The Future is Present in the Past: A Meta-Analysis on the Longitudinal Associations of Parent-Adolescent Relationships with Peer and Romantic Relationships

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Abstract

Positive peer and romantic relationships are crucial for adolescents' positive adjustment and relationships with parents lay the foundation for these relationships. This longitudinal meta-analysis examined how supportive and negative parent-adolescent relationships continue into later peer and romantic relationships. Multilevel meta-regressions based on 81 longitudinal studies (559 effect sizes, including 49,769 participants) indicated that supportive and negative parent-adolescent relationships were associated with supportive and negative future peer and romantic relationships. Meta-analytic structural equation modeling based on 48 studies (48 effect sizes, including 14,969 participants) indicated that supportive parent-adolescent relationships unidirectionally predicted supportive and negative future peer relationships, while negative parent-adolescent relationships were bidirectionally associated with supportive and negative peer relationships. Our findings highlight the importance of relationships with parents beyond childhood.

Keywords: Relationship transmission; Parent-adolescent relationship; Meta-analysis

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Maintaining positive relationships with parents throughout adolescence is key to establishing positive relationships with other social partners. Influential developmental theories, such as attachment (Bowlby, 1969) and social cognitive (Bandura, 1977) theories, commonly emphasize how the family context shapes later social relationships, such as peer and romantic relationships. Adolescence is a critical time in this development as peer relationships become increasingly intimate and first romantic relationships emerge, providing rules and patterns for social interactions in adulthood (Laursen & Bukowski, 1997). If adolescents fail to form later positive relationships with peers and romantic partners, they are at risk for health and adjustment problems, such as increased mortality and maladjustment (Cohen, 2004). The role of the parent-adolescent relationship in shaping adolescents' peer and romantic relationships is thus also important for their general functioning.

Research supports theoretical perspectives by demonstrating that adolescents who have more positive parent-adolescent relationships indeed have relatively more positive peer and romantic relationships in adolescence and young adulthood (see Meeus, 2016 for an overview). However, large heterogeneity in effects sizes and assessed relationship dimensions at different time points renders it difficult to draw coherent conclusions about the strength of these associations. Furthermore, it remains uncertain how the strength of these associations differs across time. To date, there is no systematic meta-analytic review on longitudinal associations that identifies how core dimensions of parent-adolescent relationship are related to future social relationships. By synthesizing available information from longitudinal samples, the current meta-analysis aims to examine how interindividual differences in core dimensions of parent-adolescent relationships predict and precede

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subsequent interindividual differences in peer and romantic relationships, and how these associations differ across age.

Parent-Adolescent Relationships as Foundation for Future Social Relationships

Throughout the lifespan, people engage in relationships with various social partners that fulfill different functions. The very first relationships that children form are those with parents, which are involuntary, closed, and hierarchical by nature (Laursen & Bukowski, 1997). Lifespan and “social mold” theories propose that parent-child relationships influence the child’s behavioral, emotional, and cognitive development, but also the child’s social development (Collins & Sroufe, 1999; Hartup, 1978), including the formation and development of social relationships that are particularly crucial during adolescence. Relationships with parents during this time are thought to continue to affect social developmental processes (Collins & Laursen, 2004), potentially even more so as relationships with peers and romantic partners become increasingly important and acquire more mature relational functions.

Contrary to parent-adolescent relationships, peer relationships are voluntary, egalitarian, and temporary in nature (Laursen & Bukowski, 1997). These relationships prepare adolescents for interactions among equals and the roles and expectations of adulthood. Early romantic relationships are similar to peer relationships in that both satisfy the adolescents’ need for companionship (Shaver & Hazan, 1988). Towards late adolescence, peer and romantic relationships grow more intimate, and romantic relationships begin to take over attachment functions from parent-child relationships (Hazan & Shaver, 1987; Selfhout, Branje, & Meeus, 2009; Selman, 1989). As peer and romantic relationships resemble parent-adolescent relationships in their characteristics and functions, parent-adolescent relationships are suggested to provide a direct foundation for these developing other social relationships.

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Theoretical rationale. In relationships with peers and romantic partners, adolescents apply interaction patterns that they have acquired in relationships with their parents.

According to attachment theory (Bowlby, 1969), children form representations and expectations (i.e., working models) of social relationships from relationship experiences with their parents. Children use these internal working models to understand the behavior and motivation of other social partners and guide their (future) behavior in other relationships. In sensitive, warm interactions with parents, for example, children form positive expectations of relationships that help them to meet new relationship partners with trust and affection. In this way, high quality relationships with parents can facilitate positive functioning in peer and romantic relationships. However, children may not only rely on working models in constructing their social relationships. According to social learning theory (Bandura, 1977), children observe and enact early interactions with parents and model these learned behaviors in future interactions with peers or romantic partners. If parent-child relationships consist of trust and positive behaviors, for example, children are likely to also apply these learned positive norms and behaviors to subsequent relationships.

Empirical evidence. Research supports the theoretical continuity of parent-child relationship quality into peer and romantic relationships. Evidence from meta-analyses and reviews often based on cross-sectional studies found small to moderate positive associations between early mother-child attachment and peer relationships in childhood (Pallini, Baiocco, Schneider, Madigan, & Atkinson, 2014; Schneider, Atkinson, & Tardif, 2001), as well as moderate positive associations between parent and peer attachment in adolescence (Gorrese & Ruggieri, 2012). These findings are extended by studies reporting longitudinal associations between parent-adolescent relationships and peer or romantic relationships (for a narrative review, see Meeus, 2016). For the extreme negative end of the relationship quality distribution, meta-analytic evidence showed links between violent parent-child relationships

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and violent romantic relationships through witnessing interparental violence and experiencing parental violence (Smith-Marek et al., 2015).

While previous meta-analyses mainly focused on perceived attachment or the affective quality of relationships, the current meta-analysis focuses on relationship transmission for three core relationship dimensions: support, negative interaction, and control (Baumrind, 1991; Furman & Buhrmester, 1992). Supportive relationships include aspects such as warmth, responsiveness, nurturance, and prosocial behavior. These aspects are closely related to attachment as they provide proximity, companionship, and intimacy (Weiss, 1974). Negative interaction includes aspects such as conflicts and hostility, but also physical and emotional abuse. Although conflicts can promote cognitive development and well-being through negotiation and increased self-reflection, frequent negative interactions not only strain social bonds but can also give rise to poorer developmental and health outcomes (Laursen & Hafen, 2010). Controlling relationships include aspects such as authority, dominance, power, and lack of autonomy. Control is crucial in adolescent and adult relationships as unbalanced control interactions may predict internalizing and externalizing problem behaviors (Pinquart, 2017a; Pinquart, 2017b). Support, negative interaction, and control are distinct relationship dimensions, yet they can also be interrelated. For example, as parent-adolescent relationships become increasingly egalitarian during adolescents' strive for autonomy and independence, these changes are often accompanied by momentary decreases in support and increases in negative interaction (Laursen, Delay, & Adams, 2010).

Most studies examining associations between parent-adolescent relationship quality and quality of relationships with peers and partners measured specific aspects of relationship quality within the broader dimensions of support (e.g., intimacy, Rice & Mulkeen, 1995; trust, Umemura & Šerek, 2016), negative interaction (e.g., hostility, Stocker & Richmond, 2007; conflict, Slominski, Sameroff, Rosenblum, & Kasser, 2011), or control (e.g., power, De

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Goede, Branje, Delsing, & Meeus, 2009; autonomy, Hare, Szwed, Schad, & Allen, 2015). Specifically, more supportive parent-adolescent relationships were linked to more supportive peer (e.g., Giordano, Cernkovich, Groat, Pugh, & Swinford, 1998) and romantic relationships in later life (e.g., Kochendorfer & Kerns, 2017; Meeus, Branje, van der Valk, & de Wied, 2007). Similarly, more negative parent-adolescent relationships were linked to more negative peer (e.g., De Goede et al., 2009) and romantic relationships (e.g., Kaufman-Parks, DeMaris, Giordano, Manning, & Longmore, 2018). Finally, more controlling parent-adolescent relationships were linked to more controlling peer relationships in later life (De Goede et al., 2009). These studies thus suggest continuity across social relationships within the same dimensions of relationship quality.

The few studies assessing continuity between parent-adolescent and other social relationships across different relationship dimensions (e.g., from parent-adolescent support to peer negative interaction) remain inconsistent. While some research found that more negative parent-adolescent relationships were linked to less supportive future peer (Gayman, Turner, Cislo, & Eliassen, 2011) and romantic relationships (Slominski et al., 2011), another study failed to replicate these findings (Andrews et al., 2000).

Bidirectional effects. Theoretical models on the continuity of social relationships are often based on “social mold” models (Hartup, 1978; Collins & Sroufe, 1999) and assume unidirectional pathways from parents to adolescents (i.e., parent-to-adolescent effects), in which experiences with parents provide the foundation for later experiences with peers and romantic partners. Rather than representing passive recipients, however, adolescents actively shape their environment and development (Bell, 1968). Transactional models (e.g., Sameroff, 2009) thus propose that while parents affect adolescents’ behaviors, adolescents also influence parental behaviors, resulting in bidirectional associations in which parent and adolescent reinforce each other’s behaviors over time. Particularly as peer and romantic

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relationships become more important, adolescents are likely to apply patterns learned in these interactions to already existing relationships, such as relationships with their parents.

In line with theoretical transactional models, initial research supports bidirectional links between peer and parent-adolescent relationships in adolescence, but indicates that the associations from parent-adolescent to peer relationships decrease and the associations from peer to parent-adolescent relationships increase over time (De Goede et al., 2009). Another study, however, failed to detect reversed associations between parent-adolescent and peer relationships (Luyckx et al., 2012). Apart from these few inconsistent findings, longitudinal studies to date rarely accounted for the potential lagged relations of peer and romantic relationships on later parent-adolescent relationships. Including such reversed associations is crucial to disentangle whether the associations of parent-adolescent relationships with peer or romantic relationships in adolescence are stronger for parent-to-adolescent or adolescent-to-parent effects. In this meta-analysis, we therefore aimed to examine whether associations between parent-adolescent and future peer and romantic relationships are unidirectional, and thus provide support for parents as foundation for social relationships, or whether they are bidirectional, and thus provide initial support for transactional processes.

Moderators of the Associations between Parent-Adolescent and Peer and Romantic Relationships

Time effects. As time between measurement occasions increases, the associations of parent-adolescent relationships with peer and romantic relationships are likely to become smaller. According to general systems theory (van Bertalanffy, 1968), several developmental pathways may lead to the same adaptive or maladaptive outcome (in line with the concept of equifinality in developmental psychopathology; Cicchetti & Rogosch, 1996), whereas the same developmental pathway can result in different outcomes (in line with concept of multifinality in developmental psychopathology; Cicchetti & Rogosch, 1996). If parent-

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adolescent relationships are measured in close proximity to peer or romantic relationships, there may be fewer intervening variables and thus parent-adolescent relationships may be more strongly associated with peer or romantic relationships. If they are measured further apart, however, additional events or changes in parent-adolescent relationships might occur that alter the quality of peer and romantic relationships, thus weakening the associations with parent-adolescent relationships. *Revisionist* perspectives support this idea and propose that current experiences might decrease the effects of previous relationship experiences with parents (Fraley & Roisman, 2015). It is therefore likely that the associations between parent-adolescent and future peer and romantic relationships fade over time.

Alternatively, previous relationships with parents might provide long-lasting working models that continue to shape adolescent development (Sroufe, Egeland, & Kreutzer, 1990). This perspective suggests that the effects of previous parent-adolescent relationships are *enduring*, indicating that the associations with peer or romantic relationships stabilize over time (Fraley & Roisman, 2015). As both revisionist and enduring perspectives emphasize the importance of time in how parent-adolescent relationships continue into peer and romantic relationships, this meta-analysis accounts for the potentially varying effects of time in the continuity of social relationships.

Adolescent age. As autonomy and voluntary interactions gain more importance, the main focus of adolescent relationships gradually shifts from parents to peers and romantic partners (e.g., Laursen & Williams, 1997). Although parents remain relevant sources for support, adolescents are more likely to turn to peers or romantic partners for support than to parents, which further increases as adolescents get older (Blos, 1967; Laursen & Williams, 1997). As adolescents are gradually separating from their parents, parents are less involved in adolescent lives. Their relationships with adolescents might thus become less influential in predicting future peer and romantic relationships over time. Peer and romantic relationships,

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however, grow more important throughout adolescence and might thus become more influential in predicting later relationships with parents over time.

On the other hand, parent-adolescent relationships become more reciprocal and egalitarian throughout adolescence (Eccles, Wigfield, Buchanan, & Flanagan, 1993; Hadiwijaya, Klimstra, Vermunt, Branje, & Meeus, 2017). As they realign towards greater horizontality, they more closely resemble peer and romantic relationships. Similarly, attachment functions in romantic relationships only emerge later in adolescence and young adulthood (Furman & Collins, 2009). Particularly early romantic relationships often resemble close peer relationships more than intimate sexual relationships. As attachment functions of peer and romantic relationships become stronger over time, the links between parent-adolescent and peer or romantic relationships might also become stronger with age.

Studies generally support associations of parent-adolescent relationships with later peer or romantic relationships in early adolescence (Rice & Mulkeen, 1995; Kochendorfer & Kerns, 2017), mid-adolescence (Giordano et al., 1998; Kaufman-Parks et al., 2018), and late adolescence or early adulthood (de Goede et al., 2009; Slominski et al., 2011). However, these studies do not permit conclusions about whether and how these associations change over time. While research on how parent-adolescent relationships continue into peer and romantic relationships over time remains scarce, initial findings are in line with separation theories as these associations decrease for support, but not for negative interaction or control (e.g., De Goede et al., 2009). Contrasting findings are in line with realignment theories by indicating that the associations between parent-adolescent relationships and romantic relationships increased as adolescents grew older (Kaufman-Parks et al., 2018; Meeus et al., 2007). Other research, however, did not detect any age effects (De Goede, Branje, van Duin, van der Valk, & Meeus, 2012).

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Inconsistent findings, time lags between measurements, and age groups of parent-adolescent and peer or romantic relationships render it difficult to draw coherent conclusions about the strength of associations across adolescence. This meta-analysis adds to this gap in knowledge by investigating how time lag between measurements and adolescent age might moderate the effects of parent-adolescent relationships on peer and romantic relationships. Investigating these temporal differences will provide insights into short- or long-term effects of parent-adolescent relationship quality.

The Present Study

This longitudinal meta-analysis aims to synthesize and expand previous heterogeneous evidence on how core dimensions of parent-adolescent relationships continue into future peer and romantic relationships. This is needed because longitudinal findings largely vary regarding the magnitude of associations between parent-adolescent and other social relationships, both within the same and particularly across different relationship dimensions. To provide generalizations about the extent to which core dimensions of parent-adolescent relationships continue into future peer and romantic relationships, this meta-analysis examined how support, negative interaction, and control in parent-adolescent relationships predict support, negative interaction, and control in future peer and romantic relationships, using multilevel meta-analytic regressions (Cheung, 2014; see Figure S1A in the supplemental material). This design allows us to include all existing information within and across studies while accounting for multiple effect sizes from the same study. We expected that support, negative interaction, and control in parent-adolescent relationships continue into future peer and romantic relationships, within the same and across relationship dimensions.

Furthermore, theoretical perspectives differ regarding the role of time and age in the associations of parent-adolescent relationships with future peer and romantic relationships change throughout adolescence. We therefore examined whether the associations of parent-

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adolescent relationship quality with peer and romantic relationship quality are similarly strong across time (i.e., short-term vs. long-term effects, age effects). Based on contrasting theories and findings, it remains unclear how and to what extent the links between parent-adolescent relationships and future peer or romantic relationships change as measurements were further apart in time or as adolescents get older. In addition, we explored other sample and study characteristics that may explain variation within and across studies.

Finally, previous reviews that often rely on cross-sectional designs do not allow conclusions on directionality and temporal order concerning parent-adolescent relationships and subsequent peer and romantic relationships. Therefore, we further investigated how support, negative interaction, and control in parent-adolescent relationship predicted relative change in support, control, and negative interaction in future peer relationships, controlling for over-time stability, concurrent correlations, and the potential lagged associations of peer on parent-adolescent relationships (see Figure S1B), using meta-analytic structural equation modeling (MASEM; Jak, 2015). Unlike the multilevel approach, MASEM allows to model structural pathways. We expected that support, negative interaction, and control in parent-adolescent relationships predicted peer relationships above and beyond over-time stability, concurrent, and reversed correlations. Potential reversed associations were expected to become stronger as adolescents got older.

Methods

The design, research aims, and hypotheses of this meta-analysis were preregistered (https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=103492).

Eligibility Criteria, Data Sources, Study Selection

Eligibility criteria. Our literature search aimed to identify studies that examined longitudinal associations between parent-adolescent relationship quality and adolescents' peer and/or romantic relationship quality. We used three main criteria to select studies: First,

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selected studies included an adolescent and/or emerging adult sample¹. Second, studies assessed relationship aspects for both parent-adolescent and peer or romantic relationships that correspond to core dimensions of relationship quality (i.e., support, negative interaction, or control). We excluded measures that did not focus specifically on parents, such as measures that focused on family more generally, which could include other family members, aspects that did not constitute relationship quality, such as peer affiliation or peer victimization, or aspects that we could not assign to core dimensions, such as general relationship quality (i.e., composite measures of various core components) or attachment². Retrospective reports on relationship quality with parents and peers or romantic partners that dated back to > 1 year were excluded as they could introduce potential bias and distortions and thus, do not accurately reflect relationship quality at that time. Third, studies included a longitudinal study design in which parent-adolescent relationship assessments preceded peer and romantic relationship assessments in time. The literature search was limited to articles published in peer-reviewed journals to maximize the methodological soundness. However, as this could lead to a potentially larger mean effect size in published versus unpublished studies, we also examined potential publication bias. Lastly, we set no language restrictions and if needed, received help from native speakers to decode non-English articles.

Literature search. Our strategy to identify relevant articles was threefold: First, we searched for peer-reviewed journal articles in the databases ERIC, PsycArticles, PsycInfo, Scopus, and Web of Science for all years covered up until August 2018. We used a combination of search terms that reflected (1) an adolescent and/or young adult sample, (2) relationship dimensions with parents, peers and/or romantic partners, and (3) that reflected a

¹ Studies were excluded if they reported that the sample included participants younger than 10 years or older than 25 years at the earliest measurement.

² Studies that measured attachment in the traditional sense (e.g., secure or avoidant attachment) were excluded. Studies that used the term attachment to refer to aspects of relationship quality (e.g., closeness measured with the Inventory of Parent and Peer Attachment; Armsden & Greenberg, 1987) were included as measures of support.

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longitudinal study design. The exact search strings for each of the databases are provided in the supplemental material. Second, we searched the table of contents of the top ten journals deemed most likely to publish studies on adolescent interpersonal relationships. Specifically, we manually searched for articles in the most recent issues and online first and/or early view sections of the top ten journals identified by Web of Science and SCOPUS as having the most records concerning our search terms. Third, we searched for articles by examining the reference sections of relevant review articles (e.g., Meeus, 2016) and of all articles included in current meta-analysis.

Our search strategy yielded 6,753 unique journal articles (see Figure S2). Two subsequent screening procedures of titles and abstracts as well as full-texts by the first and third author resulted in an inclusion of 146 articles. Interrater reliabilities on 25% of all studies were good ($K = .91$ and $K = .89$, respectively). Diverging assessments were discussed among the co-authors until consensus was reached. More than half of the studies (59%) did not report the required effect sizes or reported effect sizes derived from multivariate analyses. In these cases, we contacted the authors to provide the missing zero-order correlations between continuous study variables, biserial correlations between continuous and dichotomous study variables, and polychoric correlations between dichotomous study variables. If necessary, reminders were sent after two weeks. Of all 97 authors contacted, 47 provided the requested effect sizes, 22 could not provide the requested correlations, and 28 did not reply to our request. This led to an exclusion of 42 studies.

As common in longitudinal research, we identified several studies that used the same datasets as other included studies ($k = 42$ on 12 different datasets). To ensure that we did not include overlapping data, we excluded all duplicated information based on a three-fold strategy: First, of all studies that used the same dataset, we included the study with the earliest assessment, unless another study on the same dataset used a sample size $> 25\%$ of the

previous study. Second, if two studies used the same first assessment and sample size, we included the study that contributed the most effect sizes. Third, if other studies on the same dataset contributed effect sizes that were not assessed in the first study (e.g., additional relationship dimensions or waves), we also included those unique effect sizes. This strategy led to a final inclusion of 81 articles on 66 unique datasets, using 92 independent samples.

Data Extraction

A structured coding manual guided the coding procedures. To obtain estimates of coder reliability, the first and third author coded 25% of all studies. The interrater reliability was good to perfect ($K = .98$ to $K = 1.0$). Diverging assessments were discussed among co-authors until consensus was reached. After obtaining agreement, all remaining studies were coded by either one of the two first authors. Cases for which we could not clearly retrieve the required information were coded as missing. Table S1 in the supplemental material displays the sample characteristics of all studies for peer (1A) and romantic outcomes (1B).

Publication. We coded the year of publication, the journal impact factor, and the associated quartile ranking (i.e., higher impact factors and lower quartile rankings, e.g., Quartile 1, indicate higher quality journals) based on the year of publication. In cases in which impact factor and ranking were unknown, we used the impact factor and quartile of the year closest to the year of publication.

Study procedures. We coded information regarding recruitment and waves. Recruitment characteristics included geographical region of study (i.e., North America, Western Europe, South America, Eastern Europe, Asia, or Oceania), recruitment location (i.e., local or national), recruitment strategy (i.e., convenience sampling, selective sampling, or random/ stratified sampling), and percentage of attrition across waves. Wave characteristics included number of waves measuring parent-adolescent relationship and peer and/or romantic relationship, respectively, and time lag between measures.

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Sample. Sample characteristics at the assessment of the parent-adolescent relationship at time point T_n included total sample size, mean age of adolescents³, percentage of males, percentage of ethnic minorities, percentage of participants living with both or single parents, and type of population (i.e., normal, disadvantaged, or clinical). Disadvantaged population in this study refers to populations with low socio-economic status or ethnic minorities. Sample characteristics at the assessment of the peer or romantic relationship T_{n+1} included sample size, mean age of adolescents, degree of friendship (i.e., peers, close friend, or best friend), type of romantic sexuality (i.e., heterosexual, homosexual or bisexual only, or all sexualities included), and whether the same peers or romantic partners were assessed across waves.

Measures. Measure characteristics regarding the relationship constructs (i.e., with parent, peer, or romantic partner) included type of parent-adolescent relationship (i.e., both parents, mother, or father), number of relationship constructs, relationship dimension (i.e., support, negative interaction, or control), shared informant (i.e., whether the same assessment method was used for parent-adolescent and peer or romantic relationship, such as same reporter), instrument (i.e., type of questionnaire or task), and the interrater reliability of the measure. Relationship aspects such as warmth, responsiveness, nurturance, or prosocial behavior were classified as support; relationship aspects such as conflicts, arguments, hostility, or abuse were classified as negative interaction; and relationship aspects such as authority, dominance, power, and lack of autonomy were classified as control. To avoid additional levels of dependency in our effect sizes, we used weighted means to average multiple effect sizes on the same wave and construct across different types of parent-adolescent relationship (i.e., mother-adolescent and father-adolescent relationship), different reporters (e.g., adolescent reporter, rater), or different instruments.

³ If studies reported an age range of the participating adolescents, we estimated the (weighted) average. If studies reported only the grade level(s) of the participating adolescents but no age range ($k = 7$ for peer and $k = 9$ for romantic relationships), we estimated age based on the country's general age range per grade level. Rerunning the moderation analyses without these cases yielded similar estimates and conclusions.

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Effect sizes. We used Pearson's correlations of continuous relationship scores with at least one time lag between assessments to operationalize the longitudinal associations between parent-adolescent relationships and peer or romantic relationships. If studies provided correlations for more than two waves, we recorded all available correlation coefficients. If available, we recorded all stability coefficients between parent-adolescent and peer-adolescent relationship, all concurrent correlation coefficients between parent-adolescent and peer relationship at T_n and T_{n+1} , and all bidirectional correlation coefficients between peer relationship at T_n and parent-adolescent at T_{n+1} .

Statistical Analyses

Statistical procedures. All statistical analyses were performed using the package metaSEM (Cheung, 2015) for the software program R 3.5.1 (R Core Team, 2019), following the approaches outlined by Cheung (2014) for multilevel meta-analyses and Jak (2015) for MASEM analyses. Random-effect models were used for all analyses to account for heterogeneity among studies. While fixed-effects meta-analysis assumes one single mean population effect size and identical study conditions, which is hardly realistic, random effect models assume a distribution of the mean population effect size and take varying study conditions into account (Hedges & Vevea, 1998). For all analyses, we modeled the raw correlations as recommended for random effects models (Schulze, 2004). Parameter estimates were obtained with maximum likelihood estimation, and missing data was handled with full information maximum likelihood estimation. As current statistical procedures do not yet allow to perform structural equation modelling (SEM) on multilevel meta-analytic data, we conducted two complementary analyses to answer our research questions. The differences between these two statistical approaches are depicted in Figure S1.

Three-level meta-analyses. Traditional meta-analysis assumes that the effect sizes are statistically independent. However, most included studies reported multiple effect sizes (e.g.,

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the same correlation was measured at different waves), which indicates dependence among these effect sizes. To include all available study information, we used a three-level approach to account for dependent effect sizes. Specifically, the first level reflects the sampling variance around the estimated population effect size, the second level reflects the variance between effect sizes within studies, and the third level reflects the variance between effect sizes between studies (Cheung, 2014). To estimate how supportive, negative, and controlling parent-adolescent relationships are associated with supportive, negative, and controlling future peer relationships (see Figure S1A; Figure 1-I), we performed nine three-level random-effect regression analyses – three analyses for each parent-adolescent relationship dimension (i.e., support, negative interaction, and control), respectively. Similarly, to estimate how supportive, negative, and controlling parent-adolescent relationships are associated with supportive, negative, and controlling future romantic relationships (see Figure S1A; Figure 1-II), we performed nine three-level random-effect meta-regression analyses.

Cross-lagged MASEM analyses. To estimate how supportive, negative, and controlling parent-adolescent relationships predict future peer relationships over time (see Figure S1B; Figure 2), we performed nine cross-lagged MASEM analyses – three analyses for each parent-adolescent relationship component, respectively. Specifically, we added five additional paths to the model: (1) the stability of parent-adolescent relationship from T_n to T_{n+1} , (2) the stability of peer-adolescent relationship from T_n to T_{n+1} , (3) the concurrent correlation of parent-adolescent and peer-adolescent relationship at T_n (4) the concurrent correlation of parent-adolescent and peer-adolescent relationship at T_{n+1} , and (5) the reversed correlation from peer-adolescent relationship at T_n to parent-adolescent relationship at T_{n+1} . MASEM analyses do not allow for multiple effect sizes per study. Therefore, we selected only the first effect size per study for the analyses as the first assessment point usually contained the largest sample size. To estimate the cross-lagged models, we used the One-

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Stage MASEM approach (OSMASEM; Jak & Cheung, 2020). This approach is an extension of the conventional two-stage approach that first pooled correlations coefficients and then fit the structural model to the pooled correlation matrix (TSSEM; Cheung, 2014). In OSMASEM, the structural model is fitted directly on the observed correlation matrix, rather than the pooled correlation matrix. Both approaches result in the same parameter estimates and standard errors in models without moderators (Jak & Cheung, 2020). Unlike previous approaches, however, OSMASEM allows to model continuous moderators on the structural paths while accounting for missing correlations.

Moderator analyses. Heterogeneity across effect sizes was assessed in all models, using the Q -statistic and I^2 measure from Stage 1 of the two stage MASEM approach. The Q -statistic evaluates whether there is substantial variability in the effect sizes across studies ($\tau^2 \neq 0$). The I^2 quantifies how much variation across studies is attributed to heterogeneity, with values $> 25\%$, $> 50\%$, and $> 75\%$ representing small, moderate, and large heterogeneity, respectively (Higgins, Thompson, Deeks, & Altman, 2003). We reported all effect sizes to two decimal places. For small moderation effects, we deviated from this rule if rounding to two decimal places would result in non-informative, imprecise estimates.

If the analyses detected significant heterogeneity between effect sizes, we examined whether hypothesized moderators might explain this heterogeneity. As potential moderators were prespecified, we did not add all moderators successively to the model but conducted all moderator analyses separately to refrain from inflating the type II error rate and maximize statistical power. For both statistical procedures, we tested each moderator's unique contribution by adding them as predictors to the final models and calculating the proportion of explained variance (e.g., Cheung, 2014). R^2_{within} and R^2_{between} indicate how much estimated heterogeneity each predictor explained within (level 2) and between studies (level 3). However, this approach did not allow to examine the unique effects of one moderator when

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accounting for other moderators. Hypothesized moderators were adolescent age and time between measurements. Additional moderators included type of population, shared informant, percentage males, publication year, journal impact factor, and journal quartile. Continuous moderators were centered on the mean.

Publication bias. Publication bias is a major concern in meta-analyses as it may inflate the associations between two constructs, resulting in false conclusions. To date, most methods assessing publication bias suffer from serious limitations, particularly with regard to small number of included studies and effect sizes (see van Aert, Wicherts, & van Assen, 2019 for a review). Furthermore, severe heterogeneity between studies prevents a clear detection publication bias as it often results in an increase of false-positives (Terrin, Schmid, Lau, & Olkin, 2003). To get a more comprehensive picture about the potential presence and implication of publication bias in this study, we used two established methods. First, we examined funnel plots and conducted Egger's tests to estimate potential associations between effect sizes and its precision (i.e., small study effects). Asymmetrical funnel plots indicate the presence of small study effects. The Egger's test outperforms comparable methods and is the recommended method to assess publication bias in meta-analyses (van Aert et al., 2019). However, the Egger's test often fails to produce reliable results in samples with < 10 effect sizes due to insufficient power, resulting in an increase of false positives (Sterne, Gavaghan, & Egger, 2000; Terrin et al., 2003). Furthermore, it should be noted that asymmetrical funnel plots indicate small study effects, of which publication bias is only one possible cause (Egger, Smith, Schneider, & Minder, 1997). Second, we used the three-parameter selection model (Iyengar & Greenhouse, 1988) to estimate effect sizes corrected for potential publication bias. This approach allows to compare the unadjusted to bias-adjusted models using likelihood ratio tests and outperformed other effect size correction methods in simulation studies (Carter, Schönbrodt, Gervais, & Hilgard, 2019; van Aert et al., 2019).

Results

Table S2 provides a general overview of all main and moderation results.

Three-Level Meta-Regressions on Parent-Adolescent and Future Peer and Romantic Relationships

Sample description. For peer outcomes, our search yielded $N = 424$ effect sizes from $k = 48$ independent studies with a total of 56 samples and 49,769 participants. For romantic outcomes, our search yielded $N = 135$ effect sizes from $k = 36$ independent studies with a total of 40 samples and 14,969 participants. Further information regarding the number of effect sizes per sub-analysis is depicted in Table S3A. The majority of studies sampled intact (72.0%), ethnic majority families (64.8%) from Western countries (95.7%) and assessed relationship quality using adolescent informants only (78.3%). Further study characteristics are depicted in Table S1A. Forest plots for all analyses are depicted in Figures S3-S10.

Peer outcomes. Due to the small number of studies assessing control in parent-adolescent or peer relationships ($k = 2$), these analyses were not interpreted (but see Table S4). For all remaining relationship dimensions, parent-adolescent relationship quality was significantly associated with later peer relationship quality (see Figure 1-I; Table S3A). More supportive relationships with parents were associated with more supportive ($\beta = .18, p < .001$) and less negative ($\beta = -.10, p < .001$) relationships with peers at the subsequent time point. Similarly, more negative relationships with parents were associated with more negative ($\beta = .18, p < .001$) and less supportive relationships with peers at the subsequent time point ($\beta = -.07, p = .002$).

Test of moderators. All analyses revealed significant heterogeneity within and across studies (see Table S3A). Levels of heterogeneity were moderate to large between, but not within studies. Therefore, we conducted several analyses to examine whether theoretical moderators (i.e., time lag, adolescent age) and exploratory moderators (i.e., population,

shared informant, percentage males, publication year, journal impact factor, and journal quartile) significantly explained these differences (see Table S5 for descriptive statistics on all moderators). Only few moderators (i.e., time lag, adolescent age, shared informant, journal quartile) significantly improved the model fit for some relationship dimensions (see Table S6). The results of these moderators are depicted in Table S7 (see also Figure 1-I).

Time lag. Adding time lag as a moderator significantly improved the model fit for two out of four analyses: If the measurements were closer together in time, supportive parent-adolescent relationships were stronger associated with supportive peer relationships ($\beta = -.002, p < .001, R^2_{\text{within}} = .98, R^2_{\text{between}} = .20$), and negative parent-adolescent relationships were stronger associated with negative peer relationships ($\beta = -.002, p < .001, R^2_{\text{within}} < .99, R^2_{\text{between}} < .01$).

Adolescent age. Adding adolescent age as a moderator significantly improved the model fit in two out of four analyses: As adolescents became older, supportive parent-adolescent relationships were stronger associated with supportive peer relationships ($\beta = .01, p = .003, R^2_{\text{within}} = .93, R^2_{\text{between}} < .01$), and negative parent-adolescent relationships were stronger associated with negative peer relationships ($\beta = .02, p = .037, R^2_{\text{within}} = .46, R^2_{\text{between}} < .01$).

Additional moderators. Results of the moderator analyses further indicated significant effects for shared informant and journal quartile for some relationship dimensions. Specifically, studies using shared informants (i.e., the same informant reported on parent-adolescent and peer or romantic relationship) reported larger associations between supportive and supportive peer relationships compared to studies using non-shared informants ($\beta = .11, p = .028, R^2_{\text{within}} = .86, R^2_{\text{between}} = .23$). However, due to few or no variation at one level of the moderator, we could not test the effects of shared informants on the links between negative

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parent-adolescent relationships and negative or supportive peer relationships ($k = 1$ for non-shared informant).

Furthermore, publications in journals with higher quartile rankings (i.e., indicating lower quality journals) reported larger associations between supportive parent-adolescent relationships and supportive peer relationships compared to publications in journals with lower quartile rankings ($\beta = .04, p < .001, R^2_{\text{within}} = .85, R^2_{\text{between}} = .45$).

Adding population, gender, publication year, or journal impact factor separately as moderators did not significantly improve the model fit for any relationship dimension. Due to few or no variation at some levels of the moderator, we could not test the effects of population on the links between supportive parent-adolescent relationships and negative peer relationships ($k = 1$ for clinical and $k = 2$ for disadvantaged population) as well as negative parent-adolescent relationships and negative ($k = 1$ for clinical and $k = 2$ for disadvantaged population) or supportive peer relationships ($k = 1$ for clinical and $k = 0$ for disadvantaged population).

Romantic outcomes. Similar to peer outcomes, we refrain from interpreting all analyses involving controlling parent-adolescent or romantic relationships due to the small number of studies ($k = 1-4$) assessing this relationship dimension (but see Table S4). For all remaining relationship dimensions, parent-adolescent relationship quality was significantly associated with later romantic relationship quality (see Figure 1-II; Table S3A). More supportive relationships with parents were associated with more supportive ($\beta = .11, p < .001$) and less negative ($\beta = -.10, p < .001$) relationships with romantic partners at the next time point. Similarly, more negative relationships with parents were associated with more

negative ($\beta = .16, p < .001$) and less supportive relationships with romantic partners at the next time point ($\beta = -.11, p < .001^4$).

Test of moderators. The analyses involving negative, but not supportive, parent-adolescent relationships revealed significant heterogeneity within and across studies (see Table S3A). Levels of heterogeneity were moderate between, but small within studies for the association between negative parent-adolescent and negative romantic relationships, and small within, but negligible between studies for the association between negative parent-adolescent and supportive romantic relationships. Therefore, we conducted several analyses to examine whether theoretical moderators (i.e., time lag, adolescent age) and exploratory moderators (i.e., population, shared informant, percentage males, publication year, journal impact factor, and journal quartile) significantly explained these differences (see Table S5 for descriptive statistics on all moderators). Contrary to our expectations, none of these moderators significantly improved the model fit for any relationship dimension. Due to few or no variation in the data, we could not test the moderating effects of population on the links between negative parent-adolescent relationships and negative ($k = 2$ for clinical and $k = 3$ for disadvantaged population) as well as supportive peer relationships ($k = 1$ for clinical and $k = 2$ for disadvantaged population).

⁴ Due to small variation on the third level of the analyses, the analysis resulted in problems estimating the standard errors. We therefore reran the analysis using the package metafor, which produced reliable and similar estimates ($\beta = -.10, p < .001$).

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Figure 1. Main and significant moderation outcomes for three-level meta-regression analyses between supportive (A, B) and negative parent-adolescent relationships (C, D) and future peer (I) and romantic relationships (II).

*** $p < .001$ ** $p < .01$ * $p < .05$.

Cross-Lagged Panel Analyses on Parent-Adolescent and Future Peer Relationships

We used MASEM on all independent effect sizes ($N = 48$) to estimate a cross-lagged panel model that accounts for concurrent correlations at each time point, stability of each quality measure as well as the bidirectional effect from peer relationship quality to parent-adolescent relationship quality. Missing data on the separate paths ranged from $n = 1$ to $n = 8$. As too few studies assessed parent-adolescent and romantic relationships simultaneously ($k = 5$), and thus provided stability, concurrent as well as bidirectional correlations, we were unable to estimate a cross-lagged model for the associations between parent-adolescent and romantic relationships.

Main outcomes. The MASEM analyses showed that, controlling for concurrent, stability, and bidirectional correlations, parent-adolescent relationship quality significantly predicted later peer relationship quality for all relationship dimensions (see Figure 2; Table S3B): More supportive parent-adolescent relationships predicted more supportive ($\beta = .07, p < .001$) and less negative ($\beta = -.05, p = .005^5$) relationships with peers at the next time point. More negative relationships with parents predicted more negative ($\beta = .10, p = .001$) and less supportive ($\beta = -.06, p = .001$) relationships with peers at the next time point. Out of four possible reversed effects, only the two effects of peer relationships on negative relationships with parents were significant: More negative relationships with parents at the next time point were predicted by both more negative ($\beta = .06, p = .044$) and less supportive relationships with peers ($\beta = -.06, p = .017$). The two bidirectional findings indicated overlapping confidence intervals for the cross-lagged paths between negative parent-adolescent relationships and negative ($CI_{\text{par} \rightarrow \text{peer}} = [.04, .15], CI_{\text{peer} \rightarrow \text{par}} = [.00, .12]$) and supportive peer relationships ($CI_{\text{par} \rightarrow \text{peer}} = [-.10, -.02], CI_{\text{peer} \rightarrow \text{par}} = [-0.11, -0.01]$), which suggests that these cross-lagged paths did not differ from each other.

Moderator analyses. All analyses revealed significant heterogeneity across studies (see Table S3B). Levels of heterogeneity were substantial for all cross-lagged paths. Therefore, we added potential theoretical (i.e., adolescent age, time lag) and exploratory moderators (i.e., shared informant, percentage males, publication year, journal impact factor, journal quartile) on the structural cross-lagged parameters to examine whether they explained significant differences between the studies. Most moderators (i.e., time lag, adolescent age, publication year, journal impact factor, journal quartile) significantly improved the model fit

⁵ Due to some difficulties estimating the standard errors of some variances, rerunning the analyses resulted in slightly different, still significant *p*-values, but the same estimates. We therefore reran the analysis using the two-stage approach, which resulted in the same estimates ($\beta = -.05, p = .031$).

for some relationship dimensions (see Table S6). The results of these moderators are depicted in Table S7 (see also Figure 2).

Time lag. Adding time lag as a moderator did not significantly improve the model fit in any analysis⁶.

Adolescent age. Adding adolescent age as a moderator significantly improved the model fit in two out of four analyses: Consistent with the multilevel findings, as adolescents became older, negative parent-adolescent relationships predicted supportive peer relationships more strongly ($\beta = .02, p = .003, R^2_{\text{par} \rightarrow \text{peer}} = .05$). Reversely, supportive peer relationships also more strongly predicted negative parent-adolescent relationships ($\beta = .03, p = .004, R^2_{\text{peer} \rightarrow \text{par}} > .99$). For the associations between negative parent-adolescent and negative peer relationships, on the other hand, only the reversed effect was significant: As adolescents became older, more negative peer relationships *less strongly* predicted more negative parent-adolescent relationships ($\beta = -.04, p = .002, R^2_{\text{peer} \rightarrow \text{par}} > .99$).

Additional moderators. Results of the moderator analyses further indicated significant moderation by publication year, journal impact factor, and journal quartile for some relationship dimensions. Compared to older publications, more recent publications reported slightly smaller bidirectional cross-lagged paths from negative parent-adolescent to supportive peer relationships ($\beta = -.004, p = .013, R^2_{\text{par} \rightarrow \text{peer}} = .10$) and reversely from supportive peer relationships to negative parent-adolescent relationships ($\beta = -.01, p = .005, R^2_{\text{peer} \rightarrow \text{par}} > .99$) as well as slightly larger bidirectional cross-lagged paths from negative parent-adolescent to negative peer relationships ($\beta = .001, p = .024, R^2_{\text{par} \rightarrow \text{peer}} = .62$) and reversely from negative peer to negative parent-adolescent relationships ($\beta = .01, p < .001, R^2_{\text{peer} \rightarrow \text{par}} = .32$).

⁶ Due to small sample size and high model complexity, the analysis resulted in problems estimating reliable standard errors for the moderating effect of time lag on the associations between supportive parent-adolescent relationships and negative peer relationships. We therefore do not report and interpret these results.

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Adding journal impact factor and journal quartile separately as moderators significantly improved the model fit for some relationship dimensions, but mainly significantly moderated the reversed paths from peer to parent-adolescent relationships: Publications in journals with higher impact factors reported smaller effects from supportive peer to supportive parent-adolescent relationships compared to journals with lower impact factors ($\beta = -.03$, $p = .009$, $R^2_{\text{peer} \rightarrow \text{par}} = .05$) and from supportive peer to negative parent-adolescent relationships compared to journals with lower impact factors ($\beta = -.04$, $p = .002$, $R^2_{\text{peer} \rightarrow \text{par}} = .37$). Similarly, publications in journals with lower quartile rankings reported larger effects from supportive peer to supportive parent-adolescent relationships ($\beta = .04$, $p < .001$, $R^2_{\text{peer} \rightarrow \text{par}} = .24$), but also reversely from supportive parent-adolescent to supportive peer relationships ($\beta = .02$, $p = .029$, $R^2_{\text{par} \rightarrow \text{peer}} = .13$).

Adding population, shared informant, or gender separately as moderators did not significantly improve the model fit for any relationship dimension. As in the three-level meta-regression analyses, due to few or no variation at some levels of the moderator, we could not test the effects of shared informants on the links between negative parent-adolescent relationships and negative or supportive peer relationships and the effects of population on the links between supportive parent-adolescent relationships and negative peer relationships as well as negative parent-adolescent relationships and negative or supportive peer relationships.

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Figure 2. Main and significant moderation outcomes for MASEM analyses between supportive (A, B) and negative parent-adolescent relationships (C, D) and future peer relationships; Journal IF = journal impact factor.

*** $p < .001$ ** $p < .01$ * $p < .05$.

Sensitivity Analyses

To disentangle the effects of relationship continuity within (e.g., from supportive parent-adolescent to supportive peer relationships) and across relationship components (e.g., from supportive parent-adolescent to negative peer relationships), we conducted four additional posthoc analyses on the combined samples with reversed scores for the associations across relationship components. Specifically, we analyzed how peer or romantic

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relationship dimensions moderated the association between parent-adolescent support and peer or romantic relationships (i.e., supportive and negative peer relationships combined) and the association between parent-adolescent negative interaction and peer or romantic relationships. For peer outcomes, supportive parent-adolescent relationships were stronger associated with supportive than negative peer relationships in the three-level meta-regression ($\beta = .13, p < .001$), but not the MASEM analyses ($\beta = .02, p = .454$). However, the reversed effect was significant: Supportive parent-adolescent relationships were stronger predicted by supportive than negative peer relationships ($\beta = .31, p < .001$). Similarly, negative parent-adolescent relationships were stronger associated with negative than supportive peer relationships in the three-level meta-regression ($\beta = .13, p < .001$), but not the MASEM analyses ($\beta = .06, p = .077$). Again, the reversed effect was significant: Negative parent-adolescent relationships were stronger predicted by negative than supportive peer relationships ($\beta = .30, p < .001$). For romantic outcomes, negative parent-adolescent relationships were stronger associated with negative than supportive romantic relationships ($\beta = .10, p < .001$). No significant differences were detected between supportive parent-adolescent relationships and supportive or negative romantic relationships ($\beta = .02, p = .270$).

Publication Bias

As many studies in our meta-analysis did not assess the longitudinal associations between parent-adolescent and peer or romantic relationships as (primary) outcomes, we did not expect publication bias to severely impact our results. Nevertheless, we assessed publication bias and its potential impact on our analyses using two methods. First, visual inspection of the funnel plots and results of Egger's tests suggested that the effects were approximately evenly distributed around the mean for all subgroup models, all $ps > .202$ (see Table S8). Second, results from the three-parameter selection model (p value cut point = .05) indicated that the estimated model adjusted for publication bias did not fit the data

significantly better than the unadjusted model in all but one of the main analyses⁷, all $ps > .116$. However, the adjusted model seemed to fit better than the unadjusted model for the association between negative parent-adolescent relationships and supportive peer relationships in the three-level meta-regression analysis ($r_{\text{adjusted}} = -.01$, $p = .008$). Due to the small number of studies in these analyses, however, these results are likely biased and may indicate false positives (Carter et al., 2019). The weighted average effect sizes from the other adjusted models were similar to those of the unadjusted models. Together, these results suggest that publication bias is not likely to severely impact our results.

Discussion

The present meta-analysis examined how dimensions of parent-adolescent relationships continue into subsequent peer and romantic relationships, using two complimentary analyses on 82 longitudinal studies. First, we used multilevel analyses to examine how parent-adolescent relationships are associated with future peer and romantic relationships. Second, we used meta-analytic structural equation modelling (MASEM) to examine bidirectional associations between parent-adolescent and future peer relationships, controlling for concurrent associations and over-time construct stability. Results indicated that supportive and negative parent-adolescent relationships were associated with future supportive and negative peer relationships, even above and beyond concurrent associations and construct stability. Also, supportive and negative parent-adolescent relationships were associated with supportive and negative future romantic relationships. For negative parent-adolescent relationships, the transmission from parent-adolescent to peer relationship quality became stronger as adolescents got older. Despite relatively small effect sizes, these findings

⁷ Due to low variation in effect sizes, we were unable to conduct three-parameter selection analyses for the associations between supportive parent-adolescent and supportive as well as negative romantic relationships. However, recent research suggests that publication bias in relatively homogeneous datasets is weak at best (van Aert et al., 2019).

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indicate that parent-adolescent relationship dimensions are significantly related to subsequent peer and romantic relationship dimensions.

Parent-Adolescent Relationships as Foundation for other Social Relationships

Consistent with our hypotheses based on attachment and social learning theories (Bandura, 1977; Bowlby, 1969), we found significant associations across time between parent-adolescent and future peer and romantic relationships within and across relationship dimensions. Specifically, more supportive parent-adolescent relationships were associated with more supportive and less negative peer and romantic relationships. Similarly, more negative parent-adolescent relationships were associated with more negative and less supportive peer and romantic relationships. These findings suggest that core parent-adolescent relationship dimensions are related to subsequent social relationship dimensions. The results from the MASEM analyses further expanded these findings, indicating that across time more supportive and more negative parent-adolescent relationships predicted more supportive and more negative future peer relationships, above and beyond concurrent associations and construct stability. These findings support relationship continuity from parent-adolescent to future peer relationships and highlight the importance of both support and negative interaction in the transmission of relationship quality.

While the MASEM results indeed indicated unidirectional pathways from supportive parent-adolescent relationships to peer relationships, they also indicated bidirectional associations between negative parent-adolescent and peer relationships. These bidirectional associations are in line with transactional theories (Bell, 1968; Sameroff, 2009) and suggest that negative interactions might serve a different function than support during adolescence. As warm, supportive relationships with parents represent more general attachment functions and thus lay the foundation for later attachment relationships (Bowlby, 1969), they may be naturally, thus unidirectionally transmitted from parent-adolescent to peer relationships. At

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the same time, adolescence represents a time in which children become more independent and learn to negotiate their own expectations (Collins & Laursen, 2004). Peers become more important and primary attachment figures with whom adolescents practice conflict interactions among equals (Laursen & Williams, 1997). Particularly if adolescents maintain conflictive relationships with peers, it may be possible that they transfer these interaction patterns to their relationships with parents, as parents react to these more problematic peer relationships, or children might bring the negative mood resulting from these negative peer relationships home. Hence, negative interaction patterns in parent-adolescent and peer relationships might be bidirectionally related to each other.

Sensitivity analyses suggested that the transmission of relationship quality from parent-adolescent to peer relationships was stronger within the same relationship dimensions (e.g., from parent-adolescent support to peer support) than across relationship dimensions (e.g., from parent-adolescent support to peer negative interaction). Similarly, the MASEM findings indicated that the reversed associations from peer relationships to future parent-adolescent relationships were also stronger within than across relationship dimensions. One reason may be that in relationships with parents, adolescents form representations and expectations about social relationships and acquire interaction patterns that they transfer to their relationships with peers and romantic partners (Bandura, 1977). Such representations and interaction patterns are based on specific observed behaviors (e.g., positive or negative relationship behaviors) that form schemata of relationships (Mischel, 1973; see also schema theory: e.g., DiMaggio, 1997). In that way, relationship schemata are easier activated within the same, than across different relationship dimensions (Brewer & Treyns, 1981).

While the associations with peer relationships were stronger within than across relationship dimensions, these findings were only partially replicated for romantic relationships. Specifically, the association between negative parent-adolescent and negative

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future romantic relationships was stronger than the association between negative parent-adolescent and supportive future romantic relationships, while supportive parent-adolescent relationships were equally strong related to future negative and supportive romantic relationships. This suggests that the continuity of negative parent-adolescent relationships might play a particularly dominant role in romantic relationships. One reason may be that negative events, such as negative emotions or negative feedback, exert greater influence than good ones because negative feelings are lasting and heighten awareness as well as immediate reactions, while positive feelings are ephemeral and wear off more quickly (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001). Alternatively, it may be possible that attachment processes related to support in relationships with romantic partners usually do not emerge before late adolescence, while such attachment processes might already exist in relationships with parents and peers (Furman, Simon, Shaffer, & Bouchey, 2002). Particularly in early romantic relationships, adolescents and young adults might less accurately report on support in their romantic relationships as feelings of love can elicit highly positive, idealistic views of romantic partners and relationships (Murray, 2001). This romantic positivity bias can arise regardless of parent-adolescent relationships and might thus explain why supportive parent-adolescent relationships are stronger associated with supportive peer relationships than supportive romantic relationships.

To summarize, the results for both peer and romantic relationships indicate that core dimensions of parent-adolescent relationships continue into other social relationships later in time. Even more so, particularly supportive parent-adolescent relationships might provide a foundation for later peer relationships as suggested by dominant theoretical perspectives (e.g., Collins & Sroufe, 1999; Hartup, 1978), while negative parent-adolescent relationships are also predicted by peer relationships. However, the associations of parent-adolescent relationships with peer and romantic relationships were generally small. These results were in

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line with previous meta-analyses on the associations between early parent-child bonds and peer relations (Pallini et al., 2014; Schneider et al., 2001). Relationships with parents during adolescence continue to be associated with later relationships, and these associations do not seem to become weaker compared to childhood. However, the small effect sizes also suggest that relationship quality with parents not solely predicts later relationship quality with peers and romantic partners. Rather, it is likely that other processes are involved in determining the quality of social relationships (see e.g., ecological system theory, Bronfenbrenner, 1979).

Moderators in the Transmission of Relationship Quality

Effects of time lag. Although we only detected moderating effects of time lag for some relationship dimensions, assessments of parent-adolescent and peer, but not romantic relationships, that were further apart in time showed smaller associations. In line with general systems theory (van Bertalanffy, 1968; see also concept of equifinality in developmental psychopathology, Cicchetti & Rogosch, 1996) and revisionist perspectives (Fraley & Roisman, 2015), increased time between assessments might elicit changes in the parent-adolescent relationships or additional continuous pathways that decrease the association of parent-adolescent relationships with future peer relationships. From a statistical perspective, this finding might reflect serial correlation which specifies that correlations between longitudinal assessments that are closer together in time are stronger than those further apart. Parent-adolescent relationships are thus likely to promptly predict peer relationships.

The associations between parent-adolescent and future romantic relationships did not vary as a function of time intervals, which might suggest stabilizing or enduring effects that are in line with previous empirical findings on the effects of early experiences with parents (Fraley & Roisman, 2015). It may be possible that parent-adolescent relationships provide continuous internal working models that are particularly influential for romantic relationships (Bowlby, 1969; Sroufe et al., 1990). However, we should note that assessments between

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parent and romantic relationships were generally further apart in time, which resulted in less variation and heterogeneity to detect significant effects between studies. Therefore, the sample size might have also been too small to detect any potentially significant effects.

While our findings provide preliminary evidence that parent-adolescent relationships transiently affect peer relationships within the same relationship dimension and enduringly affect romantic relationships, we should note that our analyses rendered it difficult to unravel moderating effects of time intervals and adolescent age. It may be possible, for example, that the effects of parent-adolescent relationships in late, compared to early adolescence are more enduring as they realign (Eccles et al., 1993). However, analyses that would assess the effects of time intervals while accounting for adolescent age are too complex to produce reliable, interpretable results. Future studies are needed to find more suitable ways to disentangle potential time and age effects, and thus allow more substantial conclusions about the long-term effects of parent-adolescent relationships on future peer and romantic relationships.

Effects of adolescent age. Results indicated that adolescent age significantly moderated the links between parent-adolescent relationships and some future peer, but not romantic relationship dimensions. Specifically, as adolescents got older, the longitudinal associations between parent-adolescent and peer relationships within the same relationship dimensions in the three-level meta-regressions and negative parent-adolescent and supportive peer relationships in the MASEM analyses became stronger. One reason may be that parent-adolescent relationships become more egalitarian and reciprocal towards late adolescence (Eccles et al., 1993; Hadiwijaya et al., 2017) and thus more similar to horizontal peer relationships.

For negative parent-adolescent relationships, we further detected reversed, but inconsistent, effects from peer to parent-adolescent relationships. Specifically, as adolescents got older, negative parent-adolescent relationships were more weakly predicted by negative

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peer relationships, but more strongly predicted by supportive peer relationships. It may be possible that the weaker effect from negative peer to negative parent-adolescent relationship over time may again reflect the change in peer relationships. Not only do adolescents increasingly turn to peers for support (Blos, 1967; Laursen & Williams, 1997), but these relationships with peers also represent a practice ground for egalitarian relationships (Laursen & Bukowski, 1997). These new egalitarian patterns are likely to spill over to relationships with parents, which themselves become more egalitarian and aligned throughout adolescence. Once parent-adolescent relationships are realigned and established by late adolescence, however, they might also become less susceptible to the influence of peer relationships. Alternatively, it may be possible that parents worry less about peer relationships as adolescents get older, whereas they may be more concerned about negative peer interactions at younger ages, resulting in more negative parent-adolescent interactions during early to mid-adolescence (Hadiwijaya et al., 2017). On the other hand, relationships with peers also mature over time in that peers not only mutually and unconditionally support each other, but also learn to accept needs and interests that differ from their own (Selman, 1989). This development of support in peer relationships might positively transfer to parent-adolescent relationships and thus, result in less conflictive, negative interactions. While these findings indicate that there may be some moderating effects of adolescent age, for most relationship dimensions the links between parent-adolescent and future peer relationships did not differ with adolescent age, but remained equally strong throughout adolescence and adulthood.

No sample or study characteristics explained differences in how parent-adolescent relationships were associated with future romantic relationships, and only few study characteristics explained differences in how they were associated with future peer relationships. This suggests that the associations between parent-adolescent and future peer and romantic relationships were relatively robust across population, informants, adolescent

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gender, or publication year. For some relationship dimensions, however, we found that studies published in journals with higher impact factors and associated lower quartile rankings (i.e., indicating higher quality journals) reported smaller associations between parent-adolescent and peer relationships compared to journals with lower impact factors and higher quartiles. One reason may be that these journals require studies to implement more rigorous designs that often result in smaller effect sizes.

Strengths, Limitations, and Future Directions

This meta-analysis is the first to synthesize the longitudinal associations between parent-adolescent and future peer and romantic relationships, combining novel meta-analytic techniques and establishing temporal order. Multilevel meta-regression allowed us to model the longitudinal associations between parent-adolescent and future peer and romantic relationships, using complete existing evidence presented from multiple waves in longitudinal studies. Additionally, meta-analytic structural equation modelling expanded the multilevel findings and allowed us to additionally model the longitudinal associations between parent-adolescent and future peer relationships in a cross-lagged panel design, to not only control for concurrent associations and over time stability, but also to investigate potential bidirectional pathways. As such, our findings provide a comprehensive and thorough overview on how core dimensions in parent-adolescent relationships predict the same and other dimensions in later peer and romantic relationships which help to build and refine theories on adolescent relationships. While theories generally mark relationships with parents in (early) childhood as most influential for a child's later development, our findings indicate that relationships with parents in adolescence might play an important role as well.

Although this is the most extensive and comprehensive work on the transmission of relationship quality in and beyond adolescence, this meta-analysis has some limitations. First, as we decided to analyze subgroups of how parent-adolescent relationship dimensions predict

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the same and also other peer and romantic relationship dimensions, some cells in our dataset contained only few effect sizes. While we initially intended to assess how control in parent-adolescent relationships continues into peer and romantic relationships, only two studies assessed control, which did not allow reliable conclusions. As control is a core relationship dimension, future studies should assess whether and how controlling parent-adolescent relationships continue into future peer and romantic relationships.

Second, in some cases we had too few studies to detect or even test moderation effects. For example, most studies relied solely on adolescents to assess relationship quality. However, such reports may be biased as different informants might perceive relationship quality differently. To more reliably and objectively assess longitudinal associations between parent-adolescent and peer or romantic relationships, future longitudinal designs should include multi-informant ratings of relationship quality. Related to the sample size problem, we were not always able to retrieve all necessary data. From articles that did not report the required correlations, 28 authors (29%) did not reply to our requests and 22 authors (23%) replied, but were not able to reproduce the data. This is a serious problem that may introduce bias not only in conducting meta-analyses, but in scientific research in general. Open science practices, including data storage and access, help to overcome the problem and should be strongly encouraged, if not required.

Third, most studies included samples from ethnic majority, non-clinical populations and Western culture, which might not generalize to samples from other populations or cultures. It could be possible, for example, that the associations between parent-adolescent and peer or romantic relationships are stronger in more collectivistic cultures, in which the family context seems to exert greater influence throughout adolescence and young adulthood (Yoshida & Busby, 2012). Cross-cultural longitudinal research is needed to provide crucial

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insights into how the associations between parent-adolescent and other social relationships generalize to other populations and cultures.

Fourth, our meta-analysis did not allow to investigate possible differences between mothers and fathers in the association between parent-adolescent and peer and romantic relationships as such a research question would have required an additional level in our analyses. Instead, we chose to focus on parent-adolescent relationships more generally. Some studies, however, suggest that relationships with mothers and fathers continue differently into other social relationships (e.g., Möller & Stattin, 2001). Future (meta-analytic) research might further examine how differences in the relationships with mothers and fathers predict the transmission of parent-adolescent relationship dimensions to later relationships with peers and romantic partners. Relatedly, different types of peer groups, such as chosen or non-chosen groups, might fulfill different socialization functions (Albarello, Crocetti, & Rubini, 2018). Future research might thus investigate how the associations between parent-adolescent and peer or romantic relationships differ among diverse peer groups and romantic partners.

Finally, while our findings established both magnitude and relationship continuity from parent-adolescent to other social relationships, we only examined longitudinal associations that do not permit causal conclusions about the influence of parent-adolescent relationships on peer or romantic relationships. Cross-lagged models, however, allowed us to also establish temporal order between parent-adolescent and peer relationships. As studies rarely assessed parent-adolescent and romantic relationships simultaneously, we cannot rule out that (particularly later) romantic relationships might also be associated with subsequent parent-adolescent relationships. Future longitudinal studies that simultaneously assess parent-adolescent and romantic relationships over time might more clearly indicate whether romantic relationships are indeed preceded by parent-adolescent relationships or whether they might also predict them over time.

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Relatedly, studies included in this meta-analysis did not focus on within-family associations, and thus dynamic processes that occur within families were not examined. Cross-lagged models assess rank-order changes within a group and thus allow to estimate whether adolescents who have more positive relationships with their parents relative to their peers also gain more positive other social relationships relative to their peers. To assess within-family dynamics, other designs (e.g., with frequent measurements of discrete parental and adolescent behaviors) or at least other types of models (e.g., dynamic systems approach, Granic, 2005; random-intercept cross-lagged panel models, Hamaker, Kuiper, & Grasman, 2015) would be required. To infer within-family dynamics, future empirical research is needed that utilizes such models and designs. The focus of the present study, however, was on the prediction of relative changes, which combine within- and between-family variance.

Conclusion

Adolescence is a critical time in which relationships with peers and romantic partners become increasingly important and relationships with parents become essential prototypes in shaping these new relationships. The results of this meta-analysis emphasize the importance of positive parent-adolescent relationships for the development of positive peer and romantic relationships in and beyond adolescence. While both supportive and negative parent-adolescent relationships seem to equally predict subsequent peer relationships, negative parent-adolescent relationships seem to particularly strongly predict subsequent romantic relationships. Assisting adolescents and parents in maintaining a mutually supportive relationship may help adolescents to develop healthy social relationships that are crucial for their overall well-being.

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