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**Developmental Associations Between Sympathy and Mutual Disclosure in Friendships
From Mid-Adolescence to Early Adulthood**

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Abstract

Sympathy is regarded as an important precursor to the development of emotional intimacy, including mutual disclosure. In turn, emotional intimacy is assumed to foster the development of sympathy. Yet, research has not examined how sympathy and mutual disclosure in generic friendships are mutually related to one another during mid-adolescence to early adulthood.

Data came from three waves of the Swiss Survey of Children and Youth (COCON; $N = 1,258$). Bidirectional links between sympathy and mutual disclosure were tested with autoregressive cross-lagged panel analyses. Sympathy at age 15 was associated with mutual disclosure in friendships at 18, which in turn was associated with sympathy at 21. Multi-group models suggested that our model better describes these processes in females than in males.

Keywords: adolescence, early adulthood, sympathy, friendship, mutual disclosure

Adolescence is an important period for socioemotional development and is characterized by biological maturation, changes in social relationships, and exposure to new social contexts (Lerner & Steinberg, 2009). Psychological development (e.g., identity formation) and social transitions (e.g., school transitions, entry into the labor market) impact the social contexts in which adolescents interact with others and also how they interact (Buchmann & Steinhoff, 2017; Lerner & Steinberg, 2009). Adolescents are expected to become increasingly independent from their families and to form closer relationships with their peers (Meeus, 2016). Indeed, building strong peer relationships is one of the core tasks of this developmental period (Havighurst, 1981). Compared to friendships in childhood, adolescent friendships focus more on emotional intimacy, including closeness, trust, reciprocity, loyalty, and mutual disclosure; these friendship characteristics likely also shape adolescents' social and emotional development (Buhrmester & Furman, 1986; Bukowski, Pizzamiglio, Newcomb, & Hoza, 1996; Parker & Asher, 1993; Selman, 1980; Youniss, 1980).

A well-established line of research has linked specific features of friendship relationships (e.g., symmetry, reciprocity, companionship, trust) with social competencies and interpersonal understanding (Keller & Wood, 1989; Selman, 1980; Sullivan, 1953). However, longitudinal studies that can identify directionality are lacking, especially for the mid-adolescent to young adult years. Macro-theoretical approaches in developmental science stress the importance of studying development within transactional frameworks that examine how aspects of development, such as individual and friendship development, relate to one another over time (e.g., Sameroff, 2010). One recent study identified a transactional association between empathy and friendship quality in pre- and early adolescence (Van den Bedem, Willems, Dockrell, Van Alphen, & Rieffe, 2019). We extend this perspective to investigate how sympathy (i.e., the tendency to feel concern for others; Eisenberg, Spinrad, & Morris, 2013) and mutual disclosure (i.e., the voluntary sharing of thoughts, feelings, and

experiences with one another; Valkenburg, Sumter, & Peter, 2011) in generic friendships are associated with one another over time during the late adolescent years. Specifically, we use three waves of the Swiss Survey of Children and Youth (COCON), a large representative cohort of adolescents living in Switzerland, to clarify longitudinal bidirectional associations between sympathy and mutual disclosure among friends from age 15 (mid-adolescence) to age 18 (late adolescence) to age 21 (young adulthood). Given the gender differences in both adolescent friendship qualities and empathy-related responding observed in previous studies (e.g. Hall, 2011; Van der Graaff et al., 2014), we also examined potential gender differences in developmental associations between sympathy and mutual disclosure.

Sympathy in Adolescence

Sympathy, sometimes also referred to as empathic concern, entails recognizing another person's condition or state—either cognitively or emotionally—and feeling concern for that person (Ciarrochi et al., 2017; Eisenberg et al., 2013; Selman, 1980). Sympathy can be distinguished from empathy, which involves sharing others' emotional states, and cognitive perspective-taking, which is the ability to understand what others think and feel (Eisenberg et al., 2013). Empathy and cognitive perspective-taking do not always lead to feelings of concern for another person but can result in empathic distress, which is an aversive emotional state that can impair other-oriented action (Eisenberg et al., 2013). Because of its other-oriented nature, sympathy is of particular interest in the context of behavior and social relationships. Indeed, sympathy has been consistently and prospectively linked with prosocial behavior and moral development in childhood and adolescence (Carlo, Padilla-Walker, & Nielson, 2015; Malti et al., 2016; Van der Graaff, Carlo, Crocetti, Koot, & Branje, 2018). It is also related to moral decision-making and the development of social justice values, including in the sample used here (Daniel, Dys, Buchmann, & Malti, 2016; Krettenauer, Colasante, Buchmann, & Malti, 2014).

Precursors of sympathy have been documented from the first years of life (Davidov, Zahn-Waxler, Roth-Hanania, & Knafo, 2013; Eisenberg, 2000), and the tendency to feel concern for others increases throughout childhood and adolescence (for a review on the development of empathy-related responding, see Eisenberg, Spinrad, & Knafo-Noam, 2015). This development can be partly explained by the maturation of brain areas involved in perspective-taking and empathy (Blakemore, 2008; Decety, 2010), but it has also been attributed to an increasing amount of time spent with peers as children and adolescents grow older and acquire and refine their socioemotional skills (Rubin, Bukowski, & Laursen, 2011). Although levels of sympathy and other-related responding have consistently been found to differ by gender (i.e., females report more sympathy than males; Allemand, Steiger, & Fend, 2015; Van der Graaff et al., 2014), gender differences in their correlates are largely unknown.

Mutual Disclosure in Adolescent Friendships

Mutual self-disclosure is an essential behavior for creating intimacy and trust in relationships (Reis & Shaver, 1988). By disclosing (i.e., revealing personal feelings, thoughts, or motivations), interaction partners (e.g., friends) provide insights into the inner workings of each other's mind, facilitating responsive, considerate, and sympathetic reactions (Sprecher, Treger, Wondra, Hilaire, & Wallpe, 2013). We refer to such mutual acts of self-disclosure between interaction partners, in this case friends, as mutual disclosure. During adolescence, the frequency and intensity of mutual disclosure between peers increases and becomes a central process for establishing friendship intimacy (Hartup & Stevens, 1997; Rubin et al., 2011). Thus, interactions with friends are important for the acquisition of interpersonal competencies (Buhrmester & Furman, 1986; Rubin, Bowker, & McDonald, 2013). Friendships are close, voluntary, and reciprocal relationships between peers who like each other (Hartup & Stevens, 1997; Rubin et al., 2013). However, how friends interact with each other and what they do together changes with age (Hartup & Stevens, 1997). Whereas

children value friends with whom they can play and have fun, adolescents value mutual trust, perceived equality, loyalty, honesty, and disclosure in friendships (Furman & Buhrmester, 1992). These positive and intimate qualities of friendship relationships are associated with long-term positive adjustment, including satisfaction in adult romantic relationships (Allen, Narr, Kansky, & Szewedo, 2019). Although gender differences in friendship intimacy, including mutual disclosure, have been consistently observed (i.e., females reporting higher levels of friendship intimacy than males; Goede et al., 2009; Radmacher & Azmitia, 2006; Way & Greene, 2006), gender differences in correlates of friendship intimacy are not well studied.

The majority of the literature on friendship focuses on processes within dyadic best friendships. Yet, many adolescents have other friends too. Multiple close peers have been shown to each independently be associated with individual behavior (Kiesner, Kerr, & Stattin, 2004). Behavior with a best friend may also differ from behavior with other close friends. Therefore, we are interested in how sympathy and mutual disclosure in generic friendships—as opposed to only best friendships—are developmentally associated.

Reciprocal Associations of Sympathy and Mutual Disclosure in Friendships

The assumption that sympathy and mutual disclosure are reciprocally related throughout adolescent development has a strong theoretical basis. Sympathy is assumed to be an important prerequisite for creating emotional intimacy in friendships (Selman, 1980). The deep recognition, knowledge, and understanding of another's feelings, motives, and needs that come with increasing cognitive and emotional capability impact mutual disclosure and lead to more mature and intimate friendships (Selman, 1980; Steinhoff & Keller, 2020). Sympathy is also assumed to have a motivational impact on the formation of close friendships (Hastings, Utendale, & Sullivan, 2008).

Conversely, intimate friendships that are characterized by mutual disclosure constitute important social contexts in which adolescents learn interpersonal sensitivity and broaden their socioemotional competencies (Buhrmester & Furman, 1986; Keller, 1996; Sullivan, 1953; Youniss, 1980). Thus, the intimate and mutual exchange in adolescent friendships is important for learning empathy-related responding, including perspective-taking, empathy, and sympathy (Buhrmester & Furman, 1986). Indeed, repeated situations of mutual disclosure are likely to promote sympathy by fostering increased understanding and consideration of others' thoughts and feelings (Hughes & Dunn, 1998; Youniss, 1980). A functional magnetic resonance imaging study showed an association between engaging in intimate disclosure and increased activity of brain regions that support social cognition (Vijayakumar et al., 2020).

However, so far, empirical research has mostly focused on the broader concepts of empathy and friendship quality in dyadic best friendships but not specifically on sympathy and mutual disclosure in generic friendships. A recent meta-analysis (Boele et al., 2019) of studies of empathy and friendship quality, most of which are cross-sectional, suggests that peer relationship quality and empathy are moderately but robustly correlated in adolescence, indicating that greater empathic abilities are associated with positive peer relationships. Furthermore, a moderation analysis indicated that a combination of affective and cognitive empathy was more strongly associated with peer relationship quality than either affective or cognitive empathy alone (Boele et al., 2019). Since sympathy has both cognitive and emotional components, this finding supports the assumption that sympathy may be especially relevant for the development of friendship intimacy. Longitudinal evidence suggests that adolescent socio-moral sensitivity (i.e., perspective-taking, interpersonal understanding, and sense of responsibility for others) and empathy affect friendship intimacy and social competence in adulthood (Allemand et al., 2015; Steinhoff & Keller, 2020). Additionally, a comparison of cohorts in the COCON study indicated that moral motivation (which is related

to sympathy) was associated with dyadic friendship quality (i.e., help, guidance, and intimate exchange) in 21-year-olds (but not in 15-year-olds; Malti & Buchmann, 2010). Despite these advances in research, it remains unclear how sympathy and mutual disclosure in generic friendships are longitudinally associated with one another from mid-adolescence to early adulthood.

Little is known about potential gender differences in the association of sympathy and mutual disclosure. Previous research reports that females are more likely to include others in their self-description than males (Rose & Rudolph, 2006). Indeed, relationship partners – in this case, friends – may have a stronger link with females' compared to males' personal development (e.g. Cross & Madson, 1997). Furthermore, females may have higher friendship expectations for communion (i.e. mutual disclosure and empathic understanding) than males (Hall, 2011). Accordingly, associations between sympathy and mutual self-disclosure could be stronger for females than males. Reversely, associations could also be stronger for males than females, since disclosure and intimate interaction are especially salient in the friendships of adolescent females (Rose & Rudolph, 2006) and could be considered developmentally normative in females but not males. Finally, reciprocal associations between sympathy and mutual disclosure could be similar for females and males as one study reported no gender differences in the functional significance of problem talk in males and females (Rose, Smith, Glick, & Schwartz-Mette, 2016).

Other Confounding Variables

In the past, many studies of the association of sympathy and relationship functioning and the socialization of sympathy in adolescence have examined the family context (Blair et al., 2014; Malti, Eisenberg, Kim, & Buchmann, 2013). For example, adolescent sympathy was found to predict changes in the extent to which adolescents supported parental needs over two years (Miklikowska, Duriez, & Soenens, 2011). Research on mutual disclosure during

adolescence has primarily focused on the adolescent–parent context (Stattin & Kerr, 2000), showing that adolescent disclosure is linked to several positive outcomes (Frijns, Keijsers, Branje, & Meeus, 2010). Mutual disclosure between child and parent creates an opportunity for the parent to promote concern for others in their child, which, in turn, may foster sympathy and other prosocial behaviors (Chaparro & Grusec, 2015; Padilla-Walker & Son, 2018). Since we are specifically interested in unique associations between sympathy and mutual disclosure from mid-adolescence to early adulthood in the context of friendships, we adjusted our analysis for parental responsiveness. We also considered the role of maternal education, to account for the potential impact of family socioeconomic background on children’s social and emotional development (Bradley & Corwyn, 2002; Hartas, 2011).

The Current Study

The recognition of other people’s emotions and feelings of concern for other people inherent to sympathy are generally assumed to be important precursors of friendship intimacy. Conversely, mutual disclosure in friendships is considered an important context for fostering the development of sympathy. Previous studies, which are mostly cross-sectional, suggest that sympathy and other forms of empathy-related responding are related to positive qualities of adolescent peer relationships. In the current study, we aim to extend this existing body of research on the association of sympathy and mutual disclosure in adolescent friendships by examining the reciprocal associations between these qualities from mid-adolescence (age 15) to early adulthood (age 21). Specifically, we hypothesized that *higher levels of sympathy are associated with more frequent mutual disclosure in friendships (H1)* and that *more frequent mutual disclosure in adolescent friendships is associated with higher levels of sympathy (H2)* throughout the mid- and late adolescent years and into early adulthood. We adjusted for the stability of sympathy and mutual disclosure in our models (which also means that we anticipated smaller rather than larger cross-lagged associations; Adachi & Willoughby, 2015).

Finally, we explored *whether the associations of sympathy and mutual disclosure from mid-adolescence to early adulthood differ for males and females*, as there are arguments for why associations could be stronger in females or males or be similar in both groups.

Methods

Data and Sample

Our data came from the prospective longitudinal COCON (Competence and Context; www.cocon.uzh.ch) study, a multi-cohort study with three cohorts that were first recruited in childhood, adolescence, and young adulthood respectively. We used data from three survey waves of the adolescent cohort ($N = 1,258$), collected in 2006, 2009, and 2012, when adolescents were 15, 18, and 21 years old, respectively. Participants were recruited using a two-step procedure. First, to obtain a sample that represented the structure of the German- and French-speaking parts of Switzerland communities and cities were chosen based on economic and social characteristics and population size. Second, a random sample of adolescents living in these locations was contacted. The study meets established ethical standards and is consistent with the regulations of the Swiss Human Research Act and the Swiss National Science Foundation. Informed consent was obtained from all adolescents in the study. At every assessment, computer-assisted personal interviews were administered by trained interviewers in adolescents' homes. Interviews lasted approximately one hour and encompassed many different areas of adolescent social, emotional, and behavioral development. Interviews were conducted in either German or French, depending on the local language. Adolescents received a small gift for participation.

At the age 15 assessment, 1,258 adolescents participated in the study (63% of contacted adolescents), 54% of whom were females; 952 adolescents (76% of age 15 assessment) participated at age 18, and 814 (65% of age 15 assessment) participated at age 21. Adolescents who dropped out of the study were more likely to have mothers with no

tertiary education compared to those who continued in the study, $\chi^2 = 6.06 (1), p = 0.02$, 36.6% vs. 28.5%. A more detailed definition of tertiary education is provided in the section on control variables below. No other significant differences in key study variables emerged for those who dropped out of the study versus those who continued to participate (mutual disclosure, $t (843.22) = -0.14, p = 0.892$; sympathy, $t (873.32) = 1.09, p = 0.278$; gender, $\chi^2 = .18 (1), p = 0.670$; and perceived parental responsiveness, $t (870.93) = -0.91, p = 0.365$). The final sample size for our analyses was 1,258. We used full information maximum likelihood estimation in all structural equation models to reduce potential bias due to attrition mechanisms (Schafer & Graham, 2002).

Measures

Sympathy was assessed at ages 15, 18, and 21 via an adapted version of the Child-Report Sympathy Scale devised by Zhou et al. (2000), which was translated into French and German by professionals (including back-translation), respectively. The sympathy scale included four items that adolescents rated on a six-point Likert scale ranging from 1 (= *not at all true*) to 6 (= *very much true*). For example, one item read *When I see someone being hurt, I feel sorry for him or her*. Latent factors were created based on the four items. Two items (i.e., *When I see someone else feeling bad, I have sympathy for them* and *I do not have sympathy for adolescents who are being bothered*) were parceled (i.e., averaged) to obtain three indicators per factor for a more stable measurement model (Little, 2013). Following Little's (2013) recommendation, we parceled the items with the highest and lowest item-to-scale correlation. For the descriptive statistics (see Table 1), the four items were averaged. Cronbach's alphas ranged from .75 to .82 across the three time points.

Frequency of *mutual disclosure* in friendships was assessed as part of a broader set of items related to leisure time behavior with general friends (i.e., generic friendships as opposed to a specific or best friend) using a scale adapted from the Deutsches Jugendinstitut und infas

Institut für angewandte Sozialwissenschaft GmbH [German Youth Institute and infas institute for applied social science] (2003) rated on a six-point Likert scale (1 = *never* to 6 = *daily*).

The question stem was *When thinking about the time that you spend with your friends outside of clubs or organized groups, how often do you and your friends....* At ages 18 and 21, five items indicative of mutual disclosure were assessed (e.g., *...talk about problems?*, *...talk about confidential things?*). Cronbach's alphas were .74 and .76 at ages 18 and 21, respectively. For the descriptive statistics (see Table 1), the five items were averaged. At age 15, only one item—which was also included in the mutual disclosure scale at ages 18 and 21—was used (*How often do you and your friends talk about problems?*). Latent factors were created to measure mutual disclosure in the analysis. To obtain three indicators for the latent factor at ages 18 and 21, we created two parcels (i.e., by taking the average of the items with the highest and lowest and second-highest and second-lowest item–scale correlation; parcel 1 contained *How often do you and your friends discuss your and your friends' future life* and *How often do you and your friends talk about things that are on your and your friends' mind*, and parcel 2 contained *How often do you and your friends talk about confidential things* and *How often do you and your friends talk about what you and your friends will do in the future*). At age 15, a one-indicator latent factor was created. This measure does not differentiate whether and to which extent it is our participants, their friends or both who disclose information. Therefore, we chose to use the term mutual disclosure (instead of self-disclosure) here. Although mutual disclosure is conceptually a dyadic construct, it is best measured via self-reports due to its private and intimate nature (Chelune, 1979).

Control variables

Maternal education was reported by adolescents at age 15 and coded as a binary variable (1 = tertiary education, 0 = no tertiary education). We defined tertiary education as having a baccalaureate degree, a higher professional education, or a degree from a university

or university of applied science. *Perceived parental responsiveness* was assessed at age 15 using four items from the Supportive Parenting Scale (Simons, Lorenz, Conger, & Wu, 1992); e.g., *How often does [primary caregiver] talk to you about things that you do and that have happened to you?*). Participants rated the frequency of such behaviors on a scale from 1 (= *never*) to 6 (= *always*). In most cases (88%), the primary caregiver was the mother.

Cronbach's alpha was .73. Both maternal education and parental responsiveness were included as predictors of sympathy and mutual disclosure at all three time points.

Data Analysis

To test the reciprocal associations between sympathy and mutual disclosure from mid-adolescence to early adulthood, we conducted cross-lagged panel analyses within a structural equation modeling framework. The analyses were conducted in R Version 3.2.0 (R Development Core Team, 2008) using the R-package lavaan Version 0.5-23.1097 (Rosseel, 2012) for structural equation modeling. Following several recommendations (Hancock & Mueller, 2011; McDonald & Ho, 2002; McNeish & Hancock, 2018), we used a two-step procedure to test for hypothesized structural associations between variables. In a first step, sympathy and mutual disclosure were each specified as latent constructs, and measurement invariance was tested across time and groups (i.e., males and females; Little, 2013). For mutual disclosure, measurement invariance was tested for the full scale available at ages 18 and 21. Strong invariance over time was established for sympathy and mutual disclosure across time, and at least partial strong invariance for these constructs was established for males and females. A full account of our procedure for testing measurement invariance can be found in Supplement 1.

In a second step, we estimated a fully saturated measurement model and used its variance–covariance matrix as the input in a manifest path model. This allowed us to independently assess the fit of the path model from the measurement model (McDonald &

Ho, 2002). The fully saturated measurement model combined the measurement models for sympathy and mutual disclosure and included the covariates parental responsiveness and maternal education as one-indicator latent variables. All latent variables were allowed to covary. We used maximum likelihood robust (MLR) estimation as it is more reliable with non-normally distributed data (Kline, 2011).

Based on the variance–covariance matrix of the fully saturated measurement model, a series of autoregressive cross-lagged models were fit to examine transactional cross-lagged associations between sympathy and mutual disclosure from mid-adolescence to early adulthood. A stepwise modeling procedure was applied to determine whether cross-lagged associations between sympathy and mutual disclosure in friendships were meaningful from ages 15 to 21. Model 1 (M1) contained autoregressive stability paths for sympathy and mutual disclosure and same-time covariances between the two constructs but no cross-lagged paths (a subsequent analysis showed that equality constraints on within-time covariances and autoregressive paths across time would have resulted in significantly worse model fit). The next model (M2), which included freely estimated cross-lagged paths, was calculated and compared to M1. In a third model (M3), cross-lagged paths from sympathy to mutual disclosure and from mutual disclosure to sympathy (but not the autoregressive paths or same-time covariances) were constrained to be equal across time. In all models, paths from the two control variables (i.e., maternal education, perceived parental responsiveness) to sympathy and mutual disclosure were specified at each time-point. Maximum likelihood estimation was used because MLR was not applicable when the covariance matrix was used as input. Several multi-group models were estimated and compared to test gender differences in associations between sympathy and mutual disclosure. For the multi-group modeling, we applied the same basic procedure used for the overall analysis. A multi-group fully saturated measurement model was estimated and used as input in two manifest multi-group models: one in which

cross-lagged parameters were allowed to differ between gender (M4) and one in which cross-lagged parameters were constrained to be equal across gender (M5).

To assess model fit, several parameters were considered. Since the χ^2 fit statistic is known to be overly sensitive with large sample sizes (Schumacker & Lomax, 2010), we primarily considered the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). CFI > .90, RMSEA and SRMR < .10 were considered to be acceptable model fit (Hooper, Coughlan, & Mullen, 2008). According to recommendations from Chen (2007) and Little (2013), overall and multi-group models were compared across multiple indicators of model fit (i.e., changes in CFI > .01, RMSEA > .015, and SRMR > .01 indicating non-invariance).

Results

Descriptive Statistics

Table 1 shows the descriptive statistics for the overall sample and for males and females separately. The mean scores for sympathy increased slightly from ages 15 to 21 in males and females; the mean difference for sympathy between ages 21 and 15 was 0.21, $t(365) = -3.74$, $p < .001$, in males and 0.12, $t(442) = -3.02$, $p < .01$, in females. The frequency of mutual disclosure in friendships decreased from ages 18 to 21 in males and females; the mean difference between ages 21 and 18 was -0.08 , $t(365) = 2.17$, $p < .05$, in males and -0.16 , $t(437) = 5.05$, $p < .001$, in females. Since mutual disclosure at age 15 was measured using a different measure, we did not compare the mean with the full scale means at ages 18 and 21. Females reported significantly higher levels of sympathy and mutual disclosure than males at every assessment.

Correlations between latent variables in the overall sample are presented in Table 2. Correlations between variables assessed at the same age indicated that sympathy and participants' self-reports of mutual disclosure were significantly related from mid-

adolescence to early adulthood. The correlation between sympathy and mutual disclosure was largest at age 15 and declined in late adolescence and young adulthood. Cross-time correlations between sympathy and mutual disclosure were positive but small, with the exception of sympathy at age 18 and mutual disclosure at age 21, which were only marginally correlated. Latent correlations by gender can be found in Table 2. These suggest that sympathy and mutual disclosure were correlated in both males and females at age 15. At age 18, they were only correlated in females. At age 21, they were only correlated in males and only marginally so. The pattern of cross-time correlations was similar for males and females.

Cross-Lagged Panel Analyses

The differences in model fit parameters between M1 (no cross-lagged associations) and M2 (freely estimated cross-lagged associations) indicated that M2 fit the data better than M1, which supports the existence of transactional associations between sympathy and mutual disclosure from mid-adolescence to early adulthood (see Table 3 for model fit indices and comparison). A comparison of M2 and M3 (cross-lagged associations constrained across time) showed that M2 fit the data better than M3, indicating that cross-lagged associations change across time (see Table 3).

Standardized coefficients for M2 are presented in Figure 1. The results reveal moderate stability of sympathy and mutual disclosure across the three time points. Sympathy and mutual disclosure were correlated at age 15, but when autoregressive and cross-lagged paths were included, there were no significant associations between their residuals at ages 18 and 21. Regarding the cross-lagged paths, sympathy at age 15 was significantly associated with mutual disclosure at age 18, but sympathy at age 18 was not associated with mutual disclosure at age 21. Conversely, mutual disclosure at age 15 was not associated with sympathy at age 18, but mutual disclosure at age 18 was significantly associated with sympathy at age 21.

Gender Differences

In M4, all paths included in M2 were allowed to differ for males and females. In M5, cross-lagged paths were constrained to be equal between genders (autoregressive stability paths and within-time covariances were allowed to differ). A model comparison suggested that constraining cross-lagged paths for males and females did not significantly worsen model fit (see Table 3), which suggests that the associations followed the same pattern in males and females. The standardized coefficients of M5 are presented in Figure 1. However, although the overall fit of M5 was acceptable (see Table 3), differences in the χ^2 statistic ($\chi^2_{\text{Females}} = 27.334$; $\chi^2_{\text{Males}} = 172.001$) indicated that the overall structural model did not fit equally well for both groups (Little, 2013). Indeed, estimating M2 separately for males and females indicated that the overall model fit was adequate for females, $\chi^2 (df) = 17.310 (13)$; CFI = .996; RMSEA = .022; SRMR = .017, but not for males, $\chi^2 (df) = 159.899 (13)$; CFI = .866; RMSEA = .140; SRMR = .053. To further examine the reasons for model misspecification in males, we conducted stepwise modeling (i.e., comparing an autoregressive model only to models with constrained and freely estimated cross-lagged paths) separately for males and females (see Supplement 2 for a detailed description). In females, the results of the overall model were confirmed in the stepwise modeling. In males, the results revealed that a significant second-order autoregressive path from mutual disclosure at age 15 to age 21 was needed to achieve an acceptable model fit. However, since adding this path to our hypothesized cross-lagged model would have saturated the model, model fit comparisons were not possible. Nevertheless, together with the differences in χ^2 , these results suggest that our hypothesized model better reflects developmental processes in females than in males.

Discussion

This study examines transactional associations between sympathy and mutual disclosure in generic friendships from mid-adolescence to early adulthood using three waves of a population-representative cohort of adolescents in Switzerland (COCON). The results

reveal that sympathy and mutual disclosure were closely associated in the period from mid-adolescence to young adulthood and that concurrent correlations were particularly strong in mid-adolescence. Reciprocal associations between sympathy and mutual disclosure changed from ages 15 to 21. Specifically, sympathy at age 15 was associated with mutual disclosure in friendships at age 18, which, in turn, was associated with sympathy at age 21. However, the opposite pathway, whereby mutual disclosure in friendships at age 15 is associated with sympathy at age 18, which, in turn, is associated with mutual disclosure at age 21, was not supported. These results extend previous findings of reciprocal associations of empathy-related responding and friendship quality in pre- and early adolescence (Van den Bedem et al., 2019) to the mid-adolescent to young adulthood period and highlight the importance of sympathy and mutual disclosure in friendships. An exploration of gender differences indicated that the developmental processes captured in the overall model are more representative of developmental processes in females than in males.

From Sympathy to Mutual Disclosure

The finding that sympathy in mid-adolescence was associated with mutual disclosure (i.e. mutual self-disclosure within friendships) in late adolescence extends the existing cross-sectional literature on related constructs, including empathy, intimacy, closeness, conflict, companionship, and control in friendships (Chow, Ruhl, & Buhrmester, 2013; Padilla-Walker, Fraser, Black, & Bean, 2015). Our longitudinal finding provides empirical support for the theory that sympathy facilitates the establishment of friendship intimacy, at least from mid- to late adolescence.

There are several possible explanations for the non-significant path between sympathy at age 18 and mutual disclosure at age 21. First, mutual disclosure with friends may become less central in young adulthood when young people begin to form romantic partnerships and rely on a romantic partner for intimate support (Meeus, Branje, van der Valk, & de Wied,

2007). Second, our measure of mutual disclosure focused on frequency. However, young adults no longer spend most of their time at school with the same peers, which typically reduces the frequency of interactions with friends and, thus, opportunities to mutually disclose. Third, adjusting for the stability of both sympathy and mutual disclosure and for prior cross-lagged influences accounted for a substantial amount of variance in sympathy at age 18. Indeed, the cross-lagged effect of sympathy at age 18 on mutual disclosure at age 21 indicates only how sympathy explains changes in the frequency of mutual disclosure that were not already predicted by prior sympathy, which are themselves predicted by prior levels of mutual disclosure (Adachi & Willoughby, 2015). Together, our findings suggest that changes in sympathy between ages 15 and 18 do not further influence changes in the frequency of mutual disclosure from ages 18 to 21.

From Mutual Disclosure to Sympathy

To the best of our knowledge, no prior study has examined mutual disclosure in friendships as a predictor of later sympathy from mid-adolescence to early adulthood. We found that self-reported mutual disclosure in friendships in late adolescence is important for the development of sympathy in early adulthood. Our results are consistent with a study by Radmacher and Azmitia (2006), which showed that self-disclosure is more important for the development of intimacy in early adulthood than in the early adolescent years. They are also in line with a study by Malti and Buchmann (2010), which found an association between dyadic friendship quality and moral motivation in a cohort of young adults. In our study, mutual disclosure in mid-adolescence was not associated with an increase in sympathy in late adolescence. However, other friendship qualities, such as companionship, connection, and control, have been found to be cross-sectionally associated with sympathy in mid-adolescence (e.g., Padilla-Walker et al., 2015). It may be that mutual disclosure in early and mid-

adolescence differs qualitatively from mutual disclosure in late adolescence and that (possibly due to higher levels of sympathy) late adolescents disclose more effectively.

Changing Transactional Associations Between Sympathy and Mutual Disclosure

Changing transactional associations between sympathy and mutual disclosure across adolescence and into early adulthood—despite the moderately high stability of each—are likely attributable to fundamental changes and transitions during adolescence (Lerner & Castellino, 2002). In Switzerland, compulsory schooling ends after the 9th grade, when adolescents are ~16 years old. Subsequently, adolescents transition to either the workplace (i.e., by beginning an apprenticeship, which combines vocational training in a company with job-related and general schooling) or a college-bound school track (which focuses more strongly on academic skills and self-directed learning). Such substantial life changes go hand in hand with changes in adolescents' social lives. When adolescents enter new work or school environments, they meet new potential friends. Since friendships are not built between random peers but often between those with similar characteristics (Rubin et al., 2013), adolescents with high levels of sympathy likely befriend others who also have high levels of sympathy and prosocial tendencies.

Such friendship selection processes and resultant high dyadic levels of sympathy may explain why sympathy at age 15 was associated with mutual disclosure in friendships at age 18. Mutual understanding in friendships of two adolescents with high levels of sympathy likely leads to more mutual disclosure. Friendships with high levels of mutual disclosure may socialize late adolescents into developing more sympathy by young adulthood. One study documented similar changes in transactional developmental associations between friendship and individual characteristics in the context of educational transitions, but with respect to depressive symptoms (Goodwin, Mrug, Borch, & Cillessen, 2012). In this study, adolescents' depressive symptoms predicted friends' depressive symptoms across the transition to middle

school (i.e., a selection process). In the period after the transition, friends' depressive symptoms, in turn, predicted adolescents' depression (i.e., a socialization process).

Nevertheless, more research into the causes of these changing associations of sympathy and mutual disclosure in friendship is needed, including in contexts with normative educational and social transitions other than those in Switzerland.

Notably, our measure of mutual disclosure in friendships refers to self-reported interactions with friends in general (as opposed to a best friend, which is often the focus in similar research). This frame of reference yields information about how often participants generally engaged in mutual disclosure with friends and may be less confounded with individual characteristics of specific friends. However, such a broad context could also conceal potential moderating characteristics of particular friendship dyads. For example, we do not know about the gender composition of the friendships, which could be important considering the differences between same-sex and other-sex friendships (McDougall & Hymel, 2007) and friendships of males and females (Rose & Rudolph, 2006). Our measure also does not capture friendship stability, which has been associated with psychosocial development (Poulin & Chan, 2010).

Gender Differences

Consistent with the findings of prior studies, our results reveal significant gender differences in levels of both sympathy and mutual disclosure (Way & Greene, 2006). Furthermore, our exploration of potential gender differences in developmental associations of sympathy and mutual disclosure indicated that our hypothesized model better captures developmental processes in female adolescents than in male adolescents. The results of our follow-up analyses suggest that in males, mutual disclosure at age 15 is uniquely associated with mutual disclosure at age 21. This can also be seen in the bivariate correlations, which show that mutual disclosure at age 15 is more strongly associated with mutual disclosure at

age 21 than at age 18. This resembles the finding of Van der Graaff et al. (2014) that empathic concern in males decreases from early to mid-adolescence and then increases to initial levels in late adolescence. They suggested that pubertal status may play a role in this temporary dip in empathic concern (Van der Graaff et al., 2014). In females, the development of mutual disclosure seems to be more stable. This could be because female adolescents consistently emphasize the value of mutual disclosure in friendships more than males and more often include others in their self-descriptions (Hall, 2011; Rose & Rudolph, 2006). Additional research is necessary to elucidate how sympathy and friendship intimacy are related in males and to explore other factors in the domains of peer relationships and socioemotional skills that could better predict sympathy and friendship quality in male adolescents. For example, future research could examine how typical characteristics of male friendships, including play, competition, instrumental and group activities, and companionship (Rose & Rudolph, 2006; Hall, 2011), are associated with socioemotional development. It could also be valuable to consider potential differences between same- and mixed-gender friendships as it is possible that males could discuss their problems more when their friendship groups include females, which is increasingly the case when adolescents grow older (Mehta & Strough, 2009).

Strengths and Limitations

Our study has several notable strengths. The large sample size of the COCON study allowed us to perform cross-lagged panel analyses over many years and a multi-group analysis to compare model invariance for males and females. Moreover, the COCON cohort was sampled to represent the economic, social, and demographic structure of both French- and German-speaking Switzerland, which means that the results are generalizable across a wide range of adolescents. Additionally, the narrow definitions of our key constructs—mutual disclosure and sympathy—are helpful for interpreting the results and clarifying some of the findings of prior research on empathy-related responding and friendship quality, both of

which are usually assessed as an amalgam of different aspects. Our research builds on and contributes to a large body of literature that examines longitudinal associations between various socioemotional and personal skills and peer relationships (e.g. Glick & Rose, 2011; Lansford, Yu, Pettit, Bates, & Dodge, 2014; Wölfer, Cortina, & Baumert, 2012; Wrzus & Neyer, 2016)

Our study also has several limitations. First, we relied on self-report measures for all study variables. Although experiences of mutual disclosure and friendships are highly subjective, additional assessments of friends' perspectives on the friendship would have been useful for a more objective measure of mutual disclosure in friendships. Second, mutual disclosure in friendships at age 15 was measured using a one-item measure, while a more extensive measure was used at ages 18 and 21. Furthermore, our measure of mutual disclosure relied on self-reports and did not allow us to distinguish to which extent it is our participants, their friends or both who disclose. Third, we did not assess the content or specific dyadic processes of mutual disclosure (e.g., Borowski & Zeman, 2018). Fourth, our analysis does not take into account academic tracking after compulsory schooling (for an overview of the Swiss model of secondary education, see Buchmann, Kriesi, Koomen, Imdorf, & Basler, 2016). We tried to approximate these potential differences in educational trajectories in our analyses by including maternal education because family socioeconomic status is typically associated with educational tracking (Buchmann et al., 2016). However, including the full extent of tracking in this sample was beyond the scope of this study.

Fifth, even though prospective longitudinal autoregressive cross-lagged models are powerful tools for modeling sequences of developmental antecedents and outcomes, they nevertheless represent a correlative approach. Therefore, we cannot infer any causal relations between sympathy and mutual disclosure. Intervention studies manipulating either sympathy or mutual disclosure could shed light on causal relationships between these two variables.

Indeed, a recent study showed that a short video game intervention changed some of the neural correlates of empathy (Kral et al., 2018). It would be interesting to see whether such neural changes translate to real-life behavioral changes related to sympathy and mutual disclosure.

Relevance and Implications

The magnitude of the cross-lagged associations we found between sympathy and mutual disclosure is small and could be partly due to common adolescent self-report method variance. However, small to moderate effect sizes are common in autoregressive cross-lagged panel models because the autoregressive paths account for a large amount of variance in the respective outcome variables (Adachi & Willoughby, 2015). In other words, the best predictor for any given psychological characteristic is, in most cases, prior levels of that characteristic. Therefore, conventional standards for interpreting effect sizes do not generally apply to autoregressive models as they would probably underestimate the practical significance of associations (Adachi & Willoughby, 2015). Another potential reason for the rather small associations could be the large time-lag of three years between measurement points. Large time-lags have been shown to result in underestimations of causal associations (Dwyer, 1983). This could be particularly the case during the developmental period from mid-adolescence to early adulthood, which is characterized by many physical, social, and emotional challenges and disruptions.

From a more theoretical perspective, it may be that other forms of empathy-related responding are more strongly associated with mutual disclosure than sympathy (Soenens, Duriez, Vansteenkiste, & Goossens, 2007). Soenens et al. (2007) found that perspective-taking was a better predictor of friendship quality in early adolescence than sympathy. More research is needed on the differential associations of different forms of empathy-related responding with friendship relationships.

Nevertheless, our findings indicate that peer relationships in late adolescence are still important for the development of socioemotional skills in early adulthood, which is a developmental period in which individuals are more or less independent. Therefore, the transition period from mid-adolescence to early adulthood requires further attention in research on sympathy and friendship. Although our focus on generic friendships, as opposed to best friend dyads, could have diluted the size of our effects, the respective findings also highlight the importance of the larger peer context and intimacy with friends in general for adolescent sympathy development.

Sympathy was associated with mutual disclosure in friendships in mid- but not in late adolescence. Therefore, interventions aimed at promoting sympathy as a mechanism to support relationship quality should target children and adolescents before they enter mid-adolescence. In turn, helping adolescents form intimate relationships with friends and enhancing their opportunities for mutual disclosure with friends in late adolescence could promote the development of sympathy until early adulthood. Promoting intimacy and trust in larger groups of peers, such as school classes or sports clubs, might be a promising way to foster this development.

Conclusion

Taken together, our results highlight adolescence as a time of opportunity for learning empathic emotions and mutual disclosure in friendships. The genuine understanding and concern for others found in adolescents with high levels of sympathy foster the development of mutual disclosure. In turn, mutual disclosure in friendships represents an important context for learning interpersonal sensitivity and understanding. These developmental processes were observed in the overall sample and the female-only sample. However, different processes seem to apply to male adolescents. Since empathic emotions and close interpersonal relationships can promote positive adjustment and well-being in the future (Grühn, Rebucal,

Diehl, Lumley, & Labouvie-Vief, 2008; Poulin & Haase, 2015), further study of the co-development of sympathy and friendship intimacy across adolescence is crucial. Further research is particularly necessary to better understand how sympathy and friendship (co-) develop in male adolescents.

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Table 1

Descriptive Statistics for the Overall Sample and for Females and Males

Variables	Overall				Males		Females		Gender diff.
	<i>M</i>	<i>SD</i>	Skew	Kurtosis	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>p</i>
Sympathy 15	4.91	0.81	−0.69	0.16	4.65	0.82	5.14	0.73	***
Sympathy 18	4.98	0.77	−0.74	0.47	4.77	0.76	5.16	0.74	***
Sympathy 21	5.08	0.74	−0.89	0.86	4.86	0.77	5.26	0.66	***
Mutual disclosure 15 ^a	4.49	1.42	−0.95	0.1	3.93	1.53	4.95	1.13	***
Mutual disclosure 18 ^b	4.41	0.76	−0.48	0.67	4.24	0.77	4.54	0.72	***
Mutual disclosure 21 ^b	4.28	0.72	−0.42	0.77	4.16	0.75	4.38	0.68	***
Parental responsiveness 15	5.11	0.71	−1.35	2.95	5.12	0.65	5.11	0.75	
Maternal education	0.24	0.43	1.22	−0.51	0.27	0.44	0.22	0.41	

^a Based on a one-item measure

^b Based on a five-item scale

Note. $N = 756$ – 1258 ($n_{females} = 445$ – 683 , $n_{males} = 368$ – 573). Maternal education coded as 0 = *no tertiary education*, 1 = *tertiary education*. Descriptive statistics are based on the scale mean of all available participants at the measurement occasion.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 2

Latent Correlations for the Overall Sample and by Gender.

Variables	Correlations							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) Sympathy 15	--							
(2) Sympathy 18	.51***	--						
(3) Sympathy 21	.42***	.68***	--					
(4) Mutual disclosure 15 ^a	.37***	.18**	.24***	--				
(5) Mutual disclosure 18 ^b	.28***	.17***	.23***	.51***	--			
(6) Mutual disclosure 21	.20***	.10 ⁺	.15**	.46***	.57***	--		
(7) Parental responsiveness 15	.20***	.12**	.10**	.05	.02	.07	--	
(8) Maternal education	.03	.02	.00	-.05	.03	.07*	-.04	--
(1) Sympathy 15	--	.41***	.35***	.22**	.29***	.14*	.20***	.09*
(2) Sympathy 18	.48***	--	.66***	.04	.13*	.09	.12*	.01
(3) Sympathy 21	.35***	.65***	--	.15	.16*	.08	.12*	-.05
(4) Mutual disclosure 15 ^a	.28**	.09	.08	--	.49***	.30**	.01	-.07
(5) Mutual disclosure 18 ^b	.13 ⁺	.07	.18*	.49***	--	.58***	.01	.03
(6) Mutual disclosure 21	.16*	.01	.12 ⁺	.61***	.51***	--	-.08	.08
(7) Parental responsiveness 15	.23***	.12 ⁺	.09	.10	.02	.25**	--	-.04
(8) Maternal education	.01	.07	.08 ⁺	.03	.07	.10 ⁺	-.04	--

Note. The upper part of the table shows latent correlations for the overall sample; the lower part shows latent correlations for males below the diagonal and for females above the diagonal. $N = 1258$ (683 females, 575 males)

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table 3.

Model Fit Statistics for the Estimated Models

Model	Description	$\chi^2 (df)$	CFI _s	RMSEA _s	SRMR _s	Comparison	$\Delta\chi^2 (\Delta df)$	ΔCFI	$\Delta RMSEA$	$\Delta SRMR$
M1	No CL	142.019 (17)	.949	.076	.044					
M2	All free	92.824 (13)	.967	.070	.029	M2 vs M1	49.195 (4)	.018	.006	.015
M3	Constrained CL	123.592 (15)	.955	.076	.033	M3 vs M2	30.768 (2)	.012	.006	.014
M4	MG gender all free	176.968 (26)	.931	.096	.034					
M5	MG gender CL constrained	199.335 (30)	.923	.095	.038	M4 vs M5	22.367 (4)	.008	.001	.004

Note. CFI = comparative fit index; RMSEA = root mean square error; SRMR = standardized root mean square residual; CL = cross-lagged parameters; MG = multi-group model.

* $p < 0.05$; ** $p < 0.01$

Fig. 1 Standardized Coefficients of the Full Unconstrained Model (M2) and the Constrained Multi-Group Model (M5)

Note. $N = 1258$ (683 females, 575 males). Bold coefficients are standardized coefficients from M1. In italics, standardized coefficients from M5 for males are presented before the slash and for females after the slash. Solid lines represent significant paths, and dashed lines represent non-significant paths. For simplicity, covariates are excluded from the figure. For M2, the within-time correlation between sympathy and mutual disclosure at age 15 is $.38^{***}$, and the residual covariances at ages 18 and 21 are $.05^{+}$ and $.03$, respectively.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$