peer, Friend, Parent) significantly improved model fit beyond the null model (LRT = 6.91, $p = .032$). As illustrated in Figure 2, adolescents (across all school contexts and both genders) valued sharing information with unfamiliar peers more than parents ($p < .011$), and exhibited a similar trending preference for sharing with unfamiliar peers over friends ($p < .067$).

See Table S2 for further detail on model selection and Table S3 for a summary of the best-fitting model

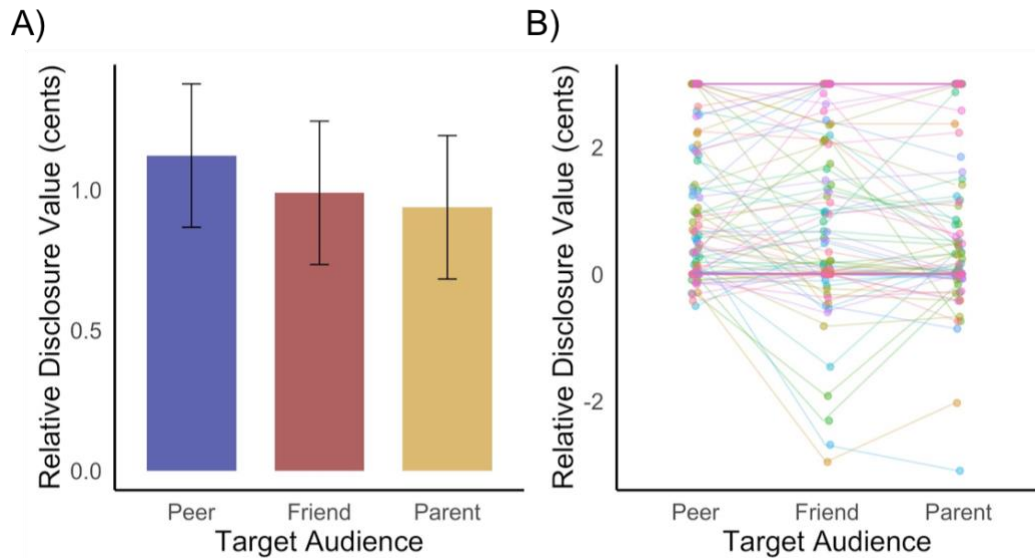


Figure 2. A) Group averages (and 95% CI) of the Relative Disclosure Value for sharing information with an unknown peer (ostensibly a prior same-age, same-sex participant), a close friend, or a parent. B) Individual participants' Relative Disclosure Value for each of these target audiences.

Effects of Age Group

Linear mixed models revealed that there was no significant main effect of age group (early, middle, late adolescence) in predicting value for disclosure (i.e., age did not improve model fit beyond the null model, likelihood ratio = 1.11, $p = .573$). Split by age group, there was a significant positive valuation of self-disclosure in early ($M = 0.80$, $SD = 1.39$, $t(32) = 3.53$, $p = .001$, $d = 0.57$), middle ($M = 1.03$, $SD = 1.44$, $t(36) = 4.35$, $p < .001$, $d = 0.71$), and late adolescence ($M = 1.22$, $SD = 1.35$, $t(37) = 5.61$, $p < .001$, $d = 0.91$).

Next, linear mixed models revealed that the interaction between target audience and age group improved model fit beyond the main effect of age (LRT = 19.51, $p = .003$). Planned

comparisons revealed that mid-adolescents shared discriminately (illustrated in Figure 3), preferring to self-disclose to certain audiences versus others (i.e., the main effect of target audience improved model fit beyond the null model; $LRT = 10.95$, $p = .004$). Specifically, they preferred disclosing to an unfamiliar peer relative to a friend ($p = 0.006$) and a parent ($p = 0.004$). No such effect was identified in early ($LRT = 1.97$, $p = .374$) or late adolescents ($LRT = 4.36$, $p = .113$). In order to further interrogate the interaction between age group and target condition, post-hoc analyses also examined the effect of age group within each target condition. However, age did not change behavioral valuation for self-disclosure within any of the target conditions. See Tables S2 and S3 for further details on linear mixed models.

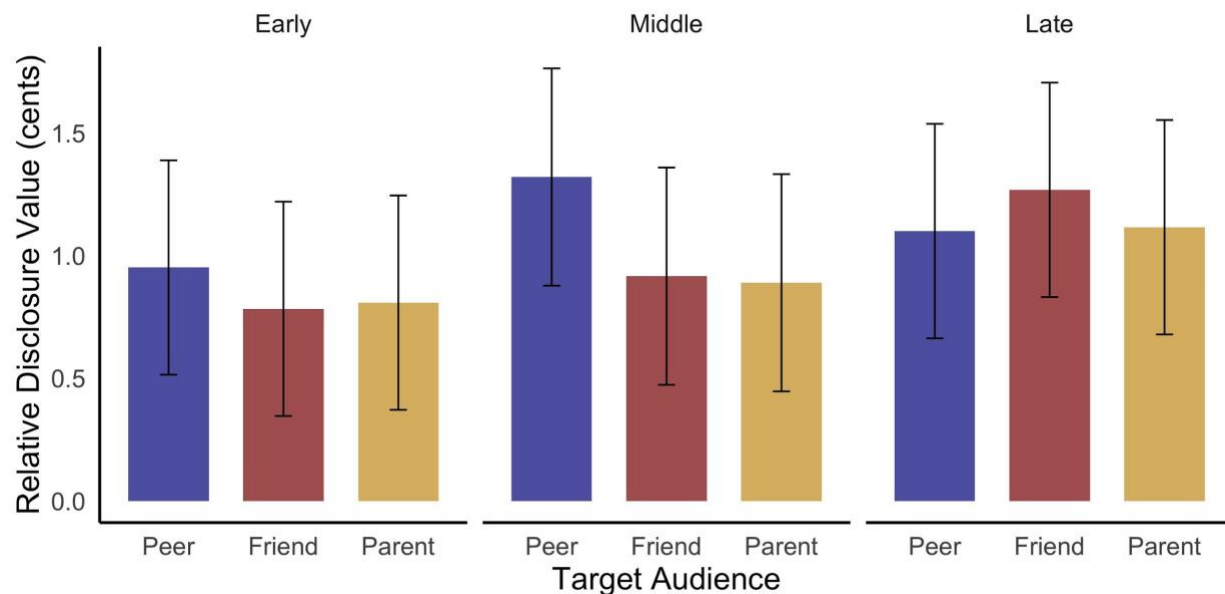


Figure 3. Group averages (and 95% CI) of the Relative Disclosure Value for sharing information with different target audiences in early, mid and late adolescents.

Effects of Gender

Linear mixed models revealed a trending main effect of gender ($LRT = 3.17, p = 0.07$); overall, females had a higher value for disclosure ($M = 1.26, SD = 1.40, d = 0.90$) than males ($M = .730, SD = 1.34, d = 0.55$). Furthermore, the interaction between gender and target audience improved model fit beyond the main effect of gender ($LRT = 11.83, p = 0.02$). Post-hoc analyses revealed that target audience improved model fit beyond the null model in males ($LRT = 7.83, p = 0.02$), but not females ($LRT = .351, p = .839$). As illustrated in Figure 4, males valued sharing with unfamiliar peers more than friends ($p = .047$) and parents ($p = .008$). See Table S2 and S3 for further details on linear mixed models.

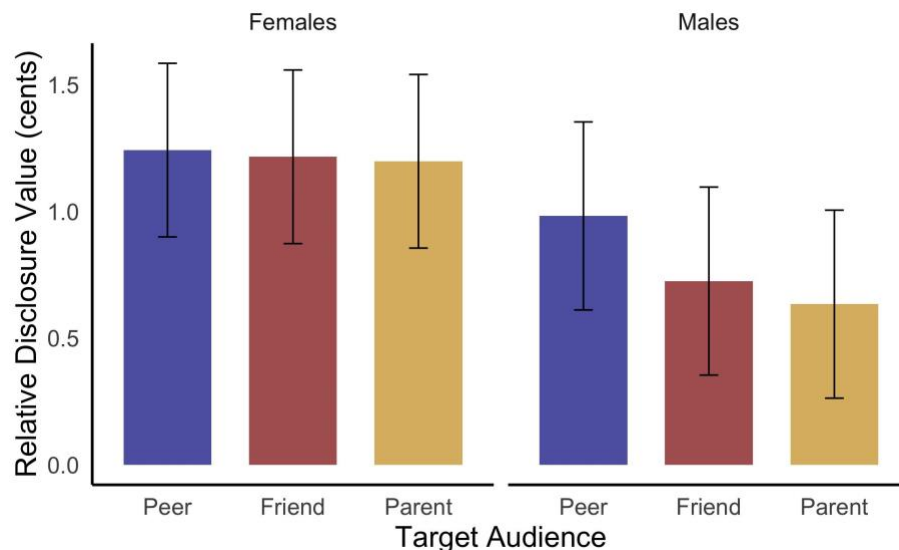


Figure 4. Group averages (and 95% CI) of the Relative Disclosure Value for sharing information with different target audiences for males and females.

Individual differences in problem behaviours

Exploratory analyses failed to identify any associations between disclosure value and externalizing problems in females. However, one significant and one trending association was present in males. Specifically, linear mixed models revealed a significant interaction between deviant peer affiliation and target audience in predicting value for disclosure in males ($LRT =$

10.39 $p = .034$). While post-hoc analyses failed to reveal significant effects of deviant peer affiliation for each of the target audiences separately, illustration of the interaction (Figure 5) revealed that the negative correlation between deviant peer affiliation and disclosure value was greatest for friends and weakest for parents. There was also a trending interaction between substance use and target audience (LRT = 9.48, $p = .050$) in predicting value for disclosure in males. Again, the negative correlation between substance use and disclosure value was greater for peers in general (friends and unfamiliar peers) than parents (see Figure 5), with post-hoc analyses finding trending negative correlations in friends (LRT = 3.68; $p = .055$) and unfamiliar peers (LRT = 3.62; $p = .057$). See Table S4 for further details on model selection for linear mixed models relating disclosure value and externalizing problems, and Table S5 for a summary of best-fitting models.

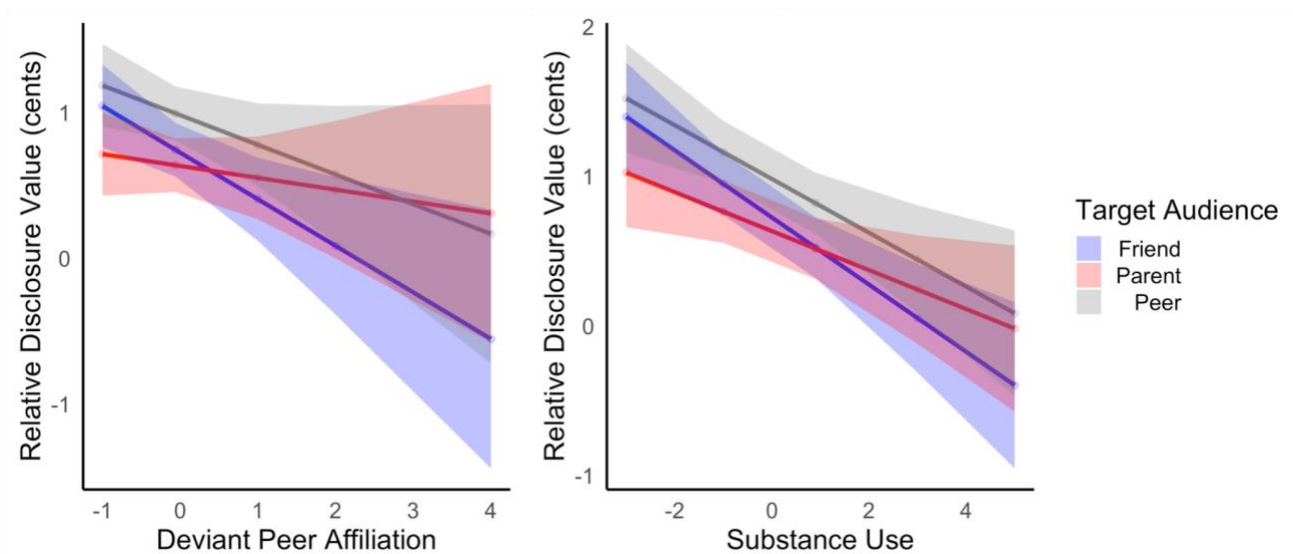


Figure 5. Relationship problem behaviors and self-disclosure value for different target audiences in males.

DISCUSSION

The current study found that adolescents valued self-disclosure across a wide range of developmental contexts; early through to late adolescents chose to share information about themselves with other people at the expense of financial gains. The degree to which self-disclosure is valuable, however, seemed to depend on *with whom* one shares. In particular, mid-adolescents assigned the greatest value to sharing with unfamiliar peers. In addition, there were gender effects that confirm and extend patterns from the self-report literature. Specifically, females valued self-disclosure more highly than males, regardless of the target audience. In contrast, males were somewhat more discriminant than females, choosing to forfeit more money to share self-relevant information with unfamiliar peers. Associations between self-disclosure value and externalizing behaviors were also only significant for male adolescents.

These results have several implications for our understanding of self-disclosure behavior and its possible role in self and social development during adolescence. Consistent with the characterization of adolescence as a period of great sensitivity to social interactions (Crone & Dahl, 2012), the current study demonstrates that sharing of self-relevant information to parents and peers is highly valued; in other words, adolescents will forgo money for the opportunity to share information with others. Our findings extend Tamir and Mitchell's (2012) study by showing that valuation for self-disclosure is present by early adolescence, which is supported with a wider literature showing that engagement in self-disclosure behaviors emerge during the transition from childhood to adolescence (Vijayakumar & Pfeifer, 2019). Indeed, research has shown that relationships that are often based around shared activities during childhood evolve to be characterized by greater time spent in conversation with one another during adolescence (Valkenburg et al., 2011). Future studies should also target the transition from late childhood to early adolescence to determine when self-disclosure becomes intrinsically rewarding.

Prominent theories also point to the importance of self-disclosure for developing intimacy within emerging interpersonal relationships (Altman & Taylor, 1973), while models on adolescence purport a process of social reorganization that prioritizes social interactions with

some specific people more than others (Nelson et al., 2016). Consistent with this understanding, our findings suggest that when it comes to sharing self-relevant information, certain target audiences are more valued than others, and these preferences may vary across developmental contexts. Interestingly, we identified an unexpected preference to disclose to unfamiliar peers in mid-adolescence, and one possibility is this may reflect the importance placed on peer groups and “crowd” affiliation. While younger adolescents find that peer groups facilitate social interactions and foster friendships, the importance of crowd affiliation decreases with age, along with increased concerns about conformity and individuality (Brown, Eicher, & Petrie, 1986). Concurrently, the need to make new friends declines in late adolescence as the quality of existing relationships deepens (De Goede, Branje, & Meeus, 2009; Way & Greene, 2006). In addition, for older adolescents, attending college often represents a major departure from previous social contexts associated with living at home. Despite changing networks of social support, needs for verifying one’s emergent identity persist, and adolescents look to those closest to them to reaffirm these self-views in the wake of increased levels of autonomy (Swann & Bosson, 2010). Thus findings suggest that the value of peer groups is particularly in flux during adolescence, while parents and close friends are more likely to remain important confidantes. While it is possible that these differences are reflective of the consistent support provided by close others, they could also be driven by changing preferences to disclose to familiar vs. unfamiliar others. Future research could include less intimate (but known) acquaintances as an additional target to further interrogate the role of familiarity.

Unsurprisingly, we found that females tended to value self-disclosure more than their male counterparts. This is consistent with prior research showing that female adolescents disclose more frequently to their parents (Finkenauer et al., 2002; Soenens et al., 2006) and peers (Valkenburg et al., 2011) than males. Interestingly, males disclosed more to unfamiliar peers than friends and parents, which is somewhat consistent with a prior meta-analysis of sex differences in self-disclosure to different target audiences (Dindia & Allen, 1992). It may be

speculated that males preference disclosing to unfamiliar peers as a means of practising this skill during adolescence, given that prior literature has identified that younger adolescent males prefer disclosing online (Valkenburg et al., 2011) and that online disclosure helps develop social skills through exposure to a wide audience of unknown peers (Koutamanis, Vossen, Peter, & Valkenburg, 2013). Exploratory analyses also revealed individual differences in the value of disclosure in males, such that adolescent males with greater value for peer-directed disclosure had less deviant peer affiliations and engaged in less substance use. Conversely, those with less value for peer-directed disclosure engaged in more of these potentially problematic behaviors. These findings suggest that disclosure can be protective against maladaptive developmental outcomes, which may reflect the social and emotional support adolescents receive when communicating their thoughts and feelings (Howe, Aquan-Assee, Bukowski, Lehoux, & Rinaldi, 2001; Lee, Noh, & Koo, 2013; Rimé, 2009). This might be particularly buffering for males, who seem to engage in less self-disclosure overall. Moreover, disclosure to friends and unfamiliar peers had a stronger effect (than parent-directed disclosure) on externalizing problems that are more likely to be engaged in around peers, highlighting the relevance of these social relationships for developmental outcomes.

We also speculate that technology and social media may be playing a critical role in shaping adolescents' decisions about with whom they share information about themselves, and in particular, the value placed on disclosing to unfamiliar peers. Adolescents spend a far greater amount of their lives online than ever before (Pew Research Center, 2018), and while adolescents primarily use social networking sites to communicate with offline friends and maintain existing relationships (Valkenburg et al., 2011), they are also exposed to a larger network of unfamiliar peers through these sites. Thus they are able to connect with others, develop new relationships, and broadcast their identities across ever-changing social mediums. Despite these unprecedented shifts in the greater social landscape, their effects on adolescents' self and social development is not very well understood, but there is no evidence in this study to

suggest self-disclosure (even to unfamiliar peers) is necessarily maladaptive. If anything, for adolescent males at least, assigning greater value to such disclosure was protective.

Limitations and Future Directions

The current findings should be considered in light of some limitations. While the experiment tried to increase ecological validity by asking that participants provide emails address of friends and parents, ostensibly to share their actual disclosures with, it was sometimes difficult for younger participants to do so. Future studies could explore alternate methods of delivering shared disclosures to target audiences, such as text messages or social media platforms. Additionally, despite having shown effects of self-disclosure value across groups, the relatively mundane content of our self-disclosure statements preclude us from overgeneralizing interpretations about adolescents' decisions to share or to keep information private. Our results suggest that adolescents value self-disclosure *even* when the disclosure content is relatively inconsequential; however, future studies may be able to draw further implications by examining the effects of more valenced or intimate disclosures statements.

Another important consideration is that disclosure to parents and peers required participants to communicate information to familiar others via email, while disclosure to unknown peers was undertaken by the researchers (i.e. did not require action by the participants). Thus differences in disclosure preferences could be driven by a preference to not disclose to familiar others. However, debriefing interviews queried potential determinants of participants disclosure decisions, and revealed that decisions were generally guided by relationships with the disclosure recipient ("she's my closest friend") and disclosure content ("not too personal", "stuff was not a big deal"), as opposed to potential discomfort with sharing with familiar others. Finally, despite the potential implications of our findings for self and social development during adolescence, the current study does not make claims about intra-individual maturational processes (i.e. whether value for self-disclosure predicts changes in

socioemotional outcomes over time). Future studies need to adopt a longitudinal approach to examine how individual profiles of self-disclosure behavior change over time, and the extent to which differential valuation of self-disclosure audiences relate to actual internalizing or externalizing behaviors in adolescents' day-to-day lives.

Conclusion

Adolescence is characterized by a myriad of changes, including shifts towards spending significantly more time with peers that warrant developing and deepening social relationships. At the same time, parents retain important roles in their children's lives across the entire duration of adolescence, serving as another critical source of support to balance the more dynamic peer landscape. The current study makes meaningful contributions to the body of research on this topic, being one of the first to use a forced-choice task to derive a behavioral measure of self-disclosure value among adolescents. We compared the intrinsic value of self-disclosure across target audiences and developmental contexts, in a manner that allowed us to sidestep potential age-related differences in monetary value. As expected, results revealed that self-disclosure is intrinsically rewarding across a wide developmental range from early through to late adolescence. The value of self-disclosure to parents and friends did not decrease across adolescence, but mid-adolescence seemed to privilege sharing with unfamiliar peers. Future studies can use this unique methodological approach to investigate how these differences relate to developmental trajectories of healthy socioemotional outcomes.

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Supplementary Material

Table S1. Age groups predicting externalizing problems

	B	SE	T	p
<i>Males</i>				
<i>Substance Use</i>				
Intercept	1.229	0.250	4.913	<0.001
Age_group: Early	-1.155	0.344	-3.360	<0.001
Age_group: Late	2.327	0.344	6.766	<0.001
<i>Deviant Behaviors</i>				
Intercept	1.019	0.123	8.268	<0.001
Age_group: Early	-0.802	0.169	-4.733	<0.001
Age_group: Late	0.557	0.169	3.291	<0.001
<i>Antisocial Behaviors</i>				
Intercept	0.312	0.043	7.199	<0.001
Age_group: Early	-0.186	0.060	-3.129	<0.001
Age_group: Late	-0.146	0.060	-2.457	<0.001
<i>Females</i>				
<i>Substance Use</i>				
Intercept	0.690	0.172	4.001	<0.001
Age_group: Early	-0.540	0.247	-2.186	<0.001
Age_group: Late	1.694	0.247	6.864	<0.001
<i>Deviant Behaviors</i>				
Intercept	0.640	0.077	8.301	<0.001
Age_group: Early	-0.506	0.110	-4.579	<0.001
Age_group: Late	0.586	0.110	5.304	<0.001
<i>Antisocial Behaviors</i>				
Intercept	0.138	0.028	4.999	<0.001
Age_group: Early	-0.061	0.039	-1.551	<0.001
Age_group: Late	0.075	0.039	1.900	<0.001

NB: Reference Age_group is "Middle"

Table S2. Model comparisons

	Model	df	AIC	BIC	logLik	Test	L.Ratio	p
Null	1	3	881.10	892.58	-437.55			
Target	2	5	878.19	897.32	-434.10	1 vs 2	6.91	0.032
Null	1	3	881.10	892.58	-437.55			
Age_group	2	5	883.99	903.12	-437.00	1 vs 2	1.11	0.574
Target * Age_group	3	11	876.48	918.56	-427.24	2 vs 3	19.52	0.003
Null	1	3	881.10	892.58	-437.55			
Age_continuous	2	4	882.30	897.60	-437.15	1 vs 2	0.80	0.370
Target * Age_continuous	3	8	877.53	908.14	-430.77	2 vs 3	12.77	0.013
Null	1	3	881.10	892.58	-437.55			
Gender	2	4	879.93	895.23	-435.97	1 vs 2	3.17	0.075
Gender * Target	3	8	876.10	906.70	-430.05	2 vs 3	11.83	0.019

NB: "Test" refers to models that are compared. AIC = Akaike information criterion; BIC = Bayesian information criterion; logLik = Log-likelihood; L.Ratio = Log-likelihood ratio

Table S3. Random and fixed effects of best-fitting models

	Random Effect	Fixed Effects				
Target	SD	B	SE	DF	T	p
Intercept	1.275	1.122	0.131	224	8.581	<0.001
Target: Friend		-0.133	0.072	224	-1.841	0.067
Target: Parent		-0.184	0.072	224	-2.556	0.011
Age_group	SD	B	SE	DF	T	p
Intercept	1.267	1.042	0.216	226	4.832	<0.001
Age_group: Early		-0.194	0.303	110	-0.641	0.523
Age_group: Late		0.119	0.303	110	0.394	0.694
Age_group*Target	SD	B	SE	DF	T	p
Intercept	1.27	1.321	0.229	220	5.767	<0.001
Target: Friend		-0.404	0.123	220	-3.274	0.001
Target: Parent		-0.431	0.123	220	-3.491	0.001
Age_group: Early		-0.369	0.322	110	-1.147	0.254
Age_group: Late		-0.22	0.322	110	-0.685	0.495
Target: Friend*Age_group: Early		0.236	0.173	220	1.36	0.175
Target: Parent*Age_group: Early		0.288	0.173	220	1.66	0.098
Target: Friend*Age_group: Late		0.572	0.173	220	3.298	0.001
Target: Parent*Age_group: Late		0.447	0.173	220	2.574	0.011
<i>Early Age Group (post-hoc)</i>						
Intercept	1.118	0.952	0.216	74	4.405	<0.001
Target: Friend		-0.168	0.13	74	-1.291	0.201
Target: Parent		-0.143	0.13	74	-1.097	0.276
<i>Middle Age Group (post-hoc)</i>						
Intercept	1.342	1.321	0.245	72	5.383	<0.001
Target: Friend		-0.404	0.143	72	-2.837	0.006
Target: Parent		-0.431	0.143	72	-3.024	0.003
<i>Late Age Group (post-hoc)</i>						
Intercept	1.278	1.1	0.219	74	5.017	<0.001
Target: Friend		0.168	0.089	74	1.89	0.063
Target: Parent		0.016	0.089	74	0.175	0.862

Gender	SD	B	SE	DF	T	p
Intercept	1.255	1.218	0.166	226	7.332	<0.001
Gender: Males		-0.438	0.245	111	-1.788	0.076
Gender*Target	SD	B	SE	DF	T	p
Intercept	1.257	1.242	0.176	222	7.041	<0.001
Target: Friend		-0.026	0.097	222	-0.271	0.787
Target: Parent		-0.044	0.097	222	-0.453	0.651
Gender: Males		-0.26	0.26	111	-0.999	0.32
Target: Friend*Gender: Males		-0.231	0.144	222	-1.607	0.109
Target: Parent*Gender: Males		-0.304	0.144	222	-2.119	0.035
<i>Males (post-hoc)</i>						
Intercept	1.17	0.982	0.187	102	5.247	<0.001
Target: Friend		-0.257	0.128	102	-2.011	0.047
Target: Parent		-0.348	0.128	102	-2.724	0.008
<i>Females (post-hoc)</i>						
Intercept	1.33	1.242	0.179	120	6.924	<0.001
Target: Friend		-0.026	0.075	120	-0.35	0.727
Target: Parent		-0.044	0.075	120	-0.584	0.56

NB: Reference Target is "Unknown Peer"

Table S4. Model comparisons for externalizing problems.

	Model	Df	AIC	BIC	LogLik	Test	L.Ratio	p
<u>Females</u>								
Substance Use								
Null	1	3	413.64	423.27	-203.82			
Substance Use	2	4	414.11	426.95	-203.06	1 vs 2	1.53	0.216
Substance Use * Target	3	8	421.68	447.36	-202.84	2 vs 3	0.43	0.980
Deviant Peers								
Null	1	3	413.64	423.27	-203.82			
Deviant Peers	2	4	413.95	426.79	-202.98	1 vs 2	1.69	0.193
Deviant Peers * Target	3	8	420.07	445.75	-202.04	2 vs 3	1.88	0.758
Antisocial Behavior								
Null	1	3	413.64	423.27	-203.82			
Antisocial	2	4	414.23	427.06	-203.11	1 vs 2	1.42	0.234
Antisocial * Target	3	8	421.08	446.76	-202.54	2 vs 3	1.14	0.887
<u>Males</u>								
Substance Use								
Null	1	3	444.06	453.21	-219.03			
Substance Use	2	4	442.74	454.94	-217.37	1 vs 2	3.32	0.068
Substance Use * Target	3	8	441.26	465.66	-212.63	2 vs 3	9.48	0.050
<i>Peers (post-hoc)</i>								
Null	1	3	171.61	177.47	-82.81			
Substance Use	2	4	170.00	177.80	-81.00	1 vs 2	3.62	0.057
<i>Friends (post-hoc)</i>								
Null	1	3	193.82	199.67	-93.91			
Substance Use	2	4	192.14	199.94	-92.07	1 vs 2	3.68	0.055
<i>Parents (post-hoc)</i>								
Null	1	3	183.45	189.30	-88.72			
Substance Use	2	4	183.96	191.77	-87.98	1 vs 2	1.48	0.223
Deviant Peers								
Null	1	3	444.06	453.21	-219.03			
Deviant Peers	2	4	445.05	457.25	-218.53	1 vs 2	1.01	0.315
Deviant Peers * Target	3	8	442.66	467.06	-213.33	2 vs 3	10.39	0.034

<i>Peers (post-hoc)</i>								
Null	1	3	171.61	177.47	-82.81			
Deviant Peers	2	4	172.51	180.32	-82.26	1 vs 2	1.10	0.294
<i>Friends (post-hoc)</i>								
Null	1	3	193.82	199.67	-93.91			
Deviant Peers	2	4	194.04	201.84	-93.02	1 vs 2	1.78	0.182
<i>Parents (post-hoc)</i>								
Null	1	3	183.45	189.30	-88.72			
Deviant Peers	2	4	185.31	193.11	-88.65	1 vs 2	0.14	0.710
Antisocial Behavior								
Null	1	3	444.06	453.21	-219.03			
Antisocial	2	4	445.93	458.13	-218.97	1 vs 2	0.13	0.716
Antisocial * Target	3	8	445.12	469.52	-214.56	2 vs 3	8.81	0.066

NB: "Test" refers to models that are compared. AIC = Akaike information criterion; BIC = Bayesian information criterion; logLik = Log-likelihood; L.Ratio = Log-likelihood ratio

Table S5. Random and fixed effects of best-fitting models for externalizing problems

	Random Effect	Fixed Effects				
Substance Use*Target	SD	B	SE	DF	T	p
Intercept	1.131	0.982	0.184	99	5.344	<0.001
Target: Friend		-0.257	0.128	99	-2.007	0.047
Target: Parent		-0.348	0.128	99	-2.718	0.008
Substance Use		-0.180	0.107	99	-1.678	0.097
Substance Use * Target: Friend		-0.045	0.075	99	-0.598	0.551
Substance Use * Target: Parent		0.049	0.075	99	0.663	0.509
<i>Friend (post-hoc)</i>						
Intercept	1.331	0.725	0.201	50	3.607	0.001
Substance Use		-0.224	0.117	50	-1.915	0.061
<i>Peer (post-hoc)</i>						
Intercept	1.076	0.982	0.162	50	6.045	<0.001
Substance Use		-0.180	0.095	50	-1.898	0.063
<i>Parent (post-hoc)</i>						
Intercept	1.230	0.634	0.186	50	3.411	0.001
Substance Use		-0.130	0.108	50	-1.203	0.235
Deviant Peer Affiliation*Target	SD	B	SE	DF	T	p
Intercept	1.159	0.982	0.187	99	5.248	<0.001
Target: Friend		-0.257	0.128	99	-2.016	0.047
Target: Parent		-0.348	0.128	99	-2.730	0.007
Deviant Peer Affiliation		-0.204	0.221	99	-0.919	0.360
Deviant Peer Affiliation * Target: Friend		-0.116	0.151	99	-0.768	0.444
Deviant Peer Affiliation * Target: Parent		0.122	0.151	99	0.809	0.420
<i>Friend (post-hoc)</i>						
Intercept	1.355	0.725	0.205	50	3.541	0.001
Deviant Peer Affiliation		-0.319	0.242	50	-1.319	0.193
<i>Peer (post-hoc)</i>						
Intercept	1.102	0.982	0.166	50	5.900	<0.001
Deviant Peer Affiliation		-0.204	0.197	50	-1.034	0.306
<i>Parent (post-hoc)</i>						
Intercept	1.246	0.634	0.188	50	3.367	0.001
Deviant Peer Affiliation		-0.081	0.223	50	-0.366	0.716

NB: Reference Target is "Unknown Peer"