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Neal, Jennifer Watling; Veenstra, René

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Network selection and influence effects on children's and adolescents' internalizing behaviors and peer victimization: A systematic review

Jennifer Watling Neal^{a,*}, René Veenstra^b

^a Michigan State University, USA

^b University of Groningen, The Netherlands

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ABSTRACT

In interpersonal models of developmental psychopathology, friendships and affiliations with peers have been considered as both consequences and determinants of children's and adolescents' internalizing behaviors and peer victimization. Longitudinal stochastic actor-oriented models (SAOMs) allow developmental researchers to disentangle *peer selection processes* where children or adolescents choose friends who are similar to themselves in internalizing behaviors or peer victimization from *peer influence processes* where children or adolescents become more similar to their friends over time in internalizing behaviors or peer victimization. This paper highlights the methods and results from a systematic review that screened 1447 empirical articles and located 28 using SAOMs to understand the interplay between peer social networks and internalizing behaviors or peer victimization. The results provide some evidence for both peer selection and influence related to depression, social anxiety, and peer victimization. Additionally, the results provide insight into directions for additional substantive and methodological research. Based on the findings of this review, future research is recommended that considers specific tests of peer selection and influence mechanisms, developmental and gender differences, individual and contextual moderators, multiplex relationships, methodological quality, and direct replication of prior studies.

Introduction

Interpersonal models of developmental psychopathology seek to characterize transactional associations between children's and adolescents' friendships or affiliations with peers and features of atypical development such as internalizing behaviors or peer victimization (e.g., Choukas-Bradley & Prinstein, 2014; Prinstein & Giletta, 2016; Prinstein, Guerry, Browne, & Rancourt, 2009; Rudolph, Lansford, & Rodkin, 2016). Such models provide theoretical insight into the social dynamics underlying developmental psychopathology by highlighting how childhood and adolescent friendships or affiliations can serve as consequences of internalizing behaviors and peer victimization through *selection processes* or can serve as determinants of internalizing behaviors and peer victimization through *influence processes*. Over the past few decades, advances in social network analysis have augmented developmental researchers' ability to test interpersonal models of psychopathology by examining the role of peer dynamics in children's and

* Corresponding author at: Michigan State University, Department of Psychology, 316 Physics Rd. Rm. 242, East Lansing, MI 48824, USA.
E-mail address: jneal@msu.edu (J.W. Neal).

adolescents' internalizing behaviors and peer victimization.

Longitudinal social network analysis, also referred to as stochastic actor-oriented modeling (SAOM) allows researchers to disentangle the dynamic interplay of selection and influence processes in a methodologically sound way, while controlling for structural tendencies present in social networks, such as reciprocity or befriending the friends of friends, or behavioral tendencies, such as self-correcting (regression to the mean) or self-reinforcing (polarization) tendencies (e.g., [Snijders, Van de Bunt, & Steglich, 2010](#); [Laninga-Wijnen & Veenstra, 2021](#); [Veenstra, Dijkstra, Steglich, & Van Zalk, 2013](#)). However, although recent reviews have attempted to synthesize research using network models to understand the role of peer dynamics in externalizing or antisocial behaviors ([Gallupe, McLevey, & Brown, 2019](#); [Sijtsema & Lindenberg, 2018](#)) and substance use ([Henneberger, Mushonga, & Preston, 2020](#)), similar efforts do not exist for children's and adolescents' internalizing behaviors and peer victimization.

In this paper, we undertake a systematic review of research using longitudinal network models to examine children's and adolescents' internalizing behaviors and peer victimization for four reasons. First, synthesizing the research on both internalizing behaviors and peer victimization is important because interpersonal models of psychopathology recognize these features of atypical development as concurrently and longitudinally correlated, and describe peer victimization as a stressor that can exacerbate internalizing behaviors (e.g., [Choukas-Bradley & Prinstein, 2014](#); [Prinstein & Giletta, 2016](#); [Prinstein et al., 2009](#); [Rudolph et al., 2016](#)). Second, synthesizing this research will provide insight into the evidentiary base for selection and influence processes in children's and adolescents' internalizing behaviors and peer victimization. Characterizing this evidentiary base will help clarify the mechanisms by which friendships and affiliations with peers shape, and are shaped by, internalizing behaviors and peer victimization. Understanding these processes is critical for informing efforts to promote social adjustment and prevent harmful peer influence ([Prinstein & Giletta, 2016](#)). Third, synthesizing this research will help identifying conceptual gaps and methodological problems in the current literature, offering direction for future research questions and improvements to study design and methods that are needed to advance our understanding of peer processes and children's and adolescents' internalizing behaviors and peer victimization. Fourth, synthesizing this research will help clarify the extent to which age and gender moderate peer selection and influence processes related to children's and adolescents' internalizing behaviors and peer victimization.

We address the following research questions: (1) To what extent does the literature provide evidence of the role of internalizing behaviors and peer victimization in peer selection? and (2) To what extent does the literature provide evidence of the role of peer influence in the development of internalizing behaviors and peer victimization? We begin by examining how interpersonal models of developmental psychopathology inform peer selection and influence processes related to childhood and adolescent internalizing behaviors and peer victimization, including age and gender moderation. Then, we discuss how research on peer social networks using longitudinal SAOMs might inform our understanding of these peer selection and influence processes. Next, we highlight the methods and results from a systematic review of empirical articles that used longitudinal SAOMs to understand the interplay between peer networks and internalizing behaviors or peer victimization. We provide details on the characteristics of studies described in these articles including contexts (e.g., country, age of participants) and methodological decisions (e.g., network boundary, measurement of relationships). In addition, we synthesize evidence for selection and influence effects across different types of internalizing behaviors and peer victimization, including age and gender moderation when relevant.

Interpersonal models of developmental psychopathology

Interpersonal models of developmental psychopathology typically conceptualize internalizing behaviors and peer victimization as related atypical features of childhood and adolescent development. These models build on a large body of past research that characterize internalizing behaviors as correlated with and as an outcome of peer victimization ([Choukas-Bradley & Prinstein, 2014](#)). In particular, peer victimization is often seen as a chronic stressor that may be associated with higher levels of internalizing behaviors in childhood and adolescence ([Choukas-Bradley & Prinstein, 2014](#); [Prinstein & Giletta, 2016](#)). These models also describe competing processes to explain associations between peer dynamics and atypical development in childhood and adolescence, including increased internalizing behaviors and peer victimization ([Choukas-Bradley & Prinstein, 2014](#); [Prinstein & Giletta, 2016](#); [Rudolph et al., 2016](#)). First, these models suggest the possible presence of *active selection* processes where children and adolescents who engage in internalizing behaviors or who experience peer victimization choose to affiliate with peers who are similar to them with respect to these behaviors (i.e., preferential attraction) or choose to avoid peers who are dissimilar to them with respect to these behaviors (i.e., repulsion; [Laninga-Wijnen & Veenstra, 2021](#)). Second, these models suggest the possible presence of *passive selection* processes where children and adolescents who engage in internalizing behaviors or who experience peer victimization experience marginalization in their relationships with typically developing peers and end up affiliating with peers who are similar to them incidentally (i.e., default selection; [Deptula & Cohen, 2004](#); [Laninga-Wijnen & Veenstra, 2021](#); [Rudolph et al., 2016](#)). Finally, these models suggest the possible presence of *influence* where children and adolescents become more similar to their peers in internalizing behaviors and peer victimization. For internalizing behaviors, the influence process may occur through social learning ([Prinstein & Giletta, 2016](#)), problematic interpersonal interactions ([Joiner & Timmons, 2009](#)) or co-rumination ([Rose, 2002](#); [Rose, Carlson, & Waller, 2007](#)). For peer victimization, influence may occur through peer contagion processes associated with the risks of befriending victims, such as lowered social status or backlash from defending victims ([Huising et al., 2014](#); [Lodder et al., 2016](#)).

Peer selection processes

Peer selection occurs when individuals form relationships with others who are similar to themselves (e.g., [Kandel, 1978](#); [Veenstra & Dijkstra, 2011](#)), and is grounded in *homophily*: "the principle that a contact between similar people occurs at a higher rate than among

dissimilar people” (McPherson, Smith-Lovin, & Cook, 2001, p. 415). Homophily can occur along demographic characteristics (e.g., gender, ethnicity, age) but is also common along values, attitudes, and behaviors (e.g., Kandel, 1978; Lazarsfeld & Merton, 1964). Homophily can result from societal opportunity structures that make it more likely for similar people to come into contact (McPherson et al., 2001; Veenstra & Dijkstra, 2011). For example, neighborhood segregation makes it more likely for people of the same ethnicity and socioeconomic status to meet one another. However, homophily can also result from other processes including *active and passive selection*. Active selection processes occur when children and adolescents purposely seek out peers who exhibit similar levels of internalizing behaviors or peer victimization and avoid peers who exhibit dissimilar levels of internalizing behaviors or peer victimization. In contrast to active selection, passive selection processes occur because of a marginalization effect where children and adolescents only have opportunities to socialize with other marginalized peers (Rudolph et al., 2016). These active and passive selection processes can be categorized into three types: preferential attraction, repulsion, and default selection (Laninga-Wijnen & Veenstra, 2021).

Preferential attraction. Active selection may be due to a preferential attraction mechanism proposed by the similarity attraction theory (Byrne, 1971). This theory argues that people are attracted to other individuals who share similar attitudes and behaviors because interacting with these individuals is less uncertain and more positively reinforcing (Berger & Calabrese, 1975; Byrne & Nelson, 1965). Preferential attraction processes have been theorized to play a role in both child and adolescent internalizing behavior and peer victimization. For example, consistent with the similarity attraction theory, Schaefer et al. (2011) proposed and tested a “misery loves company” mechanism that suggested that depressed adolescents may prefer forming relationships with other depressed adolescents because such homophilous relationships offer more relational rewards and potential support. Similarly, victimized children and adolescents may choose to befriend other victimized peers because they have shared experiences that enhance feelings of understanding and support (Lodder et al., 2016).

Repulsion. Active selection can also occur as a result of avoiding or dissolving relationships with dissimilar peers (Laninga-Wijnen & Veenstra, 2021). Repulsion often involves a mechanism of de-selection that consists of dissolving relationships with peers (e.g., Kiuru et al., 2012; Sijtsema et al., 2013; Van Zalk et al., 2010a). De-selection has been proposed as an alternative mechanism that might lead to similarity in both internalizing behavior and peer victimization among adolescent friends. Specifically, depressed adolescents often engage in problematic interpersonal interactions, including continuously seeking reassurance from friends and actively seeking out negative criticism from friends (Joiner & Timmons, 2009; Rudolph et al., 2016). Depressed individuals may also struggle to provide emotional support and closeness in their relationships, their non-depressed friends may be less likely to maintain friendships with them (Van Zalk et al., 2010a). These problematic interpersonal interactions may hinder depressed adolescents’ ability to maintain friendships. Similarly, because victimized individuals offer fewer social benefits, their non-victimized peers may be less likely to maintain friendships with them (Sijtsema et al., 2013).

Default selection. Default selection is passive in nature and involves marginalization in the peer group. This marginalization makes it harder for children and adolescents who exhibit internalizing behaviors or who experience victimization to form relationships with normative and non-victimized peers (Laninga-Wijnen & Veenstra, 2021). For example, depressed children and adolescents are often socially withdrawn and may end up on the margins of their peer group, leaving only opportunities to interact with other depressed peers (Rudolph et al., 2016). Additionally, children and adolescents who experience peer victimization often occupy a lower social status and may end up in relationships with other victimized peers because they do not have other alternatives (Lodder et al., 2016).

Peer influence processes

Peer influence occurs when individuals’ attitudes, values, or behaviors are shaped by their relationships with others (Prinstein & Giletta, 2016; Veenstra et al., 2013). These processes align with causal interpersonal models of developmental psychopathology that suggest that peer processes actively affect atypical development (Rudolph et al., 2016). Within the literature on interpersonal models of developmental psychopathology, several mechanisms of peer influence have been proposed. Social learning, problematic interpersonal interactions, and co-rumination may serve as mechanisms of peer influence in internalizing behaviors (Prinstein & Giletta, 2016; Rudolph et al., 2016). Additionally, peer contagion associated with the risks of befriending victimized peers, including lower social status and backlash from defending victims, may serve as a mechanism of peer influence in peer victimization (Huising et al., 2014; Lodder et al., 2016).

Social learning (internalizing behaviors). Social learning theory suggests that individuals receive social reinforcement by observing, modeling, or imitating the behavior of their peers (Bandura, 1977; Brechwald & Prinstein, 2011; Prinstein & Giletta, 2016; Veenstra & Dijkstra, 2011). Interpersonal models of developmental psychopathology have often applied social learning theory to describe the influence of peers on atypical development in childhood and adolescents (Prinstein & Giletta, 2016; Rudolph et al., 2016). These models posit that children and adolescents may be strongly motivated to emulate the behavior of their friends or peers in their subgroup in order to achieve social rewards including gains in social status and acceptance by their peers. Although social learning theory has often been used to explain peer influence on childhood and adolescent externalizing behaviors, similar mechanisms related to social reinforcement may also be at play if children and adolescents commonly interact with peers who exhibit internalizing behaviors. For example, studies have found that adolescents who engage in non-suicidal self-injury report similar behaviors among their friends and endorse positive social reinforcement as a motive for their own behavior (Lloyd-Richardson, Perrine, Dierker, & Kelley, 2007; Nock & Prinstein, 2005).

Problematic interpersonal interactions (internalizing behaviors). As noted earlier, internalizing behaviors like depression are linked to problematic interpersonal interactions such as excessive reassurance seeking, negative affect, interpersonal dependency, and limited social support (Joiner & Timmons, 2009). Children and adolescents who affiliate with peers who exhibit internalizing behaviors

experience more exposure to these problematic interpersonal interactions, which may lead to peer influence in internalizing cognitions and behaviors (Rudolph et al., 2016; Stevens & Prinstein, 2005). For example, among young adult women, there is some evidence that individuals who interacted over a 15–20 min period with depressed individuals reported more depression and anxiety than individuals who interacted with individuals who were not depressed (Coyne, 1976; Strack & Coyne, 1983). These studies suggest interacting with depressed individuals for even short periods of time can produce negative affect and lead to contagion of internalizing behaviors. This process might be heightened in friendships where individuals are exposed to excessive reassurance seeking, negative affect, interpersonal dependency, and limited social support over an extended period of time.

Co-rumination (internalizing behaviors). Co-rumination refers to engagement in a disproportionate amount of discussion about problems or negative affect (Rose, 2002; Rose et al., 2007; Stone, Hankin, Gibb, & Abela, 2011). Interpersonal models of developmental psychopathology suggest that co-rumination could be a major source of peer influence on childhood and adolescent internalizing behaviors (Choukas-Bradley & Prinstein, 2014; Hankin, Stone, & Wright, 2010; Prinstein & Giletta, 2016; Rudolph et al., 2016). As Rose (2002) describes: “Co-rumination may be related to depressive symptoms due to the consistent negative focus on troubling topics and to anxiety because co-rumination may exacerbate worries about whether problems will be resolved and about potential negative consequences of problems” (p. 1831). Additionally, co-rumination may indirectly lead to depressive symptoms by encouraging depressogenic attributional style among friends, where individuals describe negative events as having global, stable causes and positive events as having specific, unstable causes (Stevens & Prinstein, 2005). Co-rumination has been documented in dyadic friendships (Rose, Schwartz-Mette, Glick, Smith, & Luebbe, 2014) and mediates the contagion of internalizing behaviors including depression and anxiety among best friends (Schwartz-Mette & Rose, 2012).

Risks of befriending victimized peers (peer victimization). Forming relationships with victims of bullying or peer aggression has risks that may result in peer contagion processes. First, victims of bullying or peer aggression often have a lower social status among their peers (e.g., Ray, Cohen, Secrist, & Duncan, 1997). Therefore, forming relationships with victims may lower a child or adolescents’ own social status, placing them at higher risk for becoming victimized in the future (Lodder et al., 2016; Sijtsema et al., 2013). Second, children or adolescents who form relationships with victims may try to defend those victims from bullies or aggressors. In line with the “retaliation hypothesis”, when children or adolescents engage in defending behavior, they may face backlash from bullies who redirect their aggression toward them (Huitsing et al., 2014; Rambaran et al., 2020).

Potential moderators of peer selection and influence processes

In addition to providing theoretical insight into peer selection and influence processes in children’s and adolescents’ internalizing behaviors and peer victimization, interpersonal models of developmental psychology also point to age and gender as potential moderators of these processes.

Age

Internalizing behaviors tend to increase through childhood, peaking in early to middle adolescence before leveling off (e.g., Bongers, Koot, Van der Ende, & Verhulst, 2003). In contrast, the normative prevalence of peer victimization tends to decrease between middle childhood to adolescence, but there are subsets of individuals who experience chronic victimization or victimization that peaks in middle school (e.g., Ladd, Ettekal, & Kochenderfer-Ladd, 2017; Nylund, Bellmore, Nishina, & Graham, 2007). There are also notable developmental changes in friendships and affiliations with peers during childhood and adolescence. Middle childhood offers increased opportunities to engage in peer interactions, both in and outside of school. During this period, some children learn to successfully navigate friendships and affiliations with peers whereas others experience peer difficulties that often have continued long-term consequences for their future peer relationships and well-being (Choukas-Bradley & Prinstein, 2014; Prinstein & Giletta, 2016). Middle childhood is also characterized by the formation of social identities and more complex peer interactions (Rudolph et al., 2016). As children transition to adolescence, there is typically a decline in interaction with and monitoring by parents as peers become more central as a source of social support. Compared with middle childhood, adolescence is characterized by higher levels of intimacy and emotional disclosure with peers, a greater focus on social status, and the formation of cross-gender and romantic relationships (Choukas-Bradley & Prinstein, 2014; Prinstein & Giletta, 2016; Rudolph et al., 2016).

A recent meta-analysis found that friendship features were more strongly related to depression and loneliness among younger children than adolescents (Schwartz-Mette, Shankman, Dueweke, Borowski, & Rose, 2020). However, this study did not specifically address whether age moderates more complex network selection and influence processes related to internalizing behaviors. Developmental changes in friendships and affiliations with peers are typically expected to amplify both selection and influence processes in adolescence, especially for internalizing behaviors and peer victimization as adolescents increasingly turn to peers for support and guidance for their own behavior (Choukas-Bradley & Prinstein, 2014; Prinstein & Giletta, 2016; Rudolph et al., 2016). Therefore, in this systematic review, we examine whether studies considered the role of age as a moderator of peer selection and influence processes related to internalizing behaviors and peer victimization.

Gender

Girls and boys differ in their developmental trajectories of internalizing behaviors. In particular, girls exhibit increases in internalizing behaviors over time (Hankin, Wetter, & Cheely, 2008; Leve, Kim, & Pears, 2005) and have a higher average level of internalizing behaviors than boys by adolescence (Bongers et al., 2003; Hankin et al., 2008; Rutter, Caspi, & Moffitt, 2003). In contrast,

gender differences in peer victimization are mixed and may depend on the form of victimization (e.g., physical vs. relational; Ladd et al., 2017). Girls and boys also exhibit differences in peer friendships and affiliations, with girls favoring smaller group sizes, higher levels of social conversation and more self-disclosure than boys (see Rose & Rudolph, 2006 & Rose, 2007 for reviews). Girls also engage in higher levels of co-rumination with friends than boys (Hankin et al., 2010; Rose, 2002; Rose et al., 2007).

Based on these gender differences, girls may be more susceptible to peer processes related to internalizing behaviors. Although a recent meta-analysis found that gender did not moderate associations between friendship features and depression or loneliness (Schwartz-Mette et al., 2020), less is known about the role of gender moderation in network selection and influence processes. Therefore, in this systematic review, we will explore whether studies considered gender as a moderator of peer selection and influence processes related to internalizing behaviors and peer victimization.

Methodological approaches

To examine dynamics of peer selection and influence on children's and adolescents' internalizing behaviors and peer victimization, developmental researchers have often examined friendship dyads or broader peer groups (e.g., Giletta et al., 2011; Hogue & Steinberg, 1995; Prinstein, 2007; Stone et al., 2013). However, studies of friendship dyads and peer groups have some weaknesses that hinder their ability to disentangle selection and influence effects (Veenstra et al., 2013). First, studies of friendship dyads and peer groups do not consider the entire relational structure in a particular setting (e.g., classroom, grade). This is problematic because these studies fail to consider how the absence of relationships may affect selection and influence processes. As Veenstra and colleagues (2013) note: "To identify the determinants of selection, it is not sufficient to know who was selected as network partner; it is also necessary to know who was not selected. Likewise, for identifying peer influence effects, it is necessary to know what the absence of influence looks like, referring to how behavior changes in the absence of relationships" (p. 401). Second, the dyadic and peer group analyses used in these studies cannot control for structural network effects. For example, adolescents may be inclined to reciprocate friendships or to befriend the friends of their friends.

More recently, developmental researchers have examined peer selection and influence processes using longitudinal social network analyses in the form of SAOMs (Snijders et al., 2010; Veenstra et al., 2013). These models require binary social network data measured at least two time points, and corresponding behavioral data measured at the same time points. Until recently, SAOMs required discrete ordinal behavioral data, but recent advances now allow for continuous behavioral data (Niezink, Snijders, & van Duijn, 2019). Longitudinal SAOMs overcome the weaknesses inherent in studies of friendship dyads or peer groups because they consider the entire network structure to model selection and influence processes. These models are advantageous for several reasons. First, SAOMs separately model peer selection and influence effects, providing a way for developmental researchers to simultaneously test the different mechanisms proposed by interpersonal models of developmental psychopathology for observed similarity in internalizing behaviors or peer victimization among peers. Second, when examining selection effects, SAOMs can separately model tie formation (i.e., creation effects) and dissolution (i.e., maintenance effects), providing a way for developmental researchers to examine the presence of selection processes where individuals form new ties with similar peers or where individuals de-select or dissolve ties with dissimilar peers. Third, SAOMs allow flexibility to model peer influence in a variety of ways based on theoretical assumptions. Specifically, different influence effects can be used that estimate whether the average behaviors of a child or adolescent's peers affects one's behavior, regardless of their number of peers (i.e., *average similarity*), whether influence is proportional to the number of peers (i.e., *total similarity*), or whether children or adolescents with peers who have higher levels of behaviors (compared to the "average" child or adolescent in a group) also exhibit comparatively higher levels of these behaviors (i.e., *average alter*; Laninga-Wijnen & Veenstra, 2021; Ripley et al., 2020).

An assumption of SAOMs is that adolescents change their friendship ties and their behaviors in continuous time between the observation moments (i.e., measurement waves) on the basis of individual preferences. At a given moment, students may either change a friendship tie (i.e., create a new tie, drop an existing tie, or maintain a tie) or their behavior (go up one step, down one step, or keep their behavior the same; also called *micro-steps*) in response to the current network structure and the behavior of other peers in the network. In this way, SAOMs controls for dynamic feedback between behavior change and friendship change, as well as for structural network and individual predictors for changes in friendships and behaviors.

The use of SAOMs in developmental research has grown in the last 15 years. However, there is a need for a systematic review that synthesizes the findings from studies that use SAOMs to examine peer selection and influence processes with respect to children's and adolescents' internalizing behaviors and peer victimization.

Method

Following the reporting guidelines outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., & The PRISMA Group, 2009), we outline the search strategy, eligibility and screening criteria, and data extraction process used for all studies included in our systematic review.

Search strategy

We identified articles for the systematic review using three Google Scholar searches that employed key words designed to capture studies that used longitudinal models to understand selection and/or influence effects on childhood or adolescent internalizing behaviors and peer victimization (see Fig. 1). We used a rationale similar to a systematic review on network selection and influence

effects on children's and adolescents' externalizing behaviors (Gallupe et al., 2019). We limited searches to articles published in 1999 or later because primers on both cross-sectional and longitudinal network models were not available before that year (i.e., Anderson, Wasserman, & Crouch, 1999; Snijders, 2001) and developmental researchers were unlikely to employ these models at an earlier date.¹ We conducted a first search over a two week period in June 2019 (see Google Scholar Search 1 in Fig. 1). In reviewing the results of this search, we noticed that a few published articles using longitudinal stochastic actor-oriented models to understand children's and adolescents' internalizing behaviors were excluded because they employed different terminology to describe these models. Therefore, we conducted a second Google Scholar search over a one week period in July 2019 with a different set of keywords to ensure that these articles were also captured by our search process (see Google Scholar Search 2 in Fig. 1). Finally, while completing manuscript revisions, we conducted a search in the first week of August 2020 in order to update our systematic review with papers that had been published in late 2019 or 2020 (see Google Scholar Search 3 in Fig. 1).

Eligibility criteria and screening

We employed several eligibility criteria for inclusion in our systematic review:

- (1) In line with other recent systematic reviews of network selection and influence processes (Henneberger et al., 2020; Sijtsema & Lindenberg, 2018), all included articles were published in peer-reviewed journals. We focused on the peer-reviewed literature for two reasons. First, many of the unpublished studies using longitudinal stochastic oriented models (e.g., dissertations) were subsequently published in the peer-reviewed literature. Second, peer review provides a form of quality control on the included studies, providing some assurance that experts in the field have reviewed the appropriateness of the data, methods, and analyses. Although there is some risk that only focusing on peer-reviewed articles could lead results of our systematic review to be influenced by publication bias, we think this risk is low given that several of the studies included in our review reported null selection and/or influence effects.
- (2) As a practical constraint, all included articles were written in English.
- (3) All included articles focused on child or adolescent development. Specifically, we included articles if the mean age of participants in the sample was less than 18 years.
- (4) All included articles used a longitudinal stochastic actor-oriented network model designed to measure selection or influence effects.
- (5) All included articles modeled selection and/or influence effects on an internalizing behavior or peer victimization. We adopted an operational definition of internalizing behaviors that included a broad set of behaviors captured by our search terms including depression, anxiety, social withdrawal, and self injury as well as related behaviors that were not included in our search terms (e.g., loneliness, suicidal ideation). We also adopted a broad definition of peer victimization that included multiple forms of victimization (e.g., physical, verbal, relational) initiated by peers.²

We used a two-step process to screen abstracts and the full-text of articles from our two literature searches for inclusion (see Fig. 1). First, both authors independently screened all abstracts to eliminate duplicates, sources that were not peer-reviewed (e.g., dissertations, chapters), sources that were not written in the English language, and studies that were not focused on youth development. Second, both authors independently screened the entire text of the remaining articles that were not eliminated during abstract screening. During this process, we eliminated additional articles that did not include a network model designed to measure selection or influence, articles that did not include a measure of an internalizing behavior or peer victimization, and articles that only included internalizing behaviors or peer victimization as covariates. For 89.3% of the 28 articles eventually included in our review, we initially agreed on whether they should be included in the study (25 articles were selected by both authors, three were selected by only one author). When there was a disagreement, we came to a consensus before proceeding.

Data extraction

We extracted data from all longitudinal network studies included in our systematic review to characterize various aspects of the sample, study design, and selection or influence effects. The following information was coded: (1) country or countries where the network data were collected; (2) setting for the study (e.g., classroom, grade, school); (3) sample size; (4) mean age of participants; (5) number of longitudinal waves and the time intervals between waves; (6) type of network relationship(s) measured (e.g., friend, best friend, spends time with); (7) number of network nominations allowed; (8) type of internalizing behavior(s) or peer victimization (e.g., general, overt, relational) studied; (9) reporter for data on networks and internalizing behaviors or peer victimization (e.g., self, peer); (10) number of categories used to assess internalizing behaviors or peer victimization in the stochastic actor-oriented model; (11) coefficients and standard errors for network selection effects reported on internalizing behaviors or peer victimization; (12)

¹ Our initial search criteria and terms were designed to also identify papers that used cross-sectional exponential random graph models (ERGMs) in addition to longitudinal stochastic actor-oriented models. However, given our focus on longitudinal selection and influence processes, we have excluded cross-sectional studies from this particular review.

² One study conducted by Turanovic and Young (2016) examined violent victimization but it was not clear that the victimization was initiated by peers. Therefore, this study was not included as a study that explored network and peer victimization dynamics.

Fig. 1. Search Criteria and Search Flow Diagram.

coefficients and standard errors for influence effects reported on internalizing behaviors or peer victimization; (13) type of modeling used to assess influence (e.g., average similarity, total similarity, average alter, multiplex) if applicable.

Results

The three Google Scholar searches identified a total of 1447 potential articles (see Fig. 1). During abstract screening, 121 articles were excluded because they were duplicates, 436 articles were excluded because they were not peer-reviewed (e.g., dissertations, book chapters), 26 articles were excluded because they were not written in English, and 615 articles were excluded because they did not focus on child or adolescent development. During full-text screening of the remaining 249 articles, one additional article was excluded because it was not peer-reviewed, three additional articles were excluded because they were not written in English, and three additional articles were excluded because they did not focus on child or adolescent development. Furthermore, 77 articles were excluded because they did not include a longitudinal network model designed to measure selection or influence effects (i.e., SAOM), 115 articles were excluded because they did not measure an internalizing behavior or peer victimization, and 22 articles were excluded because they controlled for an internalizing behavior or peer victimization but did not assess selection or influence effects for these behaviors. Thus, 28 articles using longitudinal SAOMs to model selection and/or influence processes related to internalizing behaviors or peer victimization were included.

Three articles used the same dataset and nearly the same sample from the Swedish 10-to-18 study (Van Zalk et al., 2010a; 2010b;

Table 1
Studies Examining Network and Depression Dynamics.

Reference	Country	Setting (N)	Sample Size	Mean Age	Waves (Interval)	Network (Choice)	Reporter (Categories)	Selection	Type of Influence Effect	Influence
Cheadle and Goosby (2012)	USA	School (7)	798	~16	2 (12)	Closest friends (10: 5 M, 5F)	Self (10)	0.51 (0.26) _δ	Average similarity	2.13 (1.12) _δ
DeLay et al. (2017)	USA	Grade (1)	299	11.1	2 (5)	Spend time with (unlimited)	Self (4)	0.14 (0.28)	Total similarity	−0.27 (0.42)
Duxbury and Haynie (2020)	USA	School (9)	1909	16.64	2 (12)	Closest friends (10: 5 M, 5F)	Self (20)	0.31 (0.07)		
Ennett et al. (2018)	USA	School (6)	345–1384	~12	7 (6–12)	Best friends (5)	Self (5)	0.08 (0.03)		
Giletta et al. (2013)	USA	School (3)	348	15.0	4 (6)	Best friends (unlimited)	Self (3)	0.11 (0.11)		
Giletta et al. (2012)	ITA	Grade (6)	704	15.5	2 (6)	Best friends (unlimited)	Self (6)	0.39 (0.13)	Total similarity	0.04 (0.07)
Kiuru et al. (2012)	FIN	Grade (8)	949	16.2	2 (12)	Spend time with (3)	Self (3)	Creation: 0.98 (0.36) Maintenance: −2.13 (0.77)	Average similarity / Average alter	1.06 (0.46) 0.32 (0.24)
Mercer and DeRosier (2010)	USA	Grade (11)	1016	~9.5	2 (6)	Friends (unlimited)	Self (10)	0.01 (0.10)	Average similarity	0.95 (0.34) [#]
Mundt and Zakletskaia (2019)	USA	School (9)	2264	15.8	2 (12)	Closest friends (10: 5 M, 5F)	Self (2)	0.14 (0.13)		
Pachucki et al. (2015)	USA	Grade (1)	40	12.3	3 (1)	Face-to-Face Interaction (unlimited)	Self (NR)	0.23 (0.44)	Average similarity	−32.29 (31.49)
Schaefer et al. (2011)	USA	School (9)	1820	15.4	2 (12)	Closest friends (10: 5 M, 5F)	Self (NR)	0.19 (0.29)		
Turanovic and Young (2016)	USA	School (9)	1928	~16.5	2 (12)	Closest friends (10: 5 M, 5F)	Self (NR)	0.50 (0.13)		
Van Rijsewijk et al. (2016)	NLD	Class (40)	840	13.4	3 (3–4)	Helping (unlimited)	Self (NR)	0.26 (0.10)		
Van Zalk, Kerr, et al. (2010a; 2010b); Van Zalk, Van Zalk, and Kerr (2011a)	SWE	Community (1)	796–847	13.3–14.3	5 (12)	Important peers/spent time within school/spent time with out of school (23)	Self (60)	1.64 (0.13) Creation: 1.56–1.61 (0.61–0.70) Maintenance: −1.71 – −1.87 (0.46–0.56)	Average similarity	0.66–0.79 _♀ (0.08–0.09)

Note. Significant effects ($p < .05$) in bold. Total effects across the whole sample are reported in the Table. NR = not-reported. # a quadratic shape effect (Snijders et al., 2010) was not estimated. _δ= additional analyses showed that effects held for boys only. _♀= additional analyses showed that effects were larger for girls.

2011). Therefore, these articles were aggregated together as a single study in the results, leading to 26 distinct studies. Additionally, we present study findings separately for depression, social anxiety, other internalizing behaviors, and peer victimization (see Fig. 1). Here, the same study could be reviewed multiple times if it examined multiple behaviors. For example, Mercer and DeRosier (2010) included peer selection and influence effects for depression, social anxiety, and loneliness (which was counted under other internalizing behaviors). For each type of behavior, we provide a descriptive account of key contextual and methodological study characteristics and provide evidence of selection and influence processes. When relevant, we discuss the role of age and gender moderation.

Depression

Study characteristics. Fourteen studies with data from five countries examined selection and/or influence processes related to depression (see Table 1). One study collected data among children in elementary school (Mercer & DeRosier, 2010) whereas all other studies collected data from early adolescents or adolescents in secondary education. Only one study (Van Rijsewijk et al., 2016) collected networks among classmates (in 40 classes), whereas the other studies collected networks among grade-mates (with the number of settings varying from one to eleven), schoolmates (with the number of settings varying from three to nine) or among all students in one community (with about 800 students). A few studies had four to seven waves of data, but most studies had two or three waves of data. The interval between the waves was usually five to twelve months. An exception was a three-wave study with intervals of one month (Pachucki et al., 2015).

The studies varied in how they assessed depression. In articles using Add Health data (Cheadle & Goosby, 2012; Duxbury & Haynie, 2020; Mundt & Zakletskaia, 2019; Schaefer et al., 2011, Turanovic & Young, 2016) or data from the Swedish 10-to-18 study (Van Zalk et al., 2010a; 2010b; 2011a), depression was measured using 19 or 20 items from the Center for Epidemiological Studies Depression Scale (CES-D), which assesses how often respondents experienced various depressive symptoms in the past week (e.g., “you felt sad” and “you felt depressed”). Two studies (DeLay et al., 2017; Pachucki et al., 2015) used 10 items from the Children’s Depression Inventory, which asks questions related to sadness, feeling alone, self-image, and social integration. Four studies used the Mood and Feelings Questionnaire: one study used the full version with 33 items (Giletta et al., 2013) and three used the short version with 13 items (Ennett et al., 2018; Giletta et al., 2012; Mercer & DeRosier, 2010). Others used three items about symptoms of depressive mood: 1) felt unhappy, miserable, and down; 2) felt nervous and tense; and 3) worried too much (Van Rijsewijk et al., 2016) or 10 items from the Depression Scale, with as sample items “I feel sad” or “I feel that my future is hopeless.” (Kiuru et al., 2012).

Measurement of the networks was most often based on best or (closest) friend nominations, although some studies collected data on who spends time with whom (DeLay et al., 2017; Kiuru et al., 2012), who engages in face-to-face interactions (Pachucki et al., 2015), or who helps whom (Van Rijsewijk et al., 2016). In most cases, these nominations were unlimited or had a high maximum (e.g., up to 23). However, in some studies these nominations were quite restricted: up to 3 (Kiuru et al., 2012), up to 5 (Ennett et al., 2018), or up to ten (five males and five females) in studies using Add Health data (Cheadle & Goosby, 2012; Duxbury & Haynie, 2020; Mundt & Zakletskaia, 2019; Schaefer et al., 2011, Turanovic & Young, 2016). The response rates in several studies were 80% or higher in each network, but were lower (Cheadle & Goosby, 2012; Giletta et al., 2013) in two studies and not reported by network in eight studies (Ennett et al., 2018; Giletta et al., 2012; Kiuru et al., 2012; Mercer & DeRosier, 2010; Mundt & Zakletskaia, 2019; Schaefer et al., 2010; Turanovic & Young, 2016; Van Rijsewijk et al., 2016).

Evidence of selection and influence processes. Eight of 14 studies examining depression reported significant selection effects. Additionally, of 7 studies investigating influence effects, 4 reported significant results. Only one study provided evidence that children under 13 select friends based on similarity in levels of depression (Ennett et al., 2018). Likewise, only one study, using an average similarity approach, found that children under 13 are influenced by their peers’ levels of depression (Mercer & DeRosier, 2010). However, the results may be inaccurate because the specification of the SAOM in this study did not include a quadratic shape effect, referring to potential self-correcting or self-reinforcing behavioral tendencies (Snijders et al., 2010). In contrast, several studies show that adolescents may select friends based on similarity in levels of depression (Duxbury & Haynie, 2020; Giletta et al., 2012; Turanovic & Young, 2016; Van Rijsewijk et al., 2016).

Some studies separately tested creation and maintenance effects, finding that adolescents tend to form relationships with peers who have similar levels of depression but also tend to dissolve relationships with peers who become more dissimilar to them with respect to levels of depression over time (Kiuru et al., 2012; Van Zalk et al., 2010a; 2010b). Some studies, using average similarity effects, also demonstrated that peers’ levels of depression influence adolescents’ levels of depression over time (Kiuru et al., 2012; Van Zalk et al., 2010a; 2010b; 2011). However, studies did not find evidence of significant total similarity (Giletta et al., 2012) or average alter effects (Kiuru et al., 2012) when examining peers’ level of depression influence on adolescents’ levels of depression over time. Three studies found no differences between boys and girls in selection and influence effects related to depression (Giletta et al., 2012; Kiuru et al., 2012; Mercer & DeRosier, 2010). However, one study using Add Health data found that selection and influence effects held for boys only (Cheadle & Goosby, 2012), whereas another set of studies found that influence effects were larger for girls than boys (Van Zalk et al., 2010a; 2010b).

Social anxiety

Study characteristics. Four studies examined selection and influence processes related to social anxiety (see Table 2). Three of these studies were conducted with a subsample of secondary school students in a large, community study in Sweden (Van Zalk & Van Zalk, 2015; Van Zalk et al., 2011a; Van Zalk et al., 2011b) and one study was conducted in 11 elementary schools among grade-mates in the United States (Mercer & DeRosier, 2010). The Swedish study measured social anxiety with eight questions about usual fears in

different situations, including speaking in front of the class, being with classmates during breaks, initiating a conversation with someone one does not know very well, and looking into someone's eyes while speaking. The US study measured children's social anxiety with 16 items reflecting anxiety about interacting with peers, such as "I get nervous when I meet new kids" and "I feel shy even with kids I know well." The studies conducted in Sweden had three waves of data spaced a year apart whereas the US study had two waves of data spaced half a year apart. All studies relied on self-report nomination data but differed in whether they examined friend or best friend nominations (Mercer & DeRosier, 2010, Van Zalk & Van Zalk, 2015; Van Zalk et al., 2011b), or nominations for important peers with whom you spend time (Van Zalk et al., 2011a). The studies varied considerably in the degree to which they restricted nominations, ranging from a low of one best friend nomination (Van Zalk & Van Zalk, 2015) to unlimited friendship nominations (DeRosier & Mercer, 2010). Whereas one study did not report response rates by network (DeRosier & Mercer, 2010), the remaining studies used the same sample, which had a network response rate of 90%.

Evidence of selection and influence processes. Support for peer selection related to social anxiety was mixed. Only two of four studies reported significant selection effects. These two studies used data drawn from the same study of adolescent networks in a Swedish community but focused on slightly different subsamples and different operationalizations of the network relationships (Van Zalk et al., 2011a, 2011b). An additional study using these data severely restricted network nominations to one best friend only and did not find a significant selection effect (Van Zalk & Van Zalk, 2015). A study of younger elementary school-age children also did not yield a significant selection effect for social anxiety (Mercer & DeRosier, 2010). In contrast, evidence of peer influence on social anxiety was consistent, with all four studies reporting significant average similarity effects. Two studies examined whether gender moderated the effects of peer influence on social anxiety. Although there was no evidence of gender moderation for younger children (Mercer & DeRosier, 2010), influence effects related to social anxiety were larger for girls than boys in early adolescence (Van Zalk & Van Zalk, 2015).

Other internalizing behaviors

Study characteristics. Table 3 displays three studies that examined selection and influence processes related to other internalizing behaviors including generalized internalizing behavior (Fortuin et al., 2015), nonsuicidal self-injury (Giletta et al., 2013), and loneliness (Mercer & DeRosier, 2010). The study of generalized internalizing behavior was conducted with secondary students in the Netherlands and examined networks among classmates in 24 classrooms across three waves spaced 3.5 months apart. Internalizing behavior was measured with 15 items about depression, anxiety, and psychosomatic symptoms. Sample items were: "I feel tired." and "My thoughts are confused." The study focused on liking relationships and restricted nominations to seven classmates (Fortuin et al., 2015). The study of nonsuicidal self-injury was conducted with secondary students in the United States and examined networks among schoolmates in three schools across four waves spaced half a year apart. Nonsuicidal self-injury was measured with six items (e.g., cut or carved skin, burned skin, hit self). The study focused on best friend relationships and allowed unlimited nominations (Giletta et al., 2013). The study of loneliness was conducted with elementary school students in the United States and examined networks among grade-mates in 11 schools across two waves spaced half a year apart. Children's loneliness at school was measured with 16 statements describing feelings or situations of loneliness, such as "I feel alone at school" and "I don't have anyone to play with at school." The study focused on friendships and allowed unlimited nominations (Mercer & DeRosier, 2010). One study had a 100% response rate (Fortuin et al., 2015). However, among the remaining two studies, one had network response rates below 80% (Giletta et al., 2013) and the other did not report the network response rates (Mercer & DeRosier, 2010).

Evidence of selection and influence processes. There was limited evidence of peer selection and influence effects in studies of other

Table 2
Studies Examining Network and Social Anxiety Dynamics.

Reference	Country	Setting (N)	Sample Size	Mean Age	Waves (Interval)	Network (Choice)	Reporter (Categories)	Selection	Type of Influence Effect	Influence
Mercer and DeRosier (2010)	USA	Grade (11)	1016	~9.5	2 (6)	Friends (unlimited)	Self (10)	0.33 (0.23)	Average similarity	3.49 (0.42)[#]
Van Zalk and Van Zalk (2015)	SWE	Community (1)	2194	13.6	3 (12)	Best friend (1)	Self (NR)	-0.11 (0.27)	Average similarity	0.04 (0.01)
Van Zalk, Van Zalk, and Kerr (2011a)	SWE	Community (1)	796	13.3	3 (12)	Important peers/spent time within school/spent time with out of school (23)	Self (NR)	0.85 (0.30)	Average similarity	0.87 (0.23)
Van Zalk, Van Zalk, Kerr, and Stattin (2011b)	SWE	Community (1)	834	14.3	3 (12)	friends "someone you talk with, hang out with, and do things with" (3)	Self (NR)	1.28 (NR)	Average similarity	1.27 (NR)[‡]

Note. Significant effects ($p < .05$) in bold. NR = not-reported. # a quadratic shape effect (Snijders et al., 2010) was not estimated. ‡ additional analyses showed that effects were larger for girls.

Table 3
Studies Examining Network and Other Internalizing Behavior Dynamics.

Reference	Country	Setting (N)	Sample Size	Mean Age	Waves (Interval)	Network (Choice)	Reporter/ Behavior (Categories)	Selection	Type of Influence Effect	Influence
Fortuin et al. (2015)	NLD	Class (24)	542	13.3	3 (3.5)	Liking (7)	Self/ Internalizing Behavior (5)	0.14 (0.51)	Average similarity	1.91 (1.04)
Giletta et al. (2013)	USA	School (3)	348	15.2	4 (6)	Best friends (unlimited)	Self/Nonsuicidal Self-Injury (5)	−0.02 (0.14)	Average alter	−0.37 (0.69)
Mercer and DeRosier (2010)	USA	Grade (11)	1016	~9.5	2 (6)	Friends (unlimited)	Self/ Loneliness (10)	0.28 (0.17)	Average similarity	1.22 (0.52)[#]

Note. Significant effects ($p < .05$) in bold. # a quadratic shape effect (Snijders et al., 2010) was not estimated.

types of internalizing behavior, including generalized internalizing behavior (Fortuin et al., 2015), nonsuicidal self-injury (Giletta et al., 2013), and loneliness (Mercer & DeRosier, 2010). Although one article reported a significant average similarity effect for loneliness (Mercer & DeRosier, 2010), the specification of the SAOM did not include a quadratic shape effect (Snijders et al., 2010), potentially compromising these results.

Table 4
Studies Examining Network and Peer Victimization Dynamics.

Reference	Country	Setting (N)	Sample Size	Mean Age	Waves (Interval)	Network (Choice)	Reporter (Categories)	Selection	Type of Influence Effect	Influence
Berger et al. (2019)	CHL	Class (5)	185	10	3 (12)	Best friends (unlimited)	Self (4)	0.04 (0.05)	Average alter	0.25 (0.33)
DeLay et al. (2017)	USA	Grade (1)	299	11.1	2 (5)	Spend time with (unlimited)	Self (2)	0.00 (0.05)		
Hooijsma et al. (2020)	NLD	School (17)	2130	10	3 (6)	Best friends (unlimited)	Dyadic	0.04 (0.05)		
Huitsing et al. (2014)	NLD	School (3)	354	10	3 (12)	Defending (unlimited)	Dyadic	$\chi^2 = 20$	Multiplex	$\chi^2 = 30$
Lodder et al. (2016)	NLD	Grade (4)	543	15.8	2 (5)	Closest friends (up to 20)	Self (5)	0.43 (0.20)	Average similarity	2.29 (0.93)
Palacios et al. (2019)	CHL	Class (6) [#]	274	12.3	3 (6)	Hanging out at school during recess (up to 3)	Dyadic	0.06 (0.30)	Multiplex	0.58 (0.18)
Rambaran et al. (2020)	NLD	Class (19)	481	10	3 (6)	Best friends (unlimited)	Dyadic	0.06 (0.10)	Multiplex	0.03 (0.12)
Sentse et al. (2013)	USA	Grade (2)	480	11.5	3 (12)	Best friends (unlimited)	Peers (4)	<u>Physical:</u> 0.41 (0.04) <u>Relational:</u> 0.20 (0.42)	Average alter	<u>Physical:</u> 1.85 (3.12) <u>Relational:</u> 1.41 (0.41)
Shin (2019)	KOR	Class (26)	736	12.5	2 (5)	Closest friends (unlimited)	Peers (3)	1.57 (0.59)	Average alter	1.99 (0.63)
Sijtsema et al. (2013)	FIN	Grade (4)	504	12.5	3 (6)	Best friends (up to 18)	Self (9)	<u>Overt:</u> Creation: −1.10 (1.12) Maintenance: 1.14 (1.72) <u>Relational:</u> Creation: 1.46 (0.43) Maintenance: 0.10 (0.22)	Average similarity	<u>Overt:</u> 6.32 (0.89) <u>Relational:</u> 4.69 (0.74)

Note. Significant effects ($p < .05$) in bold. Creation and maintenance selection effects were estimated in a few studies: ¹ = creation; ² = maintenance. NR = not-reported.

Only the results of Palacios et al. (2019) for the control classrooms are mentioned.

Peer victimization

Study characteristics. Ten studies, from five countries, examined selection and influence processes related to peer victimization (see Table 4). Six of these studies were conducted with elementary school students whereas four studies were conducted with secondary students. These studies collected network data among schoolmates (2 studies), grade-mates (4 studies) or classmates (4 studies). All studies collected network and peer victimization data across two to three waves, with intervals ranging from five months to a year.

Peer victimization was measured with self-report or peer nominated scales ranging from a single item (DeLay et al., 2017; Shin, 2019) to 18 items (Berger et al., 2019). Moreover, there was significant variation in the types of peer victimization assessed in the studies. Some studies assessed general victimization. For example, the three items in the Lodder et al. (2019) study were: 1) How often did other students bully you in the past few months?, 2) How often do other students say mean things to you?, 3) How often were you hit, kicked, locked indoors, or other hurtful things like that?. Sample items in the Berger et al. (2019) study were “other students picked on me,” “other students made fun of me,” “other students called me names,” and “I got hit or pushed by other students.” One study distinguished overt and relational victimization (Sijtsema et al., 2013). Overt victimization items included: “my peers call me names”, “my peers pick on me”, and “my peers hit or kick me.” Relational victimization items included: “my peers say mean things about me” and “my peers make fun of me.” Another study (Sentse et al., 2013) distinguished physical victimization (“The people in your grade who get hit, pushed, or kicked by others”) and relational victimization (“The people in your grade who have lies, rumors, or mean things said about them”) using peer nominations. Finally, one study used a single-item measure of homophobic name-calling victimization (“Some kids call each other names such as gay, homos, or lesbian; How many times in the last month did anyone call you these names?”; DeLay et al., 2017).

The networks in most studies were based on self-reported nominations of best or close friendships but the studies differed in whether restrictions were placed on the nominations. Some studies limited the nominations ranging from a low of three nominations (Palacios et al., 2019) to a high of twenty nominations (Lodder et al., 2016). Other studies, including research using the Dutch KiVa dataset (Hooijmsma et al., 2020; Huitsing et al., 2014; Rambaran et al., 2020), allowed for unlimited nominations. The response rates in most studies were 80% or higher in each network, but other studies reported lower response rates for some networks (Berger et al., 2019; Sentse et al., 2013; Sijtsema et al., 2013).

Evidence of selection and influence processes. One study did not find evidence that children were more likely to select friends who reported similar levels of homophobic name-calling victimization (DeLay et al., 2017). Furthermore, a study in childhood using self-reported peer victimization and average alter effects did not find that friendships are based on selection in peer victimization or that friends influence each other's level of peer victimization (Berger et al., 2019). However, additional research provides evidence for selection on the basis of general victimization (Lodder et al., 2016; Shin, 2019), physical victimization (Sentse et al., 2013), or relational victimization (Sijtsema et al., 2013). Using average similarity or average alter effects, these studies also show that there is an influence of friends' general victimization (Lodder et al., 2016; Shin, 2019), overt victimization (Sijtsema et al., 2013), and relational victimization (Sentse et al., 2013; Sijtsema et al., 2013). A few studies examined whether gender moderated selection and influence effects related to peer victimization but found no differences between boys and girls (Sentse et al., 2013; Sijtsema et al., 2013). However, in one study of early adolescents, there was evidence of grade level differences in friendship selection with respect to overt victimization. Older adolescents were more likely to maintain relationships based on similarity in overt victimization whereas younger adolescents were more likely to dissolve relationships based on similarity in overt victimization (Sijtsema et al., 2013).

A limitation of most of the studies in Table 4 is that peer victimization was considered as individual characteristic, omitting information about who is victimized by whom. That problem was addressed in social network studies investigating the co-development of peer victimization and defending relationships (Huitsing et al., 2014) or the co-development of peer victimization and friendship relationships (Hooijmsma et al., 2019; Palacios et al., 2019; Rambaran et al., 2020). Only one study (Huitsing et al., 2014) provided evidence that victims selected each other in defending to seek support for protection against bullies. Two studies provided evidence of influence (Huitsing et al., 2014; Palacios et al., 2019), meaning that defenders of victims run the risk of becoming victimized by the bully of the defended victims.

Discussion

Interpersonal models of developmental psychopathology describe how selection and influence can lead to similarity among peers in internalizing behaviors and peer victimization (e.g., Prinstein & Giletta, 2016; Rudolph et al., 2016). Longitudinal SAOMs are a promising method for disentangling these distinct peer selection and influence processes. Therefore, this systematic review integrates the findings of studies using SAOMs to identify how friendships and affiliations with peers shape, and are shaped by, internalizing behaviors and/or peer victimization. The results advance our understanding of the interplay between peer dynamics and childhood and adolescent internalizing behaviors and peer victimization in two respects.

First, this review provides some evidence of peer selection based on similarity in an internalizing behavior or peer victimization, although findings are mixed. Specifically, 57.1% of studies that examined peer selection related to depression (i.e., 8 of 14 studies), 50% of studies that examined peer selection related to social anxiety (i.e., 2 of 4 studies), and 50% of studies that examined peer selection related to peer victimization (i.e., 5 of 10 studies) reported significant effects. No studies examining other types of internalizing behaviors (i.e., 0 of 3 studies) reported significant effects. Only a handful of studies modeled creation and maintenance effects to disentangle different types of selection processes. Both Kiuru et al. (2012) and Van Zalk et al. (2010a; 2010b) found that adolescents are both more likely to form friendships with individuals who are similar in depression and more likely to dissolve friendships with individuals who are dissimilar in depression. These findings provide some initial support for both a potential preferential attachment mechanism and a

repulsion mechanism for depressed individuals' formation and maintenance of friendships with peers. Additionally, Sijtsema et al. (2013) found evidence of preferential attachment, but not repulsion, for relational victimization (Sijtsema et al., 2013). Adolescents were more likely to form relationships with individuals who had similar levels of relational victimization over time, perhaps because they have shared victimization experiences that enhance feelings of understanding and support.

Second, this review provides more consistent evidence of peer influence related to internalizing behaviors and peer victimization, particularly for studies using average similarity effects. Specifically, 57.1% of studies that examined peer influence related to depression (i.e., 4 of 7 studies), 100% of studies that examined peer influence related to social anxiety (i.e., 4 of 4 studies), and 75% of studies that examined peer influence related to peer victimization (i.e., 6 of 8 studies) reported significant effects. Additionally, one study of loneliness also reported a significant peer influence effect, although there may be issues with the specification of the SAOM that call into question this finding (Mercer & DeRosier, 2010). Several studies reporting significant peer influence used average similarity effects that treat total influence the same irrespective of the number of peers and that model influence as convergence toward group norms. Significant average similarity effects are consistent with mechanisms of peer influence that emphasize social learning (i.e., emulating group behaviors for rewards; Prinstein & Giletta, 2016). One study of depression compared an average similarity effect with an average alter effect, finding that adolescents exhibited convergence in their levels of depression toward peers but did not exhibit evidence of peer contagion predicted by mechanisms like problematic interpersonal interactions or co-rumination (Kiuru et al., 2012).

Limitations. Like other recent systematic reviews of SAOMs (Henneberger et al., 2020; Sijtsema & Lindenberg, 2018), our systematic review should be interpreted in light of some limitations. Like these previous reviews, the scope of this review is limited to peer-reviewed articles and may overestimate the prevalence of significant selection and influence effects due to the potential of a file drawer problem. However, this concern is somewhat tempered given that many of the published studies included in this review reported non-significant selection and influence effects. Future reviews could attempt to include unpublished sources like dissertations. Additionally, as noted in previous reviews (Henneberger et al., 2020; Sijtsema & Lindenberg, 2018), SAOMs lack standardized measures of effect sizes (see also Stadtfeld, Snijders, Steglich, & Van Duijn, 2020). Therefore, it is not possible to compare the magnitude of selection and influence effects across studies as is common in meta-analyses. Moreover, across the studies included in this review, there was substantial variation in the sample (e.g., country, age), research design (e.g., network boundary, measurement of internalizing behaviors or peer victimization, type of network assessed), and SAOM model choices (e.g., covariates included, method of estimating influence). The extent of methodological variation across these articles makes it difficult to pinpoint the source of mixed results.

Future Directions. This systematic review suggests several future directions designed to test peer selection and influence mechanisms offered by interpersonal models of developmental psychopathology and to advance the literature on peer dynamics, internalizing behaviors, and peer victimization. *First, developmental researchers should capitalize on the modeling strengths of SAOMs to continue to unpack different mechanisms of peer selection and influence offered by interpersonal models of developmental psychopathology.* In our review, only a handful of studies separately modeled creation and maintenance effects, providing insight into the extent to which peer similarity in internalizing behaviors (Kiuru et al., 2012; Van Zalk et al., 2010a; 2010b) or peer victimization (Sijtsema et al., 2013) reflects different types of peer selection processes. Specifically, significant creation effects suggest the potential presence of preferential attachment processes or more long-term default selection processes whereas significant maintenance effects suggests the potential presence of repulsion processes. Additional research could continue to build an evidence base of these different peer selection processes by separately modeling these effects. Additionally, different methods of estimating peer influence effects (i.e., average similarity, total similarity, average alter) may provide insight into different theoretical mechanisms of peer influence including those based on emulating group behaviors (e.g., social learning) and those based on contagion (e.g., risks associated with befriending victims). Future studies could follow a study that modeled two types of influence effects to directly test convergence versus contagion mechanisms (Kiuru et al., 2012).

Second, more research is needed to assess developmental and gender differences in peer selection and influence related to internalizing behaviors and peer victimization. Our systematic review captured few studies of selection and influence processes in childhood, particularly for internalizing behaviors. Additionally, only one study included in our review examined grade as a moderator (e.g., Sijtsema et al., 2013). Because there are known developmental differences in the prevalence of internalizing behaviors and peer victimization (e.g., Bongers et al., 2003; Ladd et al., 2017; Nylund et al., 2007) as well as in peer interactions (e.g., Choukas-Bradley & Prinstein, 2014; Prinstein & Giletta, 2016), more research on childhood peer selection and influence and on developmental changes is sorely needed. Several studies tested for gender moderation, but findings were inconsistent. Specifically, some studies found no significant gender differences in selection or influence effects related to depression (Giletta et al., 2012; Kiuru et al., 2012; Mercer & DeRosier, 2010;), social anxiety (Mercer & DeRosier, 2010), nonsuicidal self-injury (Giletta et al., 2013) or peer victimization (Sentse et al., 2013; Sijtsema et al., 2013). However, a set of studies using the same Swedish community sample found that influence effects related to depression and social anxiety were stronger for girls (Van Zalk et al., 2010a; 2010b; Van Zalk & Van Zalk, 2015). In contrast, one study using U.S. based Add Health data found that selection and influence effects related to depression only held for boys (Cheadle & Goosby, 2012). This suggests a need for further research to better understand how gender and peer dynamics are related to internalizing behaviors and peer victimization.

Third, more research is needed to determine other individual and contextual moderators related to peer selection and influence effects. Indicators of peer status (e.g., popularity) and cognitive attributional styles such as critical self-referent attributions have been linked to internalizing behaviors and peer victimization (e.g., Choukas-Bradley et al., 2014; Prinstein, Cheah, & Guyer, 2005; Rudolph et al., 2016) and may moderate selection and influence processes (e.g., Prinstein, 2007). Understanding these individual moderators can help inform whether certain children and adolescents are more sensitive to peer processes and provide insight into the potential targets of intervention (Prinstein & Giletta, 2020). Classroom norms have been found to moderate peer selection and influence processes related

to academic achievement (Laninga-Wijnen et al., 2019) and risk attitudes (Rambaran, Dijkstra, & Stark, 2013). Similar normative processes are also likely to operate for internalizing behaviors and peer victimization. Specifically, engaging in internalizing behaviors like social withdrawal can have social rewards when these behaviors are more normative in classrooms (Stormshak, Bierman, Bruschi, Dodge, & Coie, 1999). Therefore, following a social learning mechanism, youth may be more likely to experience peer influence when internalizing behaviors are more contextually normative. Additionally, engaging in relationships with victims may be riskier for youth in classrooms with higher bullying norms, leading to more peer victimization over time. Supporting this latter idea, one recent study included in this review found that when classroom bullying is perceived as more normative in elementary school classrooms, youth become more similar to their friends in levels of peer victimization over time (Shin, 2019). Understanding contextual moderators can help inform classroom or school-based interventions designed to prevent internalizing behaviors and peer victimization. Such research would provide insight into whether interventions targeting behavioral norms can change the extent to which peers influence internalizing behaviors and peer victimization (Gest, Osgood, Feinberg, Bierman, & Moody, 2011).

Fourth, more research is needed to examine cross-behavioral influence processes and multiplex network dynamics. Social network analysis allows researchers to examine not only direct influence processes – for instance that friends' internalizing behaviors influence children's own internalizing behaviors – but also cross-behavioral influence processes. The first study to examine indirect influence processes in longitudinal social network analysis indicated that friends' depressive symptoms predicted changes in adolescents' nonsuicidal self-injury (Giletta et al., 2013). Furthermore, recent work suggests the utility of using SAOMs to examine the role of multiplex relationships in peer selection and influence processes. For example, selection and influence processes related to peer victimization may depend on multiplex dynamics between dyadic bullying and defending relationships (Huitsing et al., 2014) or between dyadic victim-bully relationships and friendships (Hooijisma et al., 2020; Palacios et al., 2019; Rambaran et al., 2020). Furthermore, because most SAOM studies focus on positive relationships like friendship, future research should examine the role of negative relationships, such as dyadic victim-bully relationships, in selection and influence processes related to internalizing behaviors.

Fifth, future research should aim to improve the methodological quality of network data used to model peer selection and influence processes. Some of the articles included in this review reported response rates under 80%. Additionally, several studies used fixed choice designs that limited the number of possible network nominations. Although common in developmental studies, missingness and fixed choice designs can compromise the quality of network data and the resulting analyses (Neal, 2020). Because the results of SAOMs may be linked to the quality of the network data modeled, developmental researchers should aim to collect network data that includes unlimited choice nominations and high response rates. When response rates are lower than recommended, methods should be used to impute missing data (Krause, 2019).

Finally, research is needed that either replicates past findings by directly reproducing prior studies methods or that tests how different methodological decisions moderate findings related to peer selection and influence. As noted earlier, the studies included in this review were marked by a large amount of methodological variation with respect to study samples, design choices, network measurement, the measurement of internalizing behaviors or peer victimization, and model specification. Studies that directly reproduce the methods used in past articles or that directly test different methods (e.g., tests of different types of network or behavior measurement; tests of different SAOM model specifications) can help determine whether certain methodological decisions might account for inconsistencies in findings across studies included in this review.

Conclusion. SAOMs have the strong potential to inform interpersonal models of developmental psychopathology. To this end, this systematic review synthesizes the results of 28 articles using SAOMs to model peer selection and influence processes related to childhood and adolescent internalizing behaviors and peer victimization. The findings provide some evidence of both peer selection and peer influence related to internalizing behaviors and peer victimization. Additionally, the results of this review point to further directions for research including specific tests of peer selection and influence mechanisms, consideration of developmental and gender differences, examination of individual and contextual moderators, exploration of multiplex relationships, efforts to increase methodological quality, and replication studies. These future directions will expand our knowledge of the role of peers in the development of internalizing behaviors and peer victimization and inform prospective prevention and intervention efforts.

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CRedit authorship contribution statement

Jennifer Watling Neal: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing. :
René Veenstra: Conceptualization, Methodology, Formal analysis, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors declared that there is no conflict of interest.

References

(Articles with a * are included in the systematic review)

- Anderson, C. J., Wasserman, S., & Crouch, B. (1999). A p* primer: Logit models for social networks. *Social Networks*, 21(1), 37–66. [https://doi.org/10.1016/S0378-8733\(98\)00012-4](https://doi.org/10.1016/S0378-8733(98)00012-4)
- Bandura, A. (1977). *Social learning theory*. Englewood Cliffs, NJ: Prentice Hall.
- Berger, C. R., & Calabrese, R. J. (1975). Some explorations in initial interaction and beyond: Toward a developmental theory of interpersonal communication. *Human Communication Research*, 1(2), 99–112. <https://doi.org/10.1111/j.1468-2958.1975.tb00258.x>
- *Berger, C., Gremmen, M. C., Palacios, D., & Franco, E. (2019). "Would you be my friend?": Friendship selection and contagion processes of early adolescents who experience victimization. *The Journal of Early Adolescence*, 39(9), 1286–1310. <https://doi.org/10.1177/0272431618824753>
- Brechwald, W. A., & Prinstein, M. J. (2011). Beyond homophily: A decade of advances in understanding peer influence processes. *Journal of Research on Adolescence*, 21(1), 166–179. <https://doi.org/10.1111/j.1532-7795.2010.00721.x>
- Bongers, I. L., Koot, H. M., Van der Ende, J., & Verhulst, F. C. (2003). The normative development of child and adolescent problem behavior. *Journal of Abnormal Psychology*, 112(2), 179–192. <https://doi.org/10.1037/0021-843X.112.2.179>
- Byrne, D. (1971). *The attraction paradigm*. New York: Academic Press.
- Byrne, D., & Nelson, D. (1965). Attraction as a linear function of proportion of positive reinforcements. *Journal of Personality and Social Psychology*, 1(6), 659–663. <https://doi.org/10.1037/h0022073>
- *Cheadle, J. E., & Goosby, B. J. (2012). The small-school friendship dynamics of adolescent depressive symptoms. *Society and Mental Health*, 2(2), 99–119. <https://doi.org/10.1177/2156869312445211>
- Choukas-Bradley, S., & Prinstein, M. J. (2014). Peer relationships and the development of psychopathology. In M. Lewis & K. Rudolph (Eds.), *Handbook of developmental psychopathology* (pp. 185–204). Springer, https://doi.org/10.1007/978-1-4614-9608-3_10
- Coyne, J. C. (1976). Depression and the response of others. *Journal of abnormal psychology*, 85(2), 186–193. <https://doi.org/10.1037/0021-843X.85.2.186>
- *DeLay, D., Hanish, L. D., Zhang, L., & Martin, C. L. (2017). Assessing the impact of homophobic name calling on early adolescent mental health: A longitudinal social network analysis of competing peer influence effects. *Journal of Youth and Adolescence*, 46(5), 955–969. <https://doi.org/10.1007/s10964-016-0598-8>
- Deptula, D. P., & Cohen, R. (2004). Aggressive, rejected, and delinquent children and adolescents: A comparison of their friendships. *Aggression and Violent Behavior*, 9, 75–104. [https://doi.org/10.1016/S1359-1789\(02\)00117-9](https://doi.org/10.1016/S1359-1789(02)00117-9)
- *Duxbury, S. W., & Haynie, D. L. (2020). School suspension and social selection: Labeling, network change, and adolescent, academic achievement. *Social Science Research*, 85, Article 102365. <https://doi.org/10.1016/j.ssresearch.2019.102365>
- *Ennett, S. T., Faris, R. W., Hussong, A. M., Gottfredson, N., & Cole, V. (2018). Depressive symptomology as a moderator of friend selection and influence on substance use involvement: Estimates from grades 6 to 12 in six longitudinal school-based social networks. *Journal of Youth and Adolescence*, 47(11), 2337–2352. <https://doi.org/10.1007/s10964-018-0915-5>
- *Fortuin, J., van Geel, M., & Vedder, P. (2015). Peer influences on internalizing and externalizing problems among adolescents: A longitudinal social network analysis. *Journal of Youth and Adolescence*, 44(4), 887–897. <https://doi.org/10.1007/s10964-014-0168-x>
- Gallupe, O., McLevey, J., & Brown, S. (2019). Selection and influence: A meta-analysis of the association between peer and personal offending. *Journal of Quantitative Criminology*, 35(2), 313–335. <https://doi.org/10.1007/s10940-018-9384-y>
- Gest, S. D., Osgood, D. W., Feinberg, M. E., Bierman, K. L., & Moody, J. (2011). Strengthening prevention program theories and evaluations: Contributions from social network analysis. *Prevention Science*, 12(4), 349–360. <https://doi.org/10.1007/s11211-011-0229-2>
- *Giletta, M., Burk, W. J., Scholte, R. H., Engels, R. C., & Prinstein, M. J. (2013). Direct and indirect peer socialization of adolescent nonsuicidal self-injury. *Journal of Research on Adolescence*, 23(3), 450–463. <https://doi.org/10.1111/jora.12036>
- Giletta, M., Scholte, R. H., Burk, W. J., Engels, R. C., Larsen, J. K., Prinstein, M. J., & Ciairano, S. (2011). Similarity in depressive symptoms in adolescents' friendship dyads: Selection or socialization? *Developmental Psychology*, 47(6), 1804–1814. <https://doi.org/10.1037/a0023872>
- *Giletta, M., Scholte, R. H., Prinstein, M. J., Engels, R. C., Rabaglietti, E., & Burk, W. J. (2012). Friendship context matters: Examining the domain specificity of alcohol and depression socialization among adolescents. *Journal of Abnormal Child Psychology*, 40(7), 1027–1043. <https://doi.org/10.1007/s10802-012-9625-8>
- Hankin, B. L., Stone, L., & Wright, P. A. (2010). Co-rumination, interpersonal stress generation, and internalizing symptoms: Accumulating effects and transactional influences in a multi-wave study of adolescents. *Development and Psychopathology*, 22(1), 217–235. <https://doi.org/10.1017/S0954579409990368>
- Hankin, B. L., Wetter, E., & Cheely, C. (2008). Sex differences in child and adolescent depression: A developmental psychopathological approach. In J. R. Z. Abela & B. L. Hankin (Eds.), *Handbook of child and adolescent depression* (pp. 377–414). Guilford.
- Henneberger, A. K., Mushonga, D. R., & Preston, A. M. (2020). Peer influence and adolescent substance use: A systematic review of dynamic social network research. *Adolescent Research Review*. <https://doi.org/10.1007/s40894-019-00130-0>
- Hogue, A., & Steinberg, L. (1995). Homophily of internalized distress in adolescent peer groups. *Developmental Psychology*, 31(6), 897–906. <https://doi.org/10.1037/0012-1649.31.6.897>
- *Hooijsma, M., Huitsing, G., Kislafusi, D., Dijkstra, J. K., Flache, A., & Veenstra, R. (2020). Multidimensional similarity in multiplex networks: Friendships between same- and cross-gender bullies and same- and cross-gender victims. *Network Science*, 9, 79–96. <https://doi.org/10.1017/nws.2020.1>
- *Huitsing, G., Snijders, T. A., Van Duijn, M. A., & Veenstra, R. (2014). Victims, bullies, and their defenders: A longitudinal study of the coevolution of positive and negative networks. *Development and psychopathology*, 26(3), 645–659. <https://doi.org/10.1017/S0954579414000297>
- Joiner, T. E., & Timmons, K. A. (2009). Depression in its interpersonal context. In I. H. Gotlib, & C. L. Hammen (Eds.), *Handbook of Depression* (2nd ed., pp. 322–339). Guilford Press.
- Kandel, D. B. (1978). Homophily, selection, and socialization in adolescent friendships. *American Journal of Sociology*, 84(2), 427–436. <https://doi.org/10.1086/226792>
- *Kiuru, N., Burk, W. J., Laursen, B., Nurmi, J. E., & Salmela-Aro, K. (2012). Is depression contagious? A test of alternative peer socialization mechanisms of depressive symptoms in adolescent peer networks. *Journal of Adolescent Health*, 50(3), 250–255. <https://doi.org/10.1016/j.jadohealth.2011.06.013>
- Krause, R. W. (2019). Multiple imputation for missing network data. Groningen: Dissertation. https://www.publicatie-online.nl/files/7015/7467/5769/139548_Robert_Krause_PDF.pdf
- Ladd, G. W., Ettekal, I., & Kochenderfer-Ladd, B. (2017). Peer victimization trajectories from kindergarten through high school: Differential pathways for children's school engagement and achievement? *Journal of Educational Psychology*, 109(6), 826–841. <https://doi.org/10.1037/edu0000177>
- Laninga-Wijnen, L., Gremmen, M. C., Dijkstra, J. K., Veenstra, R., Vollebergh, W. A., & Harakeh, Z. (2019). The role of academic status norms in friendship selection and influence processes related to academic achievement. *Developmental Psychology*, 55(2), 337–350. <https://doi.org/10.1037/dev0000611>
- Laninga-Wijnen, L., & Veenstra, R. (2021). Peer similarity in adolescent social networks: Types of selection and influence, and factors contributing to openness to peer influence. In B. Halpern-Felsher (Ed.), *The Encyclopedia of Child and Adolescent Health*. Elsevier.
- Lazarsfeld, P. F., & Merton, R. K. (1964). Friendship as a social process: A substantive and methodological analysis. In M. Berger, T. Abel, & C. H. Page (Eds.), *Freedom and Control in Modern Society*. New York: Octagon Books.
- Leve, L. D., Kim, H. K., & Pears, K. C. (2005). Childhood temperament and family environment as predictors of internalizing and externalizing trajectories from ages 5 to 17. *Journal of Abnormal Child Psychology*, 33(5), 505–520. <https://doi.org/10.1007/s10802-005-6734-7>
- Lloyd-Richardson, E. E., Perrine, N., Dierker, L., & Kelley, M. L. (2007). Characteristics and functions of non-suicidal self-injury in a community sample of adolescents. *Psychological Medicine*, 37(8), 1183–1192. <https://doi.org/10.1017/S003329170700027X>
- *Lodder, G. M., Scholte, R. H., Cillessen, A. H., & Giletta, M. (2016). Bully victimization: Selection and influence within adolescent friendship networks and cliques. *Journal of Youth and Adolescence*, 45(1), 132–144. <https://doi.org/10.1007/s10964-015-0343-8>

- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27(1), 415–444. <https://doi.org/10.1146/annurev.soc.27.1.415>
- *Mercer, S. H., & DeRosier, M. E. (2010). Selection and socialization of internalizing problems in middle childhood. *Journal of Social and Clinical Psychology*, 29(9), 1031–1056. <https://doi.org/10.1521/jscp.2010.29.9.1031>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLOS Medicine*, 6, e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- *Mundt, M. P., & Zakletskaia, L. I. (2019). Adolescent friendship formation and mental health: A stochastic actor-based model of help-seeking behavior. *Journal of Social Structure*, 20, 50–69.
- Neal, J. W. (2020). A systematic review of social network methods in high impact developmental psychology journals. *Social Development*. <https://doi.org/10.1111/sode.12442>
- Niezink, N. M., Snijders, T. A., & van Duijn, M. A. (2019). No longer discrete: Modeling the dynamics of social networks and continuous behavior. *Sociological Methodology*, 49(1), 295–340. <https://doi.org/10.1177/0081175019842263>
- Nock, M. K., & Prinstein, M. J. (2005). Contextual features and behavioral functions of self-mutilation among adolescents. *Journal of Abnormal Psychology*, 114(1), 140–146. <https://doi.org/10.1037/0021-843X.114.1.140>
- Nylund, K., Bellmore, A., Nishina, A., & Graham, S. (2007). Subtypes, severity, and structural stability of peer victimization: What does latent class analysis say? *Child Development*, 78(6), 1706–1722. <https://doi.org/10.1111/j.1467-8624.2007.01097.x>
- *Pachucki, M. C., Ozer, E. J., Barrat, A., & Cattuto, C. (2015). Mental health and social networks in early adolescence: A dynamic study of objectively-measured social interaction behaviors. *Social Science & Medicine*, 125, 40–50. <https://doi.org/10.1016/j.socscimed.2014.04.015>
- *Palacios, D., Berger, C., Luengo Kanacri, B. P., Veenstra, R., & Dijkstra, J. K. (2019). The interplay of adolescents' aggression and victimization with friendship and antipathy networks within an educational prosocial intervention. *Journal of Youth and Adolescence*, 48, 2005–2022. <https://doi.org/10.1007/s10964-019-01105-z>
- Prinstein, M. J. (2007). Moderators of peer contagion: A longitudinal examination of depression socialization between adolescents and their best friends. *Journal of Clinical Child and Adolescent Psychology*, 36(2), 159–170. <https://doi.org/10.1080/15374410701274934>
- Prinstein, M. J., Cheah, C. S., & Guyer, A. E. (2005). Peer victimization, cue interpretation, and internalizing symptoms: Preliminary concurrent and longitudinal findings for children and adolescents. *Journal of Clinical Child and Adolescent Psychology*, 34(1), 11–24. https://doi.org/10.1207/s15374424jccp3401_2
- Prinstein, M. J., & Giletta, M. (2016). Peer relations and developmental psychopathology. In D. Cicchetti (ed.), *Developmental Psychopathology, Theory and Method*, Vol 1 (pp. 527–579). Wiley.
- Prinstein, M. J., & Giletta, M. (2020). Future directions in peer relations research. *Journal of Clinical Child & Adolescent Psychology*, 49(4), 556–572. <https://doi.org/10.1080/15374416.2020.1756299>
- Prinstein, M. J., Guerry, J. D., Browne, C. B., & Rancourt, D. (2009). Interpersonal models of nonsuicidal self-injury. In M. K. Nock (Ed.), *Understanding Non-Suicidal Self-Injury: Origins, Assessment, and Treatment* (pp. 79–98). American Psychological Association. <https://doi.org/10.1037/11875-000>
- Rambaran, A. J., Dijkstra, J. K., & Stark, T. H. (2013). Status-based influence processes: The role of norm salience in contagion of adolescent risk attitudes. *Journal of Research on Adolescence*, 23(3), 574–585. <https://doi.org/10.1111/jora.12032>
- *Rambaran, J. A., Dijkstra, J. K., & Veenstra, R. (2020). Bullying as a group process in childhood: A longitudinal social network analysis. *Child Development*, 91, 1336–1352. <https://doi.org/10.1111/cdev.13298>
- Ray, G. E., Cohen, R., Secrist, M. E., & Duncan, M. K. (1997). Relating aggressive and victimization behaviors to children's sociometric status and friendships. *Journal of Social and Personal Relationships*, 14(1), 95–108. <https://doi.org/10.1177/0265407597141005>
- Ripley, R. M., Snijders, T. A. B., Boda, Z., Vörös, A., & Preciado, P. (2020). *Manual for RSiena (February 16, Oxford, UK: Department of Statistics. Nuffield College: University of Oxford.*
- Rose, A. J. (2002). Co-rumination in the friendships of girls and boys. *Child development*, 73(6), 1830–1843. <https://doi.org/10.1111/1467-8624.00509>
- Rose, A. J. (2007). Structure, content, and socioemotional correlates of girls' and boys' friendships: Recent advances and future directions. *Merrill-Palmer Quarterly*, 53, 489–506. <https://doi.org/10.1353/mpq.2007.0019>
- Rose, A. J., Carlson, W., & Waller, E. M. (2007). Prospective associations of co-rumination with friendship and emotional adjustment: Considering the socioemotional trade-offs of co-rumination. *Developmental Psychology*, 43(4), 1019–1031. <https://doi.org/10.1037/0012-1649.43.4.1019>
- Rose, A. J., & Rudolph, K. D. (2006). A review of sex differences in peer relationship processes: Potential trade-offs for the emotional and behavioral development of girls and boys. *Psychological Bulletin*, 132(1), 98–131. <https://doi.org/10.1037/0033-2909.132.1.98>
- Rose, A. J., Schwartz-Mette, R. A., Glick, G. C., Smith, R. L., & Luebbe, A. M. (2014). An observational study of co-rumination in adolescent friendships. *Developmental Psychology*, 50(9), 2199–2209. <https://doi.org/10.1037/a0037465>
- Rudolph, K. D., Lansford, J. E., & Rodkin, P. C. (2016). Interpersonal theories of developmental psychopathology. In D. Cicchetti (Ed.), *Developmental Psychopathology* (3rd ed., pp. 1–69). Wiley.
- Rutter, M., Caspi, A., & Moffitt, T. E. (2003). Using sex differences in psychopathology to study causal mechanisms: Unifying issues and research strategies. *Journal of Child Psychology and Psychiatry*, 44(8), 1092–1115. <https://doi.org/10.1111/1469-7610.00194>
- *Schaefer, D. R., Kornienko, O., & Fox, A. M. (2011). Misery does not love company: Network selection mechanisms and depression homophily. *American Sociological Review*, 76(5), 764–785. <https://doi.org/10.1177/0003122411420813>
- Schwartz-Mette, R. A., & Rose, A. J. (2012). Co-rumination mediates contagion of internalizing symptoms within youths' friendships. *Developmental Psychology*, 48(5), 1355–1365. <https://doi.org/10.1037/a0027484>
- Schwartz-Mette, R. A., Shankman, J., Duweke, A. R., Borowski, S., & Rose, A. J. (2020). Relations of friendship experiences with depressive symptoms and loneliness in childhood and adolescence: A meta-analytic review. *Psychological Bulletin*. <https://doi.org/10.1037/bul0000239>
- *Sentse, M., Dijkstra, J. K., Salmivalli, C., & Cillessen, A. H. (2013). The dynamics of friendships and victimization in adolescence: A longitudinal social network perspective. *Aggressive Behavior*, 39(3), 229–238. <https://doi.org/10.1002/ab.21469>
- *Shin, H. (2019). The role of perceived bullying norms in friendship dynamics: An examination of friendship selection and influence on bullying and victimization. *International Journal of Behavioral Development*. <https://doi.org/10.1177/0165025419868533>
- Sijtsema, J. J., & Lindenberg, S. M. (2018). Peer influence in the development of adolescent antisocial behavior: Advances from dynamic social network studies. *Developmental Review*, 50, 140–154. <https://doi.org/10.1016/j.dr.2018.08.002>
- *Sijtsema, J. J., Rambaran, A. J., & Ojanen, T. J. (2013). Overt and relational victimization and adolescent friendships: Selection, de-selection, and social influence. *Social Influence*, 8(2–3), 177–195. <https://doi.org/10.1080/15534510.2012.739097>
- Snijders, T. A. (2001). The statistical evaluation of social network dynamics. *Sociological Methodology*, 31(1), 361–395. <https://doi.org/10.1111/0081-1750.00099>
- Snijders, T. A., Van de Bunt, G. G., & Steglich, C. E. (2010). Introduction to stochastic actor-based models for network dynamics. *Social Networks*, 32(1), 44–60. <https://doi.org/10.1016/j.socnet.2009.02.004>
- Stadtfeld, C., Snijders, T. A. B., Steglich, C., & Van Duijn, M. (2020). Statistical power in longitudinal network studies. *Sociological Methods & Research*. <https://doi.org/10.1177/0049124118769113>
- Stevens, E. A., & Prinstein, M. J. (2005). Peer contagion of depressogenic attributional styles among adolescents: A longitudinal study. *Journal of Abnormal Child Psychology*, 33(1), 25–37. <https://doi.org/10.1007/s10802-005-0931-2>
- Stone, L. L., Giletta, M., Brendgen, M., Otten, R., Engels, R. C., & Janssens, J. M. (2013). Friendship similarities in internalizing problems in early childhood. *Early Childhood Research Quarterly*, 28(2), 210–217. <https://doi.org/10.1016/j.ecresq.2012.12.003>
- Stone, L. B., Hankin, B. L., Gibb, B. E., & Abela, J. R. Z. (2011). Co-rumination predicts the onset of depressive disorders during adolescence. *Journal of Abnormal Psychology*, 120, 752–757. <https://doi.org/10.1037/a0023384>
- Stormshak, E. A., Bierman, K. L., Bruschi, C., Dodge, K. A., & Coie, J. D. (1999). The relation between behavior problems and peer preference in different classroom contexts. *Child Development*, 70(1), 169–182. <https://doi.org/10.1111/1467-8624.00013>

- Strack, S., & Coyne, J. C. (1983). Social confirmation of dysphoria: Shared and private reactions to depression. *Journal of Personality and Social Psychology*, 44(4), 798–806. <https://doi.org/10.1037/0022-3514.44.4.798>
- *Turanovic, J. J., & Young, J. T. (2016). Violent offending and victimization in adolescence: Social network mechanisms and homophily. *Criminology*, 54(3), 487–519. <https://doi.org/10.1111/1745-9125.12112>
- *Van Rijsewijk, L., Dijkstra, J. K., Pattiselanno, K., Steglich, C., & Veenstra, R. (2016). Who helps whom? Investigating the development of adolescent prosocial relationships. *Developmental Psychology*, 52(6), 894–908. <https://doi.org/10.1037/dev0000106>
- *Van Zalk, M. H. W., Kerr, M., Branje, S. J., Stattin, H., & Meeus, W. H. (2010a). Peer contagion and adolescent depression: The role of failure anticipation. *Journal of Clinical Child & Adolescent Psychology*, 39(6), 837–848. <https://doi.org/10.1080/15374416.2010.517164>
- *Van Zalk, M. H. W., Kerr, M., Branje, S. J., Stattin, H., & Meeus, W. H. (2010b). It takes three: Selection, influence, and de-selection processes of depression in adolescent friendship networks. *Developmental Psychology*, 46(4), 927a–938. <https://doi.org/10.1037/a0019661>
- *Van Zalk, N., & Van Zalk, M. (2015). The importance of perceived care and connectedness with friends and parents for adolescent social anxiety. *Journal of Personality*, 83(3), 346–360. <https://doi.org/10.1111/jopy.12108>
- *Van Zalk, N., Van Zalk, M. H. W., & Kerr, M. (2011). Socialization of social anxiety in adolescent crowds. *Journal of Abnormal Child Psychology*, 39(8), 1239–1249. <https://doi.org/10.1007/s10802-011-9533-3>
- *Van Zalk, N., Van Zalk, M., Kerr, M., & Stattin, H. (2011). Social anxiety as a basis for friendship selection and socialization in adolescents' social networks. *Journal of Personality*, 79(3), 499–526. <https://doi.org/10.1111/j.1467-6494.2011.00682.x>
- Veenstra, R., & Dijkstra, J. K. (2011). Transformations in adolescent peer networks. In B. Laursen, & W. A. Collins (Eds.), *Relationship pathways: From adolescence to young adulthood* (pp. 135–153). New York: Sage.
- Veenstra, R., Dijkstra, J. K., Steglich, C., & Van Zalk, M. H. (2013). Network-behavior dynamics. *Journal of Research on Adolescence*, 23(3), 399–412. <https://doi.org/10.1111/jora.12070>