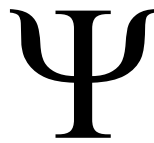




**DET PSYKOLOGISKE FAKULTET**



***To What Extent is Social Media Use Related to Online Prosocial Behavior Among Adolescents?***

**HOVEDOPPGAVE**

*profesjonsstudiet i psykologi*

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Veiledet av Jens Christoffer Skogen og Tormod Bøe

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### Abstract

Social media activity constitutes a large part of adolescents' lives. Even though the behavior on social media is complex, the research on social media have, to a certain degree, focused on negative effects, bad content and online antisocial behavior. Less research seems to have been conducted on their prosocial counterparts. Thus, to what extent online prosocial behaviors are widespread is relatively unknown. A systematic review was conducted to investigate to what extent online prosocial behavior is related to social media use among adolescents. A multidatabase search resulted in two studies which met the eligibility criteria. Both included studies found an association between online prosocial behavior and social media use. However methodological issues identified through a quality assessment, as well as the small size of the data, clearly inhibit any conclusions. Possible reasons for the scarcity of eligible studies and directions for future research are discussed.

## Sammendrag

Sosiale medier er en stor del av ungdommers liv. Selv om atferd på sosiale medier er komplekst har forskningen på sosiale medier fokusert i stor grad på negative effekter, innhold og atferd. Mindre forskning ser ut til å ha blitt gjort på de prososiale motvektene. I hvilken grad online prososial atferd er utbredt hos ungdommer er derfor relativt ukjent. En systematisk gjennomgang ble gjennomført for å undersøke i hvilken grad online prososial atferd er assosiert med sosiale medier-bruk hos ungdommer. Et multidatabasesøk resulterte i to studies som oppfylte inklusjonskriteriene. Begge studiene fant en assosiasjon mellom online prososial atferd og sosiale medier-bruk. Metodologiske svakheter identifisert gjennom en grundig kvalitetsvurdering og det at datagrunnlaget er såpass lite gjør at det ikke kan trekkes noen konklusjoner. Potensielle forklaringer på mangelen på studier som oppfyller inklusjonskriteriene, og retninger for fremtidige studier diskuteres avslutningsvis.

## To What Extent is Use of Social Media Related to Online Prosocial Behavior Among Adolescents?

Social media, which will subsequently be referred to as SM, have been defined as “the sites and services that emerged during the early 2000s, including social networking services (SNS), video-sharing sites, blogging and microblogging platforms, and related tools that allow participants to create and share their own content” (Boyd, 2014). Social media is ubiquitous. An estimated 3.48 billion people were using social media worldwide in 2019, an increase of 9 percent since 2018 (Kemp, 2019).

Adolescents are among the most active users, and the 2018 Pew Report showed that almost half of all U.S. teenagers report going online “almost constantly”, and 87% report they use at least one social media platform daily (Pew Research Center, 2018). SNS dominate the landscape, with Facebook, Twitter and Instagram being the most popular sites. Instant messaging services (e.g. Snapchat, Whatsapp) have recently overtaken a substantial part of the userbase, with reports showing over one third of adolescents using Snapchat more often than the large social networking services (Pew Research Center, 2018). Watching, sharing and commenting on other people`s videos (i.e. vlogging) are also widely popular online behaviors among youth on social media platforms such as Youtube. Youtube is one of the most popular platforms, and adolescents watch online videos on average 1 hour a day (Rideout & Robb, 2019). Social media use is becoming increasingly more accessible for adolescents both during school and leisure time; 95% of U.S. teens have access to a smartphone, a 22%-increase from 2014-2015 to 2017-18 (Pew Research Center, 2018). Thus, youth spend a lot of their time on and do their social activities through social media.

A growing concern has been raised by several researchers regarding the potential negative effects of social media use (Han, 2018; Twenge & Campbell, 2019). Social media use has especially been linked to mental health problems, and one meta-analysis found an

association between SNS use and depression and anxiety (Keles, McCrae, & Grealish, 2020). Others have found both a negative and a positive association with well-being (Verduyn, Ybarra, Résibois, Jonides, & Kross, 2017). Most authors in the field note that the observed relationship between mental health problems and well-being and time spent on social media is complex. Moderating and mediating variables need to be examined to understand the relationship, and the authors note that few studies were designed to do so (Keles et al., 2020). Consequently, although the data on social media use and mental health outcomes are abundant (Orben, 2020), the data may not be specific and strong enough to derive any practical conclusions from. Indeed, one study found that higher investment in social media (e.g. active instead of passive use of SM) predicted adolescents' depressive symptoms, and that time spent on social media in itself did not (Neira & Barber, 2014).

A number of variables may mediate and moderate the association between social media and depression and anxiety. Positive interactions, social support, and social connectedness on social media seem to be related to lower levels of mental health problems, whereas negative interactions and social comparison on social media were associated with higher levels (Seabrook, Kern, & Rickard, 2016). Without the use of more advanced study designs (i.e. longitudinal and experimental designs) and a wider focus on moderating and mediating variables, the research on social media use and mental health outcomes may remain inconclusive or too general to warrant any policy change.

Much of the previous research on social media has focused on its possible *effects* (Orben, 2020). Another area of study has been the *type of behavior* children and adolescents perform on social media. Studying children and adolescents' actual behavior online should also be of interest, because the type of online social behavior, as opposed to using general variables of "time-spent on social media" or "amount of screen time-activity", might influence outcome variables (i.e. mental health and well-being). Indeed, a great deal of

attention has been directed at the negative behavior performed online by adolescents, typically in the form of “cyberbullying” (Kowalski, Giumetti, Schroeder, & Lattanner, 2014).

Cyberbullying are behaviors that can take many forms. They will in general have an intention to hurt, be perceived as hurtful, be repetitive, represent an imbalance in power in the relationship (Vandebosch & Van Cleemput, 2008), and be executed through various forms of digital technologies (P. K. Smith et al., 2008). Cyberbullying is quite common (Brochado, Soares, & Fraga, 2016) and can have serious impact on children and adolescents, as it is linked to depression, anxiety, lower self-esteem and academic performance both for the bullies and the bullied (Kowalski & Limber, 2013).

Less research seems to have been devoted to online prosocial behavior (subsequently referred to as OPB). To my knowledge, there are no reviews on OPB, only one comprehensive book chapter by Wright and Li (2012). For comparison, a systematic map of reviews on screen-based activities and children and adolescents` mental health outcomes found 19 reviews on cyberbullying, whereby included primary studies in each review ranged from 10 to 131 (Dickson et al., 2018). Thus, OPB is not well researched, and little is known about the online prosocial behavior of adolescents today.

However, a wealth of research has been done on offline (e.g. traditional) prosocial behavior since the 1970`s (Eisenberg, Fabes, & Spinrad, 2007) and its findings warrants a greater interest in its online counterpart. For example, studies have found that offline prosocial behavior is associated with a number of positive outcomes, such as academic performance (G. Carlo, White, Streit, Knight, & Zeiders, 2018), higher self-esteem (Laible, Carlo, & Roesch, 2004) and subjective well-being (Aknin et al., 2013). Experimental research shows that performing prosocial behaviors can lead to feelings of well-being and happiness (Aknin et al., 2013; Martela & Ryan, 2016). Thus, in order to elaborate on online prosocial behavior, one should be familiar with the concept of (offline) prosocial behavior.

## **Prosocial behavior**

Prosocial behavior has traditionally been defined as voluntary actions intended to benefit others (Eisenberg et al., 2007). Such behaviors can be helping, comforting, sharing with and supporting others. It is separate from the construct of altruism as altruism is a motivational concept. Altruism can be defined as the motivation to increase another person's welfare (Batson & Powell, 2003). Thus, prosocial behaviors need not be motivated by altruism and altruism need not lead to prosocial behaviors. Prosocial behaviors can be motivated by a variety of reasons, as to get a reward, gain approval from others, acting according to social norms or out of genuine sympathy (Eisenberg & Mussen, 1989).

Up to the 1960's, the research interest in prosocial behavior was relatively low, as the early studies of Hartshorne, May, Maller, and Shuttlesworth (1928) showed non-significant correlations between morality behaviors and the authors later urged researchers to abandon morality and prosocial behavior as coherent constructs. However, the field of prosocial behavior in psychology experienced a surge of research in the 1960's and -70's. That surge was much due to the bystander-intervention studies (Latané & Darley, 1970), in which researchers identified dispositional and situational factors that promote (or inhibit) individuals to help strangers. The surge has also been attributed to the advent of predicting (prosocial) behavior from aggregate dispositional measures (Staub, 1974). After the resurgence of interest in the 60's, the field of prosocial behavior, its antecedents and correlates extended to developmental psychology in terms of cognitive developmental (Kohlberg & Kramer, 1969) and moral developmental theories (Hoffman, 1970). Studies have identified prosocial behavior's developmental trajectories, antecedents and correlates. The next section introduces prosocial behaviors through a developmental perspective, detailing adolescent trajectories, positive effects associated with prosocial behaviors and factors shown to foster prosocial behaviors.



**Development of prosocial behaviors.** Infants show signs of early prosocial behaviors in terms of sharing with, helping and comforting others (Dahl, 2015; Warneken & Tomasello, 2013). One year-olds will aid adults with pointing at unseen events, as well as offering help with picking up objects out of reach (Hay & Cook, 2007; Liszkowski, 2005; Warneken & Tomasello, 2013). At the age of 3 years, toddlers reliably comfort other people in distress, and share resources with those who express a need for food or toy (Bandstra, Chambers, McGrath, & Moore, 2011; Brownell, Iesue, Nichols, & Svetlova, 2013; Svetlova, Nichols, & Brownell, 2010). Studies on social cognition in different cultural settings indicate the existence of the same basic forms of prosocial behaviors in one-to-three years-olds (Callaghan et al., 2011).

At the age of four, children begin to construct a deeper understanding of other's minds, desires and actions, often called theory of mind (Carpendale & Lewis, 2004). For example, when toddlers and children under the age of four years allocate resources prosaically, do so based on the principle of equality – everyone gets the same amount of resources. From the age of four and older, resource allocation need not be based solely on equality, as the children take other factors into account, such as effort, group membership, need and previous experiences (Hamann, Bender, & Tomasello, 2014; Rizzo, Elenbaas, Cooley, & Killen, 2016; C. E. Smith, Blake, & Harris, 2013). During middle childhood (age six to 12 years), children start to associate more with peers than with their parents, and to internalize social norms from other arenas than the home, such as school and leisure activities, where they identify with different groups (Abrams, Van de Vyver, Pelletier, & Cameron, 2015). Consequently, their prosocial behaviors evolve into increasingly complex behaviors, considering the motivations behind and functions of the behaviors. For example, children start to lie in order to protect other's feelings, called prosocial lying (Evans & Lee, 2013), and engage in behavior that may harm others, with the goal of rescuing them from a greater evil, called necessary harm (Jambon & Smetana, 2014).

Measuring prosocial behaviors among adolescents has been particularly popular in recent years, due to the increasing interest in the field of positive youth development (Lerner, Lerner, Bowers, & Geldhof, 2015). The development of prosocial behavior during adolescence is complex and multidimensional and may differ as a function of numerous individual and contextual factors (Padilla-Walker, Dyer, Yorgason, Fraser, & Coyne, 2013). Findings from studies on prosocial development in adolescence do not paint a clear and stable trajectory, although several studies suggest that prosocial behaviors decline in early and middle adolescence, before increasing into young adulthood.

One longitudinal study (Jambon & Smetana, 2014) obtained teachers' and mothers' reports on Canadian adolescent's prosocial behaviors and compared it with teacher and self-reports in Italian adolescents, in an effort to describe developmental trajectories from middle childhood to adolescence (10-14 years). Small, but significant associations were established between teacher and mother ratings, and between self and mother ratings, though there was a tendency for teacher ratings to report more declining prosocial behaviors compared to self- and mother-reports. Identifying developmental trajectories, the researchers found that all but one trajectory (7%, rising) showed stable or declining levels of prosocial behavior from middle childhood to adolescence. Change with age in self-reported prosocial behavior can vary with the recipient of the behavior. One study found that prosocial behavior toward family was generally stable or decreased over time, while prosocial behavior toward friends increased over time (Padilla-Walker et al., 2013).

Gustavo Carlo, Crockett, Randall, and Roesch (2007) found that self-reported prosocial behavior declined from 7<sup>th</sup> to 12<sup>th</sup> grade (12-18 years) among low SES-adolescents, although there was a small incline in the 12<sup>th</sup> grade. Kanacri, Pastorelli, Eisenberg, Zuffiano, and Caprara (2013) found similar results, showing a decline in self-reported prosocial responding in Italian adolescent from 13 to 17 years of age, and then a slight rebound until 21

years. Showing contradictory results, Jacobs and Vernon (2004) reported a significant growth in self-reported increase in helping, volunteering and general prosocial behaviors from 7<sup>th</sup> to 8<sup>th</sup> grad (12 to 14 years), and some increase to 10<sup>th</sup> grade (15-16 years). Summarized, studies on prosocial development in adolescence show a slight decline in prosocial behaviors in early and middle adolescence, except for some behaviors such as volunteering and helping. This decline may vary as a function of behavior recipient (e.g. parent vs. friend) and seems to rebound to original levels (i.e. before the decline in early adolescence began) of prosocial behaviors at a later age.

**Correlates.** Prosocial behaviors seem to correlate with several positive outcomes. For example, studies show a moderate correlation with social efficacy (Bandura, Caprara, Barbaranelli, Pastorelli, & Regalia, 2001), the personal judgement of how well one can affect prospective situations (Bandura, 1982). Some have suggested that social efficacy may promote prosocial behaviors, and that performing prosocial behavior in turn promotes social efficacy, creating a positive loop (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003). Prosocial behaviors also seem to correlate with self-esteem (Laible et al., 2004), academic achievement (G. Carlo et al., 2018), lower levels of negative school related outcomes, such as school dropout, suspension and course failure (Moore & Allen, 1996) and delinquency (Padilla-Walker, Memmott-Elison, & Coyne, 2018).

Experimental evidence from research on adults show that prosocial behavior can lead to feelings of well-being and happiness (Aknin et al., 2013; Martela & Ryan, 2016). One study showed that people derive positive emotional benefits from using their financial resources on others or charity, compared to people who spent their resources on themselves (Aknin et al., 2013). In the same study, Aknin et al. (2013) investigated the relationship between subjective well-being and prosocial spending in over 136 countries, with results suggesting a stable relationship between the two variables across cultures and socio-economic

status. The same effects seem to apply to adolescents as well, although not shown experimentally. In a longitudinal study, adolescents' overall level of prosocial behaviors were associated with increased life satisfaction two years later (Son & Padilla-Walker, 2019).

In summary, prosocial behaviors form a complex relationship with social efficacy, self-esteem and academic achievement. The direction of effect in these relationships are not clear cut. However, they seem to positively reinforce each other. For example, one large longitudinal study found that adolescent self-esteem was associated longitudinally with subsequent prosocial behavior toward strangers, and earlier prosocial behavior toward strangers promoted subsequent self-esteem (Fu, Padilla-Walker, & Brown, 2017). However complex that relationship may be, the link between prosocial behaviors and life satisfaction, on the other hand, is rather clear (Aknin, Williams, Norton, & Dunn, 2019). Thus, research on prosocial behaviors show how the fostering of prosocial behaviors in adolescence may have positive effects for the adolescents themselves, but also for the community, in terms of the possible positive feedback-loop between self-esteem, life satisfaction and prosocial behaviors.

**Fostering prosocial development.** Parental warmth and support have been positively associated with children's prosocial behavior (Llorca, Richaud, & Malonda, 2017; Yagmurlu & Sanson, 2009). Longitudinal studies show that parental warmth predicts adolescent prosocial behaviors. In contrast, parental strict control is negatively and weakly linked to these behaviors. Bidirectional relations tests seem to indicate that prosocial behavior in early adolescence predicts parental warmth and later prosocial traits in adolescents (G. Carlo, Mestre, Samper, Tur, & Armenta, 2010). Thus, the fostering of prosocial behavior is complex, but results may indicate a positive feedback-loop between adolescents' prosocial behaviors and parental warmth.

Positive peer interaction have also shown a positive relationship with prosocial behaviors (Padilla-Walker, Fraser, Black, & Bean, 2015; van Hoorn, van Dijk, Meuwese,

Rieffe, & Crone, 2016). Scholars point out that adolescence is a period where youngsters seek out group identity and membership, enabling a space where one can establish positive and reciprocal relations, increase social competence and regulate and punish aggression (G. Carlo, 2006). Children who receive long-term peer acceptance show significantly higher levels of prosocial behaviors, than those who do not, indicating that positive peer interaction may have substantial effects over time (Dijkstra, Lindenberg, & Veenstra, 2007).

Lastly, media exposure has consistently been linked to social behaviors among children and adolescents, both antisocial and prosocial behaviors. General media exposure constitutes a major part of children and adolescents' typical day. Media encompasses traditional forms of media such as television, music and books, and newer forms such as gaming, cell-phone use and social media. According to a representative probability based survey of 2,568 8-18-year-olds in the U.S., children and adolescents average 6 to 9 hours of media exposure every day (Rideout, 2016). The majority of research concerning media exposure on children and adolescents has focused on the negative effects of violent and aggressive media, and has found a plethora of negative outcomes (Bushman & Huesmann, 2006; Ferguson, 2015). Some researchers argue for a bias in research attention regarding media effects on children, claiming that there are hundreds of studies on the effects on violent media, and only a few dozen on positive social and educational effects of positive media on children and adolescents (de Leeuw & Buijzen, 2016). However, there are several recent studies linking prosocial media to prosocial behavior (Mano, 2014; Padilla-Walker, Coyne, Collier, & Nielson, 2015; Prot et al., 2014) and one recent meta-analysis reported a significant effect between prosocial media use and more prosocial behavior (Coyne et al., 2018).

Coyne et al. (2018)'s meta-analysis, including over 70 studies, highlights the difficulties in operating with general variables such as "media" and "prosocial behaviors". In order to reach more practical and stronger conclusions, they argue for more precise

nomenclature. For example, their meta-analysis coded for different subtypes of prosocial behaviors, such as “helping”, “sharing” and “donating”, and different types of media, splitting them into passive (e.g. watching tv, listening to music) and active (e.g. video gaming, use of social media). Results showed a significant association between prosocial media on helping behaviors and prosocial thinking, but not on donating and sharing. In addition, passive media showed a larger effect size than active media, although both were statistically significant (Coyne et al., 2018). Conceptually, the differences between passive and active media are obvious (i.e. engagement, commitment, investment), and as indicated by Coyne et al. (2018), there might be differences in outcomes as well. However, the research on more active forms of media (e.g. social networking, vlogging, chat forums) and prosocial behavior is scarce, except for gaming (Greitemeyer & Mügge, 2014). The research on active forms of media (i.e. social media) and *online prosocial behavior* might therefore be even more limited. However, the research on offline prosocial behavior and its findings during the last 50 years warrants a greater interest in its online counterpart, and this study aims at reviewing that research.

### **Online Prosocial Behavior**

Online prosocial behavior, or cyberprosocial behavior (Wright & Li, 2012), refers to prosocial behavior in a digital context (i.e. being on the internet). As previously mentioned, only one book chapter (Wright & Li, 2012) has attempted a summary of the research on OPB, and no reviews exist. I argue that the need for a systematic review is warranted due to several reasons.

First, the chapter by Wright and Li (2012) compiled much of the seemingly relevant research on online prosocial behavior, yielding a wide picture, unable to draw practical conclusions or future directions. The chapter details a historical account of online prosocial behavior, starting with prosocial behavior during in which the internet was just a message board, in the 1980`s (Schneider, 1986), up to prosocial behaviors on social networking sites

(Wright & Li, 2011). The authors operated with a wide definition of prosocial behaviors, including online mentoring, donating to online charities, virtual voluntarism, helping through electronic groups and social networking services. The research on prosocial behaviors on SNS and online gaming prior to 2012 was limited, as the authors discussed only 4 articles on the subject (Ferguson & Garza, 2011; Sudzina, Razmerita, & Kirchner, 2015; C. C. Wang & Wang, 2008; Wright & Li, 2011). Such a wide definition of prosocial behaviors on social media today may be too wide as it may encapsulate inherently different forms of prosocial behaviors. Evidence suggest that there are different forms of helping, and that they may differ on the basis of motivation, targets and outcomes (G. Carlo, Hausmann, Christiansen, & Randall, 2003; G. Carlo & Randall, 2002; Padilla-Walker & Carlo, 2015). Thus, prosocial behaviors directed at individuals online compared to prosocial behaviors directed at organizations and large groups (e.g. donating or voluntarism) may differ substantially. In order to obtain a more specified account of adolescents` online prosocial behavior, this review seeks to investigate online prosocial behaviors directed at particular others, excluding donations and voluntarism, and including forms of communication between individuals online.

Second, although the chapter by Wright and Li (2012) was comprehensive, the studies enlisted may no longer be generalized or relevant, due to the continuous and enormous evolution of social media during the last 15 years. As the review detailed studies conducted in the interval from 1980 to 2011, with the majority of them being conducted prior to 2005, many of the studies missed the advent of Facebook in 2004 ("Facebook," 2020) and smartphones, particularly the Iphone in 2007 (Kerris & Dowling, 2007). Arguably, the landscape of social media has transformed since 2005, as well as the size of the user base. Thus, there is a clear need for a new and updated review.

Third, online prosocial behaviors are arguably in need of research attention, as the research on offline prosocial behavior yield findings contributing to adolescent well-being and happiness. In their book chapter, Wright and Li (2012) outlines that cyberprosocial behavior may result in the same benefits as offline prosocial behavior, both for the receiver (Brennan, Moore, & Smyth, 1992; Sudzina et al., 2015) and for the helper (McAleer & Bangert, 2011; Mukherjee, 2010), indicating the need for more research on the topic. The online world may even be more suited for prosocial behaviors than the offline world. For example, the cyber context offers more flexibility to people receiving or giving help compared to the offline world, allowing individuals to receive or give aid even when restricted by physical handicaps (Hassett, Lowder, & Rutan, 1992), geographical location or time.

Fourth, just as the potential for harmful behaviors on the internet is ample (i.e. cyberbullying), the potential for prosocial behaviors is also extensive. Content analyses of online messages in blogs, chats and social networks indicate the ominous presence of prosocial behaviors in terms of empathic and supportive comments and messages (Baym, 2002; Thelwall, Wilkinson, & Uppal, 2010). The cyber context contains an abundance of possible helpers and receivers, and a variety of prosocial behaviors are being performed and received on social media. Adolescents use social media to give and receive support from informal peer networks (K. Gibson & Trnka, 2020), but also from strangers (M. Gibson, 2016), to share emotions and to respond aptly to emotion sharing (Bazarova, Sosik, Choi, Cosley, & Whitlock, 2015; Vermeulen, Vandebosch, & Heirman, 2018), to help each other when playing online games (C. C. Wang & Wang, 2008) and cooperate with adolescents they identify with (Kim & Kim, 2017). They are more willing to confide in friends than in adults and professionals (Michelmore & Hindley, 2012), indicating that a lot of online prosocial behavior remain unnoticed by parents, teachers and other authority figures in their lives. Most of this research is qualitative, using focus groups or interviews, with a low number of



respondents. Thus, it is hard to form a comprehensive overview of to what degree adolescent`s time on social media concerns online prosocial behavior.

### **Present Study**

The aim of the present study is to conduct a systematic review on the relationship between social media use and online prosocial behavior in adolescence, in order to answer the research question: to what extent is use of social media related to online prosocial behaviors among adolescents?

**Systematic review.** There are various forms of research methods, each suited to provide answers to different research questions. Thus, the research question should indicate what kind of research method the study needs to use. In the next sections I will briefly outline the following. Firstly, why the present research question demands quantitative primary studies. Secondly, why the present research questions indicate the need for observational studies, and not experimental studies, and why experimental studies may be hard to conduct when operating with complex social variables (i.e. online prosocial or antisocial behavior). Thirdly, why the present research question demands a review, and why it may be beneficial to conduct a systematic review.

**Quantitative primary studies.** The present research question seeks to investigate a relationship between two variables. Such an investigation is quantitative in nature. According to Creswell (1994) quantitative research is a type of research which collects numerical data and uses mathematical methods to analyze that data in order to explain phenomena. A variable is simply something, or in possession of something, that varies. The variables in question are “online prosocial behaviors” and “use of social media”. Operational definitions of a variable are the set of procedures used to measure or manipulate it (Cozby & Bates, 2015). The use of operational definitions enables researchers to be confident in how other

researcher choose to measure the variable of interest. This ensures good communication between researchers in a field of study. It may also aid the process of data-piling, in which results from different studies can be compiled (e.g. meta-analysis), because most of the studies used the same instrument to measure the variables and hence, may have used the same unit of measurement.

Qualitative studies, on the other hand, are not suited to answer the present research questions, as qualitative research focuses on how people behave in natural settings and seeks to describe their world in their own words. Within this method of research, researchers emphasize collecting in-depth information on relatively small samples (i.e. few individuals). Results are typically expressed in non-numerical terms using language and images, and the conclusions are based on interpretations drawn by the investigator (Cozby & Bates, 2015). Qualitative research is therefore more suited to describe how an individual or several individuals *experience* a phenomenon (e.g. social media), not to quantify the relationship between two variables. Thus, the present research question indicates the need for quantitative research in order to provide an appropriate answer.

***The need for observational primary studies.*** Quantitative research can grossly be split into correlational and experimental research. Correlational or observational studies examine the relationship among variables by making observations and measures, in order to establish that the variables vary together (Cozby & Bates, 2015). For example, Laible et al. (2004) measured level of offline prosocial behaviors and self-esteem among adolescents, and noted that they varied significantly together (i.e. were correlated). On the other hand, experimental research involves direct manipulation and control of variables of interest. The aim is to establish cause and effect. This is enabled by manipulating an independent variable and observing the response on the dependent variable, all the while controlling for confounding variables. Confounding variables can be defined as any variable that influences the

relationship between the independent and dependent variable. In a randomized controlled trial, controlling for confounding variables is achieved by randomizing a large sample of participants into a control group and an experimental group. In this way, individual factors will affect the outcome in both groups equally (e.g. randomly), and the observed difference between the groups will be attributed to the manipulation of the independent variable – typically what separates the experimental group from the control group. For example, Aknin et al. (2013) randomly assigned participants into either buying items for charity or to buying the same items for themselves, thereby manipulating the independent variable of prosocial behavior (prosocial spending). After the manipulation, the researchers measured levels of subjective well-being, where the experimental group reported significantly higher positive affect than the control group.

Another group of alternative explanations of the results from an experiment relates to the issue of demand characteristics (Orne, 1962), which is any feature that may inform the participants of the purpose of the study. Researchers are concerned that when participants form expectations about the hypotheses of the experiment, and hence, how the researchers might want them to respond, they will do what is necessary to confirm the hypothesis. The most common way to counteract demand characteristics is deception – making the participants believe that you are studying something else than what you are actually studying. The easiest ways to do this is to provide filler items in questionnaires, thereby disguising the variable of interest among many other possible variables, or to provide cover stories to explain the purpose of the study.

Demand characteristics relate to participant expectations. Another type of expectations that might influence the results of a study is experimenter expectations. Experimenters are typically highly aware of the purpose of the study, and their expectations have been showed to bias the results, often called experimenter bias (Rosenthal, 1969). One solution to control for

experimenter bias may be to train experimenters and practice displaying consistent behaviors across the different groups. Another solution may be to present the experimenter to the groups simultaneously, ensuring the same information and behavior to all groups. Finally, double-blind experiments have been used. In a double blind-experiment, neither the participant, nor the experimenter are aware of which group is selected for the experimental condition (Cozby & Bates, 2015). For example, in medical research, to control for experimenter bias, the researchers may be unaware which groups is getting the treatment drug and which is getting the placebo drug.

Most researchers aim to establish a cause and effect-relationship. However, experiments are expensive and time-consuming to execute, and they may not be feasible or ethical to conduct. Therefore, the majority of psychology studies are observational, rather than experimental. Take for instance the vast research previously mentioned on cyberbullying. Numerous observational studies have demonstrated an association between being victimized by cyberbullying and depression (Kowalski & Limber, 2013). In order to establish a cause and effect relationship (e.g. cyberbullying leads to depression in adolescents), and not merely an association, researchers would have to conduct a randomized controlled experiment where the participants in the experimental group would receive cyberbullying and the control group would not. To control for demand characteristics, the groups would probably not be informed how they would be manipulated (e.g. bullied or not). Controlling for participants expectations in such an experiment, where the manipulation is rather clear, is very difficult. More importantly, it is highly unethical and would never gain the approval of ethical committees in psychological research. Thus, researchers in psychology often turn to observational studies, preferably longitudinal ones, and more advanced statistical modelling to strongly indicate a cause-effect relationship.

***The need for a review.*** However, one or a few studies is not enough to clearly establish and generalize a link between two variables. Therefore, reviews are conducted in order to synthesize all published primary papers on a topic. For example, a vast number of correlational studies have looked at the association between SNS use and symptoms of depressions. Most of these studies report a positive correlation, but the strength of the association (i.e. the size of correlation coefficients) varies between the studies. To obtain a clearer picture of the actual strength of the association, Yoon, Kleinman, Mertz, and Brannick (2019) conducted a meta-analysis on the relationship between SNS use and depressive symptoms. A meta-analysis is a statistical technique whereby researchers compile the data from the included studies, typically resulting in a single effect size. Yoon et al. (2019) identified 33 studies for inclusion and compiled effect sizes from all of the studies linking SNS use with depressive symptoms, yielding a small positive correlation ( $r = 0.11$ ).

With regards to the present research question, the aim is to investigate to what extent online prosocial behavior is related to social media use among adolescents. “To what extent” refers to the numerical strength of the relationship, detailing the use of quantitative studies. As previously mentioned, in order to establish a relationship between two variables, one study is not enough, and researchers conduct reviews of published studies on the topic. There are different forms of reviews, each suited to different goals in research.

***Conducting a systematic review.*** A host of different forms of reviews exist, but the standard forms of literature reviews are narrative reviews (or traditional reviews) and systematic reviews. According to O'Connor, Whitlock, and Spring (2018), a systematic review is secondary research which appraises and synthesizes primary research papers, using a rigorous and clearly documented methodology in both search strategy and the selection of studies. The aim is to minimize bias as well as to document the process and decisions that have been made, enabling the review to be reproduced. According to the Cochrane Handbook

for Systematic Reviews of interventions (Higgins & Green, 2008), there are several characteristics of a systematic review. There is a clearly stated set of objectives with pre-defined eligibility criteria for studies. Second, there is an explicit, reproducible methodology. Third, a systematic search attempts to identify all studies which meet the eligibility criteria. Fourth, a methodological assessment of the included studies (i.e. assessment of risk of bias and quality of evidence). Fifth, a systematic presentation and synthesis of the data extracted from the studies. The extraction and presentation of data *may* result in a meta-analysis.

A narrative review, on the other hand, is typically broader in scope, may be theory-driven and often gathers information to support a particular viewpoint. A narrative review is therefore more vulnerable to bias than a systematic review. It has a non-standardized methodology, meaning it does not follow a pre-defined protocol. Searches are not exhaustive, often rely on researcher`s own knowledge of the literature, and reasons for including and excluding articles may be lacking. Thus, it may be substantially hard to replicate a narrative review.

With regards to the present research question, a systematic review is appropriate as the research question is well defined, the field is narrow, and I do not base the aim for this paper on a theory or a previously formed hypothesis. Preferably, a meta-analysis will be executed, depending on the data extracted from the included studies.

***The usefulness of systematic reviews.*** The use of systematic reviews has increased. One explanation may be due to the fact that the number of scientific publications have multiplied by 2.3 since 2000, reaching 1.9 million in 2016 (Science and Technology Observatory, 2019). As previously mentioned, single studies are not enough to establish clear relationship or to draw practical conclusions. Therefore, reviews must aim to compile all the relevant studies on the potential relationship in order to draw conclusions. An increase in scientific publications should therefore indicate a need for more systematic reviews as well.

Another possible explanation is that systematic reviews currently inform policy in an increasing number of countries (Vogel et al., 2013). Thus, policymakers are starting to understand the scientific need to rely on systematic compilations of data when drawing conclusions, compared to the reliance on single primary studies. In addition, media attention to systematic reviews has also increased (Chalmers & Fox, 2016), which may be indicative of journalists becoming aware of the dangers basing stories on single study results. Both these trends may contribute to a supply and demand relationship for systematic reviews.

Along with the increase in scientific publications is the rising number of publishing scientists and academic journals (Johnson, Watkinson, & Mabe, 2018). On the surface, this could be a positive sign of countries and institutions investing in research and development. Unfortunately, yearly reports of scientific publications show a substantial rise in low-quality publications – publications which are lacking substantial peer-review, even when counting for the general increase in publications (National Science Board, 2018). Consequently, an increase in publications may not be indicative of scientific development. With compiled sets of scientific data (i.e. reviews) potentially having a real-life impact (e.g. through policy decisions and lawmaking) on society, accurate and thorough quality assessments of primary studies in systematic reviews are essential.

In sum, to investigate the possible relationship between the two variables OPB and SM among adolescents, a systematic review will be conducted on quantitative primary studies, in order to see if, and how much, these variables vary together. To ensure high quality of potential conclusions, a thorough quality assessment will be conducted on the included studies. The next sections will provide definitions of central constructs and the methods employed to investigate the present research question.

**Definitions.** Social media has proven to be hard to define, evident from the many different definitions in the literature. Several researchers (Jelenchick, Eickhoff, & Moreno,

2013; Sampasa-Kanyinga & Lewis, 2015; Seabrook et al., 2016) limit the construct to “social networking sites” (e.g. Facebook, Instagram and Twitter), which excludes other forms of social media (e.g. blogs and virtual game worlds) . As the literature on social media and prosocial behavior seems to be in its infancy and therefore to be quite small, this paper will use a wider definition of social media to capture as much relevant literature as possible. I have chosen to use the following definition offered by Kietzmann and colleagues (2011, page 1): “Social media employ mobile and web-based technologies to create highly interactive platforms via which individuals and communities share, co-create, discuss, and modify user-generated content” (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011).

Examples of such may be blogs, collaborative projects (e.g. Wikipedia), vlogs/social networking (e.g. Facebook), virtual social worlds (e.g. Second Life), content communities (e.g. Twitch, Youtube) and virtual game worlds (e.g. League of Legends, Apex Legends). The definition by Kietzmann and colleagues (2011, page 11) excludes other use of electronic or web-based programs, such as one-way communication of content (e.g. podcasts), online health related services (e.g. chat helplines) and real-time exchanges through technology (e.g. Skype and Facetime). Various chat and discussion forums will be included as the content is partly user generated.

Online prosocial behavior refers to “voluntary behavior carried out in an electronic context (/social media context) with the intention of benefitting particular others or promoting harmonious relations with others” (Erreygers, Vandebosch, Vranjes, Baillien, & De Witte, 2018a). Examples of online prosocial behavior include comforting a friend via digital technologies, online sharing of resources and information with a classmate, and helping peers out on social network sites. This definition excludes behaviors such as online donations to charities (i.e. activism), online volunteering and helping online organizations, as the



definitions of OPB focuses on *particular others* and thus the relational nature of adolescent behavior.

## Methods

### Protocol and Registration

For transparency, and in line with scientific principles, the protocol for this review was registered with the International Prospective Register of Systematic Reviews on December 12<sup>th</sup>, 2019 (Prospero; see link [https://www.crd.york.ac.uk/prospero/display\\_record.php?RecordID=162161&VersionID=1324735](https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=162161&VersionID=1324735)). It has also been registered with the Current Research Information System In Norway (CRISTIN; <https://app.cristin.no/projects/show.jsf?id=2038994>). This report follows the guidelines of APA 6<sup>th</sup> edition.

### Search Strategy and Databases

The databases PsychINFO, Ovid MEDLINE(R), EMBASE, COCHRANE Database of Systematic Reviews, Web of Science, Sociological Abstracts and Sociological Services Abstracts and Eric were systematically searched in December 9<sup>th</sup> and 10<sup>th</sup>, 2019. See Table 1 (For example of search strategy).

### Eligibility Criteria

The following eligibility criteria were developed in order to ensure that the search and selection process yielded studies of interest.

- a. Inclusion: For inclusion in this review, studies fulfilled the following eligibility criteria:
  - i. Participants: Age 13 to 18
  - ii. Exposure: Measurement of social media use

- iii. Outcome: Online prosocial behavior
  - iv. Studies published in peer-reviewed journals with full text available in English, Swedish, Danish or Norwegian.
  - v. Quantitative, non-experimental studies reporting on the relationship between the exposure variable and the outcome variable.
- b. Exclusion
- i. Social media use of which is not covered by Kietzmann and colleagues' definition (2011, page 1 or see "Definitions above").
  - ii. Online prosocial behaviors of which is not covered by the definition by Erreygers, Vandebosch, Vranjes, Baillien, and De Witte (2018b), thus excluding voluntarism and digital donations to organizations among others.

### **Data Extraction**

All papers from the automated database searches were collated using the Rayyan Systematic Reviews web app (Ouzzani, Hammady, Fedorowicz, & Elmagarmid, 2016). After duplicates were deleted, screening was conducted to ensure that studies fulfilled the eligibility criteria. The following information was extracted from each included study:

- a. Bibliography
  - a. Author(s)
  - b. Title
  - c. Journal
  - d. Year of publication
- b. Study characteristics

- a. Study design
  - b. Study setting
  - c. Country of origin
  - d. Participants
  - e. Gender distribution
  - f. Main aim of the study
  - g. How social media is defined and assessed
  - h. How online prosocial behavior is defined and assessed
  - i. Type of scales used
  - j. Data analysis methodology
- c. Results
- a. Main findings

### **Assessment of Risk of Bias**

One of the main characteristics of a systematic review is the methodological appraisal of the primary research. The extent to which a review can draw conclusions about the strength of a relationship or the effect of an intervention depends on whether the data from the included primary studies are valid. Thus, a review assesses the risk of bias within each primary study. A bias can be defined as a systematic error, or deviation from a true value, in results or inferences (Higgins, Altman, & Sterne, 2017). Flaws in the design, conduct and analysis of the study often produces biases. Some examples can be errors in the formulation of the research question, selection bias, information bias, bias in analyzing data and bias pertaining to the overall quality of the study. For example, illustrating selection bias, one review of case-control studies found exaggerated effects in studies using hospital-based control groups compared to population-based control groups (Huwiler-Müntener, Jüni, Junker, & Egger, 2002). Differences in the risk of bias among the included studies in a review

may help to explain for variation in the results. More rigorous studies are more likely to result in answers closer to the true value, and thus to be more consistent when replicated. Less rigorous studies have a higher risk of bias and are more likely to produce results further from the true value, and thus to be more variable (i.e. heterogenous) (Higgins et al., 2017).

Bias differs from imprecision. Bias refers to systematic errors or inaccuracy, in which replications of the original study would on average produce the (same) wrong answer. Imprecision, on the other hand, refers to random error – error due to chance or random variability (American Psychology Association, 2020). Thus, with multiple replications, imprecision would produce different effect estimates due to sampling variations. However, the net effect of random errors decreases with the number of observations (e.g. participants or measurements), meaning that the probability of deviation from true values in the results due to random errors is minimized along with increasing the size of the study. Thus, in addition to assessing the risk of bias in included studies, there should also be an evaluation of the probability of random errors, looking at the size of the sample and confidence interval of the results.

The tools for appraising quality and risk of bias in randomized clinical trials have been well established, much due to The Cochrane Collaboration. However, no established tool or gold-standard for assessing non-interventional studies exist (Jarde, Losilla, & Vives, 2012; Katrak, Bialocerkowski, Massy-Westropp, Kumar, & Grimmer, 2004; Sanderson, Tatt, & Higgins, 2007). For observational studies, especially case-control and cohort studies, The Newcastle-Ottawa Scale (NOS) for non-randomized studies has been widely used (Wells, Shea, & O'Connell, 2014). It has also been adapted for cross-sectional studies (Herzog et al., 2013), though it has not, nor has any other adaptations for cross-sectional studies, been thoroughly validated. However, the NOS adapted for cross-sectional studies has proven to be

quick, adaptable and to show moderate reliability, compared to the also widely used Appraisal Tool for Cross-Sectional Studies (AXIS) (Moskalewicz & Oremus, 2020).

**The Newcastle-Ottawa Scale.** The NOS is the product of a collaboration between the universities of Newcastle (Australia) and Ottawa (Canada) and was developed using a Delphi process. It has been tested on systematic reviews (Wells et al., 2014). The NOS focuses on cohort and case-control studies, considering eight items from three bias processes: selection of the groups, comparability of the groups and assessment of outcome and exposure. It uses a “star system” in order to give a semi-quantitative assessment of the risk of bias. Thus, each item is given one star if the study characteristic is satisfactory, except for comparability in which it is possible to receive two stars. The NOS which was adapted for cross-sectional studies uses the same star system, but 5 five stars are allocated to the selection dimension, two for comparability and three for outcomes (Herzog et al., 2013; Modesti et al., 2016). Herzog et al. (2013) operates with the following star evaluation: very good studies (9-10 points), good studies (7-8 points), satisfactory studies (5-6 points) and unsatisfactory studies (0-4 points).

The next section will briefly account for the dimensions in the adapted NOS for this paper. Each paper will be assessed on 3 dimensions of quality: selection, comparability and outcome. Selection consists of four elements. First, representativeness will be assessed based on sampling procedure and description of the sample (low quality = selected group/convenience sample/inadequate description, high quality = random sampling/sample somewhat representative using non-random sampling). Second, sample size will be assessed (low quality = no description/to small sample, high quality = justification (e.g. power analysis) or adequate sample size). Third, non-respondents will be assessed regarding recruitment rate and description (low quality = unsatisfactory recruitment rate, no summary data on non-respondents, high quality = basic summary of non-respondents in sampling frame recorded). Fourth, ascertainment of the exposure will be assessed based on appropriate

measures of social media use (low quality = non-validated self-report measure/not described, high quality = validated self-report measure/objective measure (e.g. “time-on-app-records”).

The second dimension, comparability, will be assessed based on the level of adjustment of data/controlling for confounders (low quality = unadjusted/unclear, high quality = adjusted for at least one sociodemographic factor, preferably known/relevant confounders). Finally, the third dimension of outcome will be assessed focusing on ascertainment of OPB (outcome variable) (low quality = non-validated self-report measure/no description, high quality = validated self-report measure or parental and peer-report measure) and statistical test (low quality = unclear/not described, high quality = clearly described, appropriate and measures of association presented including confidence intervals and/or probability level (p-value)).

## **Results**

The search in PsycInfo (n=77), Ovid MEDLINE(R) (n=70), Embase (n=35), Cochrane (n=9), Web of Science (n=160), Sociological Abstracts and Sociological Services Abstracts (n=6) and Eric (n=20) resulted in 377 articles. Duplicates were deleted manually in the Endnote library, resulting in 295 articles. All papers were collated using the Rayyan Systematic Reviews web app (Ouzzani et al., 2016). Two independent reviewers (Jens Christoffer Skogen and Christoffer Lysenstøen) conducted a blinded screening of title and abstract based on general relevancy concerning quantitative studies on social media and prosocial behavior. 283 of 295 articles displayed agreement, yielding a total agreement score of 95,6%. The remaining 12 articles of disagreement were reviewed by a third reviewer (Gunnhild Johnsen Hjetland) and discussed in order to reach confidence in exclusion and inclusion. Primary screening and secondary reviewing and discussion excluded in total 276 articles.

Thus, 19 articles (Coyne, Padilla-Walker, Day, Harper, & Stockdale, 2014; Erreygers, Vandebosch, Vranjes, Baillien, & De Witte, 2017; Erreygers et al., 2018b; Erreygers, Vandebosch, Vranjes, Baillien, & De Witte, 2019; Greer, 2018; Guo, Sun, & Li, 2018; Jin & Li, 2017; Lane & Dal Cin, 2018; R. B. Lee, Baring, Maria, & Reysen, 2017; Y. J. Lee, 2020; Loparev, 2016; Lu, Hao, & Jing, 2016; Machackova, Dedkova, Sevcikova, & Cerna, 2018; Meeus, Beyens, Geusens, Sodermans, & Beullens, 2018; Parlangei et al., 2019; Prot et al., 2014; Ranney, 2016; X. Wang & Xing, 2018; Wartberg et al., 2016) were assessed for eligibility based on full texts. 17 articles were evaluated as not fulfilling the inclusion criteria due to measuring offline prosocial behavior instead of online prosocial behavior (Coyne et al., 2014; Greer, 2018; Jin & Li, 2017; Lane & Dal Cin, 2018; R. B. Lee et al., 2017; Y. J. Lee, 2020; Meeus et al., 2018; Prot et al., 2014; X. Wang & Xing, 2018; Wartberg et al., 2016), not containing measurements of social media use (Erreygers et al., 2018b; Guo et al., 2018; Loparev, 2016; Lu et al., 2016; Machackova et al., 2018) or not reporting any analyses or descriptive statistics on the relationship between social media use and online prosocial behavior (Parlangei et al., 2019; Ranney, 2016). To be clear, 2 of the excluded articles did include satisfactory measures of social media use and online prosocial behavior, but did not, through their texts, report data regarding the variables of interest or analysis of the relationship between them. See flow diagram in Figure 1.

The aim of this thesis is to provide a quantitative assessment of the extent to which social media use is related to OPB among adolescents. Based on the present search, no study had the sole explicit aim to investigate the association between these variables. However, as part of a study design and/or several measures, four studies (Erreygers et al., 2017; Erreygers et al., 2019; Parlangei et al., 2019; Ranney, 2016) measured social media use and OPB among adolescents. Only two of these (Erreygers et al., 2017; Erreygers et al., 2019) reported data on the relationship between the variables. The two included studies are authored by the

same researchers. Erreygers et al. (2017) was published in the journal “Media Psychology” and Erreygers et al. (2019) was published in “Journal of Happiness Studies”. For a summary of the results, see Table 2.

### **Study Characteristics**

**Participants and samples.** The mean age for the participants in the studies ranged from 13.51(Erreygers et al., 2019) to 13.61 (Erreygers et al., 2017). The sample sizes were 136 (Erreygers et al., 2019) and 1720 (Erreygers et al., 2017). The samples contained slightly more girls, 54% (Erreygers et al., 2017) and 51% (Erreygers et al., 2019). Erreygers et al. (2017) recruited participants through schools whereas Erreygers et al. (2019) used schools, universities, social media and a market research agency as recruitment arenas. Both studies were carried out in Belgium.

**Aims, study design and measures of the included studies.** The aims of the studies differed and consequently, the study designs were different. Erreygers et al. (2017) aimed to investigate dimensions of online antisocial and prosocial behavior and how these were related to adolescent`s experienced emotions and their use of digital media. In order to do so the study used a cross-sectional design, obtaining several measures of the same population at a specific point in time. Erreygers et al. (2019) wanted to investigate spillover (context) and crossover (person) effects of adolescents` and their parents` daily happiness on adolescents` online prosocial behavior via a daily diary. Spillover effects refer to the transmission of emotional states from one context (e.g. school) to another context (e.g. home) within individuals. Crossover effects refer to the transmission of emotional states between individuals. The study used a repeated-measures design via. a daily diary, obtaining data on parental and adolescent happiness two times a-day, and adolescent OPB at evening. The study also included SM use as a control variable as previous studies had indicated that SM could be a confounder in the association between happiness and online prosocial behavior.



Both studies collected data using self-report measures. Erreygers et al. (2017) collected data on OPB and SM use once at participants' school and Erreygers et al. (2019) collected data once every evening over a period of five days. Social media use was defined and measured somewhat differently. Erreygers et al. (2017) measured "internet use". The study used a version of the EU Kids Online questionnaire for internet use, including 11 internet activities. Although the scale was adapted for Erreygers et al. (2017), the original version has been revised and validated as part of a research toolkit used by the EU Kids Online network funded by the EC (DG Information Society) Safer Internet Program (project code SIP-KEP-321803). To explore their adapted version, the researchers ran an exploratory factor-analysis. The questionnaire yielded 3 factors: one related to online gaming (i.e. playing online games with others), one related to use of social and audiovisual media (i.e. visiting a social network site) and one related to functional use of digital media (i.e. sending or receiving an email). Erreygers et al. (2019) measured "use of digital technologies for interpersonal contact" such as use of SNS, instant messaging and sending e-mails and texts.

The two studies used similar assessments of OPB. Erreygers et al. (2017) assessed OPB as part of a larger scale including online antisocial behavior. The scale included 14 OPB elements and 11 OAB elements. Frequency of these behaviors as both the performer and the receiver were assessed. The OPB part of the scale consisted of five items adapted from the scale used by Wright and Li (2011) (i.e. "cheering up", "offer help", "say nice thing", "let someone know I care about them") and 9 adapted items from two scales (Caprara & Pastorelli, 1993; G. Carlo & Randall, 2002). Two of the items were poorly understood by the participants and thus not included in the final analysis, yielding a total of 12 items. The scale was later validated using the same sample, measuring the participants at a wave 2 (second time). Exploratory factor-analysis yielded 10 items, as two of the items were omitted due to low factor loadings compared to the rest of the items. The authors named the scale the Online

Prosocial Behavior Scale (OPBS) (Erreygers et al., 2018a). Erreygers et al. (2019) assessed OPB using a shortened and modified version of the OPBS for diary use, leaving five items.

**Data analysis methodology.** Erreygers et al. (2019) used a time-based daily diary design. Participants were assessed two times a day on OPB and happiness, and once a day on SM use. The study used a 1-1-1 multilevel structural equation model (MSEM) with fixed slopes in order to test the mediation model of T1 happiness predicting T2 OPB via T2 happiness (T1=after school/work, T2=adolescent bedtime). For the association between OPB and SM use, SM use (use of digital technologies) was used as a control variable in the multilevel SEM-model for both within- and between-persons. Erreygers et al. (2017) measured OPB, emotions and SM use, in a standard cross-sectional design. In their main analysis, a structural equation model for association between online behaviors and emotions was estimated. In a post-hoc analysis, a structural model with SM used as a mediation variable between online behavior and emotions was estimated.

### **Association Between Exposure and Outcome**

Both studies reported a significant association between use of social media and OPB. Erreygers et al. (2017) found that online gaming and using audiovisual and social media were related to OPB. Online gaming was related negatively to performing ( $b = -0.217, p < .001$ ) and receiving ( $b = -0.252, p < .001$ ) online prosocial behavior, whereas using audiovisual and social media was strongly positively associated with performing ( $b = 0.768, p < .001$ ) and receiving ( $b = 0.956, p < .001$ ) OPB. Erreygers et al. (2019) found that adolescents' use of digital media was positively correlated with (performing) OPB ( $pOPB, UDT = 0.39, p < 0.001$ ).

One study reported an association between social media use and online prosocial behavior in terms of unstandardized coefficients (Erreygers et al., 2017) and one study

reported an association in terms of standardized coefficients (Erreygers et al., 2019). Path (or regression) coefficients relate to changes in the dependent variable to changes in the independent variable. Consequently, it acts as a measure of association (Grace, Johnson, Lefcheck, & Byrnes, 2018).

For linear regressions, unstandardized (raw) coefficients reflect the expected linear change in the dependent variable with each unit change in the predictor. Erreygers et al. (2017) found, for example, that online gaming was related negatively to performing (b = -0.217,  $p < .001$ ). This means that, on average, a one-point increase on the gaming use-scale predicts a 0.217 decrease on performing OPB scale. Thus, unstandardized coefficients are often intuitive to interpret and can be used directly in calculations and analysis. They can also be used to make comparisons within the regression equation, as long as only one measurement scale is in use.

If the measurement scales used for the independent variables are different however, the variables cannot be compared in most cases. For example, if you regress online prosocial behavior scores on both “time spent on social media” and “self-esteem”, the variables will use different scales (e.g. hours and “self-esteem level”) and the raw coefficients cannot be compared. For comparisons with different measurement scales, researchers standardize the coefficients. Standardizing turns the coefficients into equivalent units (i.e. mean 0 and standard deviation 1), based on the standard deviations of the variables (Grace et al., 2018). Thus, standardized coefficients, sometimes called beta weights, refer to how many standard deviations a dependent variable will change, per standard deviation increase in the independent variable (Grace & Bollen, 2005). In effect, beta weights on, for example social media use and self-esteem, can be directly compared, which enables comparisons of the relative strength of their relationship with online prosocial behavior.

Comparisons between different independent variables cannot be done with unstandardized coefficients, as previously mentioned, unless the same measurement scale has been used for all variables. In their study, Erreygers et al. (2017) used the same measurement scale for all of the independent variables (i.e. audiovisual and social media, gaming and functional use of media) and was thus able to compare the relative strength of the relationships. However, as the standardized coefficients have not been reported, the strength of the relationship (i.e. association) cannot be directly and numerically evaluated (i.e. weak, moderate and strong). It is possible to calculate standard coefficients using number of participants and standard error, and subsequently convert it into Cohens d. This is a standard process in conducting meta-analyses (Higgins & Deeks, 2017). However, standard error was not reported in Erreygers et al. (2017).

### **Risk of Bias Assessment**

Based on NOS, one study was unsatisfactory (Erreygers et al., 2019) and one was satisfactory (Erreygers et al., 2017). Erreygers et al. (2019) is considered to be at a high risk of bias. The sample size was small and unjustified, the study used convenience sampling, a non-validated self-report measure was used to measure social media use, and relevant confounders for the relationship between OPB and SM use were not adjusted for. In summary, there is a high risk of bias in the study, and one should be careful when generalizing the results. Erreygers et al. (2017) is considered to be at moderate risk of bias. Even though no sample size justification was reported, the sample size ( $n = 1720$ ) is considered to more than big enough to satisfy a conservative assumption about the nature of the true population value, as long as an adequate sampling technique has been applied and the response rate is satisfactory. Random sampling was used, and the sample can be considered to be representative of the average in the target population, as 13 of 29 invited schools participated. Full information maximum likelihood (FIML) was used to estimate the model

and handle missing data (Enders & Bandalos, 2001), however the missing data was not described. The study is at risk of bias because it relies on self-report in measuring both the exposure and the outcome variable and no relevant confounders for the relationship between OPB and SM use were adjusted for. The study used an adapted and thus unvalidated version of a validated self-report measure to measure social media use. However, the scale is only slightly adapted, and at face value seem to contain the same elements as the original scale. Consequently, the use of this adapted scale will not lower the overall quality of the study.

It is important to note that neither of these studies' main aim was to investigate the relationship between OPB and social media use. Both studies included SM use a possible confounder or mediator. Thus, the lack of control with regards to cofounders between OPB and SM use, is not necessarily evidence of low study quality, because the studies did adjust for confounders with regards to the relationship between their main variables of interest. However, not controlling for confounders between OPB and SM use indicates a risk of bias in the results reported on that particular relationship. Consequently, the results should be approached with caution. For a summary of the risk of bias assessment, see Table 3 (For a detailed account of the risk of bias assessment, see Appendix B).

### **Meta-analysis**

In the protocol (registered at PROSPERO: [https://www.crd.york.ac.uk/prospero/display\\_record.php?RecordID=162161&VersionID=1324735](https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=162161&VersionID=1324735)), a strategy for data synthesis was described. More specifically, a meta-analysis was to be conducted if the review included at least four studies with similar enough designs (i.e. low heterogeneity). Two studies fulfilled the eligibility criteria and thus a meta-analysis will not be conducted.

### **Discussion**

This paper`s aim was to examine to what extent social media use is related to online prosocial behavior among adolescents. A systematic review of primary studies on that relationship was conducted and resulted in two studies which met the eligibility criteria.

Although both studies included in this review reported an association between social media use and online prosocial behavior among adolescents, it is clear that the amount of quantitative data and studies on the present relationship is scarce. In addition, the quality of the present data may not be adequate. Consequently, associations cannot be established based on the current research. However, some points from these articles will be discussed, which may aid the future research directions on the topic. Moreover, the fact that the review only revealed two eligible studies is a finding in itself, illuminating the scarcity of research on online prosocial behavior.

Therefore, the next sections will discuss (a) the relationship between SM use and OPB among adolescents, (b) the quality of the data regarding this relationship and (c) the scarcity of eligible studies on the subject.

### **The Relationship Between Social Media Use and Online Prosocial Behavior Among Adolescents**

Both studies included in this review reported an association between social media use and online prosocial behavior among adolescents. In other words, the more social media adolescents use, the more online prosocial behavior they display. This is in line with previous research on adolescents (Lister, 2007), young adults (Wright & Li, 2011) and adults (Kinnunen, Lindeman, & Verkasalo, 2016). More specifically, Lister (2007) found an association between computed mediated communication, defined as instant messaging and visiting social media sites (coined as “blogging”), and online prosocial behaviors among American adolescents in 7<sup>th</sup> grade (12-13 years), 9<sup>th</sup> grade (14-15 years) and 11<sup>th</sup> grade (16-17

years). Wright and Li (2011) found that time spent using electronic technologies were correlated with online prosocial behaviors through that particular technology, including social networking sites, chat programs, email and text-messages, among young adults (mean age = 20 years). Kinnunen et al. (2016) found use of social media, defined as time spent on different social media sites, such as Facebook, Youtube and Wikipedia, was associated with helping and moral courage among university students in Finland (mean age = 26 years). These studies did not fulfill the eligibility criteria and thus were not included in the review. However, they do serve as corroboratory evidence of a possible association between SM and OPB.

One of the studies (Erreygers et al., 2017) in this review reported different associations for different subtypes of social media use. The authors reported a positive association between OPB and audiovisual and social media (i.e. visiting a social network site or vlogging-site), a negative association with gaming (i.e. playing online games with others) and no significant relationship with the functional use of digital media (i.e. sending or receiving an email). These results are supported by Wright and Li (2011) who found a stronger positive association between chat programs and social networks and OPB, than between e-mails and text-messages and OPB, among young adults. In other words, youth seem to be engaging more in OPB when visiting a social network site or vlogging site, than when they send text-messages or emails. In sum, these studies indicate that different forms of social media may relate to OPB in different ways. "Classic social media", such as social network sites, may be positively correlated with OPB, functional use of social media may be weakly correlated or not correlated with OPB and online gaming may be negatively correlated with OPB.

One study (Erreygers et al., 2017) measured both receiving and performing prosocial behavior, finding associations with audiovisual and social media use for both variables of OPB. In other words, the more adolescents visited social media or used audiovisual media, the

more prosocially they behaved online as well as received more prosocial reactions from others. Drawing from research that indicates an association between prosocial media content and prosocial behavior (Coyne et al., 2018), it is plausible that consuming positive audiovisual media content and messages could elicit online prosocial behaviors, which could, in turn, elicit prosocial reactions from peers.

### **The Strength of the Data in the Present Review**

Both studies found notable associations between SM and OPB. One of the studies (Erreygers et al., 2017) also indicated differences in the relationships between OPB and typical social media (i.e. social networking sites) and OPB and online gaming. Studies published prior to 2014 (Lister, 2007) and studies on adults (Kinnunen et al., 2016; Wright & Li, 2011) support these findings.

Although these results are interesting, they are, however, not strong enough to establish associations. First, neither of the two studies controlled for confounding variables, thereby leaving the door open for alternative explanations. For example, some studies have indicated gender differences in adolescent (offline) prosocial behavior (Caravita, Di Blasio, & Salmivalli, 2009; Eisenberg, Zhou, & Koller, 2001; Van der Graaff, Carlo, Crocetti, Koot, & Branje, 2018). Moreover, Lister (2007) found that females reported a higher degree of online prosocial behavior than males. However, Wright and Li (2011) and C. C. Wang and Wang (2008) found no gender differences in online prosocial behavior. With the effects of gender remaining unclear, controlling for gender as a possible confounder in the SM use-OPB relationship would be beneficial.

Research on offline prosocial behavior among adolescents and children indicate several possible relevant confounding variables. Studies (Gustavo Carlo et al., 2007; Jambon & Smetana, 2014; Kanacri et al., 2013) show a decline in prosocial behaviors during early and



middle adolescence, suggesting age as relevant confounder. Personality has also been shown to strongly predict prosocial behaviors among adolescents, especially morally relevant personality traits and resiliency (Padilla-Walker & Fraser, 2014; Xie, Chen, Lei, Xing, & Zhang, 2016). Some studies have indicated significant links between socio-economic status and prosocial behavior (Eisenberg et al., 2007). Prosocial behavior in rural areas may be relatively low due to depleted social capital and community resources (Gustavo Carlo et al., 2007), compared to adolescents from more urban areas and middle-to-high SES-families (Van der Graaff et al., 2018). However, one large study (Plenty, Östberg, & Modin, 2015) indicated the importance of the school environment, showing that students who experience more manageable school demands and social support from teachers and classmates are more likely to display more prosocial behaviors. Thus, both SES and school environment could be important confounders. Lastly, the recipient of prosocial behavior may be a relevant confounding factor, as evidence indicate that prosocial behaviors in adolescence increase towards friend, but not towards members of one`s family (Padilla-Walker et al., 2013).

Second, an assessment of the risk of bias in the studies revealed that one study (Erreygers et al., 2019) was unsatisfactory and thus at a high risk of bias, and the second study (Erreygers et al., 2017) was barely satisfactory and thus with a moderate risk of bias. One of the reasons for this is the use of self-report measures in both studies. Although highly cost-effective, self-report measures are at high risk of social desirability bias (SD), especially relevant in measuring online prosocial behavior. SD can be defined as the tendency for research subjects to give socially desirable responses (i.e. answers which will be viewed favorably by others), instead of responses reflecting their true feelings. It can take the form of overreporting “good behavior”, underreporting “bad behavior”, or a combination of both. Research show that SD influence the results in almost half of all studies using self-report (Van de Mortel, 2008).

Social desirability scales can be used to limit the effects of SD, however, neither of the studies in this review did so.

In addition, self-report methods in relation social media use have demonstrated low to moderate correlations with actual use, when comparing self-reports and tracking data. This has been shown when measuring both internet use (Araujo, Wonneberger, Neijens, & de Vreese, 2017; Scharrow, 2016) and social network use (Junco, 2013; Scharrow, 2016). The typical tendency is overreporting (Araujo et al., 2017). Although the “gold standard” of measuring online behavior would be triangulation (i.e. use multiple data sources, such as tracking data and self-report), realistically, self-report measures will remain a crucial measure of internet and media use because of the low cost-high benefit relationship. Some researchers therefore highlight the need to investigate factors that influence under- and overreporting of online use, and to develop survey designs that aid respondents into providing the most accurate estimates of their own behavior (Araujo et al., 2017).

Third, although both studies used a validated instrument of OPB (OPBS), the OPBS is a global measure of OPB. Global measures of prosocial behavior have been criticized (Coyne et al., 2018; Padilla-Walker & Carlo, 2015). The vast research base on (offline) prosocial behaviors has shown that prosocial behaviors differ in their motivations, and hence in social and psychological outcomes (see Padilla-Walker & Carlo, 2015 for a detailed account). For example, G. Carlo, Knight, McGinley, Zamboanga, and Hernandez Jarvis (2010) found evidence for 6 different prosocial behaviors. The limitations of using a global measure of OPB may be numerous, but the most pressing limitation concerns the validity of the results derived from the global measures. It may be the case that one of several subtypes of OPB (e.g. helping vs. sharing or altruistically motivated vs. egotistically motivated prosocial behavior) is able to explain much of the variance in the OPB-SM use relationship. The researchers

behind the OPBS themselves encourage the development of a more elaborate measure of OPB covering different subtypes (Erreygers et al., 2018a).

Fourth, both studies contained similar groups of participants in terms of culture. The participants were all Belgian adolescents and thus generalizing the findings to other countries and cultures may not be warranted yet. The researchers note the need for more diversity in the samples, in terms of nationality and culture, in order to corroborate their results. This point is substantiated by the aforementioned research on the links between (offline) prosocial behavior and SES.

### **Scarcity of Eligible Studies**

The present review revealed four studies (Erreygers et al., 2017; Erreygers et al., 2019; Parlangeli et al., 2019; Ranney, 2016) which measured social media use and OPB among adolescents. However, only two of these (Erreygers et al., 2017; Erreygers et al., 2019) reported relevant data on the relationship between the variables of interest. For example, Parlangeli et al. (2019) measured social network use and OPB among adolescents and young adults, but they did not report data on the relationship. However, the study reported a significant association between hours spent online and online offensive acts (i.e. antisocial behavior). Ranney (2016) measured frequency of use of information and communication technologies (i.e. social networks, instant messaging, texting) and self-reported and peer reported prosocial behaviors among adolescents. However, the study did not report data on that specific relationship.

The present review found and included only two studies. Two possible explanations for the scarcity of eligible studies emerge. Firstly, the eligibility criteria may have been too narrow. The criteria demanded quantitative studies reporting adequate data on the relationship between OPB and SM use among adolescents (13-18 years), published between 2014 and

2019. Wright and Li (2012) did refer to a number of qualitative studies on online prosocial behavior in 2012, which may indicate a substantial qualitative research base on OPB today, considering the increase in research concerning digital media. However, this research was deemed to be outside the scope of this review focusing on the quantitative association between SM use and OPB.

In order to investigate if more articles of relevance could be found by loosening the criteria, a thorough hand search and *snowballing* (i.e. reading articles cited in articles identified in the systematic review) was conducted. This search was only focused on studies containing relevant data on the relationship between SM use and OPB. The investigation revealed no additional articles which met the original eligibility criteria, and resulted in only three studies containing relevant data on SM use and OPB, although in different/unwanted target groups (Kinnunen et al., 2016; Wright & Li, 2011) or which was published prior to 2014 (Lister, 2007; Wright & Li, 2011). There are therefore no strong indications that the strict eligibility criteria were mainly responsible for the low number of included studies.

Thus, the other possible explanation does not concern the eligibility criteria, but a scarcity of OPB-studies in general. There is a vast base of research on media and media effects on children and adolescents (Valkenburg, Peter, & Walther, 2016). However, some researchers (de Leeuw & Buijzen, 2016; Livingstone, 1996) note that media research traditionally have contained an imbalance in research attention. More specifically, there seems to be a bias in research attention regarding “bad content” and negative effects of media compared to positive content and positive effects.

To illustrate this bias, de Leeuw and Buijzen (2016) claim that meta-analyses on media violence can gather hundreds of studies, while meta-analyses on positive and educational effects of media may contain far less. Evidently, this is also the case for the relationship between research on cyberbullying or online antisocial behavior and online prosocial

behavior. As previously mentioned, a systematic map of reviews on screen-based activities and children and adolescents' mental health outcomes found 19 reviews on cyberbullying, whereby included primary studies in each review ranged from 10 to 131 (Dickson et al., 2018), while, to the best of my knowledge, only one book chapter (Wright & Li, 2012) is to be found for online prosocial behavior.

Erreygers et al. (2017) note the seemingly paradoxical fact that the amount of research devoted to online prosocial behavior vs. online antisocial behavior is almost opposite to the actual occurrence of this behavior. In their study they investigated the simultaneous occurrence of AOB next to OPB and found that OPB were much more prevalent. Those findings are supported by Lister (2007), which also found that OPB were more prevalent than AOB. de Leeuw and Buijzen (2016) stresses the importance of balancing the research on positive and negative behavior and effects of (social) media, as there are enormous potentials for child and youth development to be explored in media, in particular social media.

### **Strengths and limitations**

The present review may have several limitations. First, the search may not have covered all relevant literature. Even though social media use was widely operationalized, the way in which online prosocial behavior was operationalized may have excluded some relevant articles. "Online prosocial behavior" as a term is fairly new and may not necessarily be the nomenclature used in fields outside psychology or social sciences. Consequently, there may be a base of data in, for example marketing and communication research, labeling the variables of interest in other terms, which the present search may not have detected. In addition, research on social media and online behavior is rapidly increasing and possibly relevant studies published after 2019 (i.e. after the search was conducted) have not been assessed for inclusion in this review.

However, the search in itself can be considered one of the strengths of this review. The search was developed in collaboration with specialist librarians at the Norwegian Institute for Public Health, test searches were conducted prior to the main search in order to increase sensitivity and specificity, and the search covered seven large databases in social, psychological and health sciences.

Second, there were too few studies included in this review to establish an association and to conduct a meta-analysis. However, finding only two studies which fulfilled the eligibility criteria is a finding in itself, and as I have argued in the sections above, seems to be indicative of a research gap within the field.

Finally, although the NOS adapted for cross-sectional studies has proven to be quick, adaptable and to show moderate reliability, compared to the also widely used Appraisal Tool for Cross-Sectional Studies (AXIS)(Moskalewicz & Oremus, 2020), it has not been thoroughly validated. It has merely been adapted for the use of cross-sectional studies, without thorough testing and validation. Therefore, even though the risk of bias-assessment in this review was thoroughly conducted, the use of NOS may have unintentionally skewed the risk of bias assessment in either a low-risk or a high-risk direction.

### **Conclusion and future directions**

The present review included 2 studies which met the eligibility criteria. Although both studies found an association between OPB and SM use among adolescents, the results are not strong enough to establish an association. Finding only two studies may indicate a research gap in the field. Regardless, additional research on the subject is required and warranted. To aid future research on the subject, the next section will propose possible topics of inquiry.

First, future research on the relationship between OPB and SM use may benefit from looking at different subtypes of social media in relation to OPB. It may be that functional

media use, social networking and vlogging, and online gaming all relate to OPB in ways. Particularly interesting would also be to investigate whether the negative correlation between OPB and online gaming found in Erreygers et al. (2017) could be mediated by gaming content (i.e. prosocial vs. antisocial content).

Second, future studies may benefit from including potential confounders and moderators when investigating the relationship between OPB and SM use; such as gender, age, personality types, socio-economic status, school environment and the recipient of the behavior (i.e. directed at friend vs. family).

Third, in order to increase validity of and accuracy in the data collected, future studies could benefit from including social desirability scales (Van de Mortel, 2008) in relation to OPB, and match tracking data with self-reports in relation to SM use. Finally, offline prosocial behavior is considered to be a multidimensional construct (Padilla-Walker & Carlo, 2015), which eludes to the limited usefulness of a global measure of prosocial behavior. Thus, there are ample reasons to view its online counterpart as a multidimensional construct as well. Consequently, future research could benefit from looking at prosocial behaviors and its subtypes (i.e. altruistically and egotistically motivated prosocial behavior). Although, it should be noted that the subtypes of OPB could be quite different from the subtypes of offline prosocial behavior (i.e. online donations, online activism, online sharing).

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## Appendix A: Tables and figures

**Table 1***Example of search strategy*

Participants	(adolescen* or boy? or girl? or juvenil* or underage* or "under age" or teen? or teenager? or minor? or pubescen* or "young people" or "young person?" or youth* or (("high school" or "middle school" or "secondary school" or "special education" or transfer) adj (student? or graduate?)) or pupil? or "emerging adult?" or pediatric? or paediatric?).tw.  OR  Middle School Students/ or High School Students/ or Junior High School Students/ or Special Education Students/ or Transfer Students/ or High School graduates/ or Pediatrics/
Exposure	exp Social Media/ or Computer Games/ or Digital Gaming/ or Blog/ or Electronic Communication/ or Computer Mediated Communication/  OR  ("Social Media" or "Social Medium" or "Online Social Network*" or "virtual social world?" or "content communit*" or "Internet communication" or "communicating online" or "computer mediated communication" or "Internet group?" or Twitter or Snapchat or Facebook or Messenger or Youtube or Instagram or Tumblr or Reddit or Pinterest or blog? or blogging or vlog? or vlogging or weblogs or podcast? or skype or facetime or "Google talk" or Myspace or Flickr or Twitch or "instant message" or "instant messaging" or chat? or forum? or "Video game*" or "Computer game*" or Videogame* or Computergame* or "virtual gam* world?" or "World of warcraft" or "league of legends" or "Apex Legends" or PlayStation or Xbox or Nintendo).tw.
Outcome	Prosocial Behavior/ or Caring Behaviors/ or Altruism/ or Cooperation/ or "Assistance (Social Behavior)"/ or "Sharing (Social Behavior)"/ or "Trust (Social Behavior)"/  OR  (((prosocial or "pro social" or prosocially or "pro socially") adj1 (behavio?r? or behave? or behaving or value? or interaction? or motivation? or "moral reasoning")) or (("positive online" or caring or sharing or comforting or helping or cooperative or respectful or trust*) adj (behavio?r? or interaction?)) or altruis* or helpfulness).tw.
Limit by	yr="2014 -Current"  AND  to (danish or english or norwegian or swedish)

*Note.* This is an example of the search strategy used for PsycInfo. Search strategies were adapted to fit different search engines.

**Table 2***Data extraction of included studies*

Authors	Title and journal	Study design, setting and country	Main aim	Participants	Type of SM and type of measure	Type of OPB and type of measure	DAM	Type of scales	Findings
Erreygers et al. (2017)	Nice or Naughty? The Role of Emotions and Digital Media Use in Explaining Adolescents' Online Prosocial and Antisocial Behavior. In <i>Media Psychology</i> .	Cross-sectional. School. Belgium.	Examine dimensions of online prosocial and antisocial behavior and how these are related to adolescents' experienced emotions and their uses of digital media.	N = 136 ( <i>M</i> <sub>age</sub> = 13.51, SD 0.63)  Boys=67 Girls=69	Internet use  (social media, online gaming and functional media)  Self-report	Performing and receiving OPB, including cheering up, comforting and supporting others.  Self-report	SEM on the association between OPB and emotions, where SM was used as a mediation variable	The Online Prosocial Behavior Scale(Erreygers et al., 2018a).  SM: adapted version of the EU Kids Online (2014) questionnaire for internet use.	Gaming was related negatively to performing ( $b = -0.217, p < .001$ ) and receiving ( $b = -0.252, p < .001$ ) OPB. Using social and audiovisual media was strongly positively associated with performing and receiving OPB (POPB: $b = 0.768, p < .001$ ; ROPB: $b = 0.956, p < .001$ ).
Erreygers et al. (2019)	Feel Good, Do Good Online? Spillover and Crossover Effects of Happiness on Adolescents' Online Prosocial Behavior. In <i>Journal of Happiness Studies</i> .	Cross-sectional and repeated measures design. Home. Belgium.	Spillover (context) and crossover (person) effects of adolescents' and their parents' daily happiness on adolescents' online prosocial behavior via a daily diary.	N = 1720 ( <i>M</i> <sub>age</sub> = 13.61, SD= 0.49)  Boys = 784 Girls 930	Use of digital technologies for interpersonal contact (use of social network sites, instant messaging, emailing, texting)  Self-report	Cheering up, helping, comforting and supporting via mobile phone/internet  Self-report	A 1-1-1 MSEM with fixed slopes to test mediation model of T1 happiness prediction T2 OPB via T2 happiness. SM as a control variable.	OPB: 5 items based on the Online Prosocial Behavior Scale (Erreygers et al. 2018a).  SM use: 5 point Likert scale on digital use	A significant positive correlation ( $0.39 = p < .001$ ) between online prosocial behavior and the use of digital technologies.

*Note.* M = Mean, SD = Standard deviation, OPB = Online prosocial behavior, SM = Social media (use), DAM = Data analysis methodology, SEM = Structural equation model, MSEM = Multilevel structural equation model, T1= time 1 (after school/work), T2 = time 2 (at adolescent bedtime), POPB = performing online prosocial behavior, ROPB = receiving online prosocial behavior.

**Table 3***Summary of risk of bias assessment*

Criteria	S. Erreygers, Vandebosch, Vranjes, Baillien, and De Witte (2019)	S. Erreygers, Vandebosch, Vranjes, Baillien, and De Witte (2019)
<b>Representativeness of the sample</b>	0	*
<b>Sample size</b>	0	*
<b>Non-respondents</b>	*	*_
<b>Ascertainment of the exposure</b>	0	*_
<b>Comparability</b>	0	0
<b>Assesment of outcome</b>	*	*
<b>Statistical tests</b>	*	*
<b>Total score</b>	*** = Unsatisfactory	****- = Satisfactory

*Note.* Star evaluation: very good studies (9-10 points), good studies (7-8 points), satisfactory studies (5-6 points) and unsatisfactory studies (0-4 points).



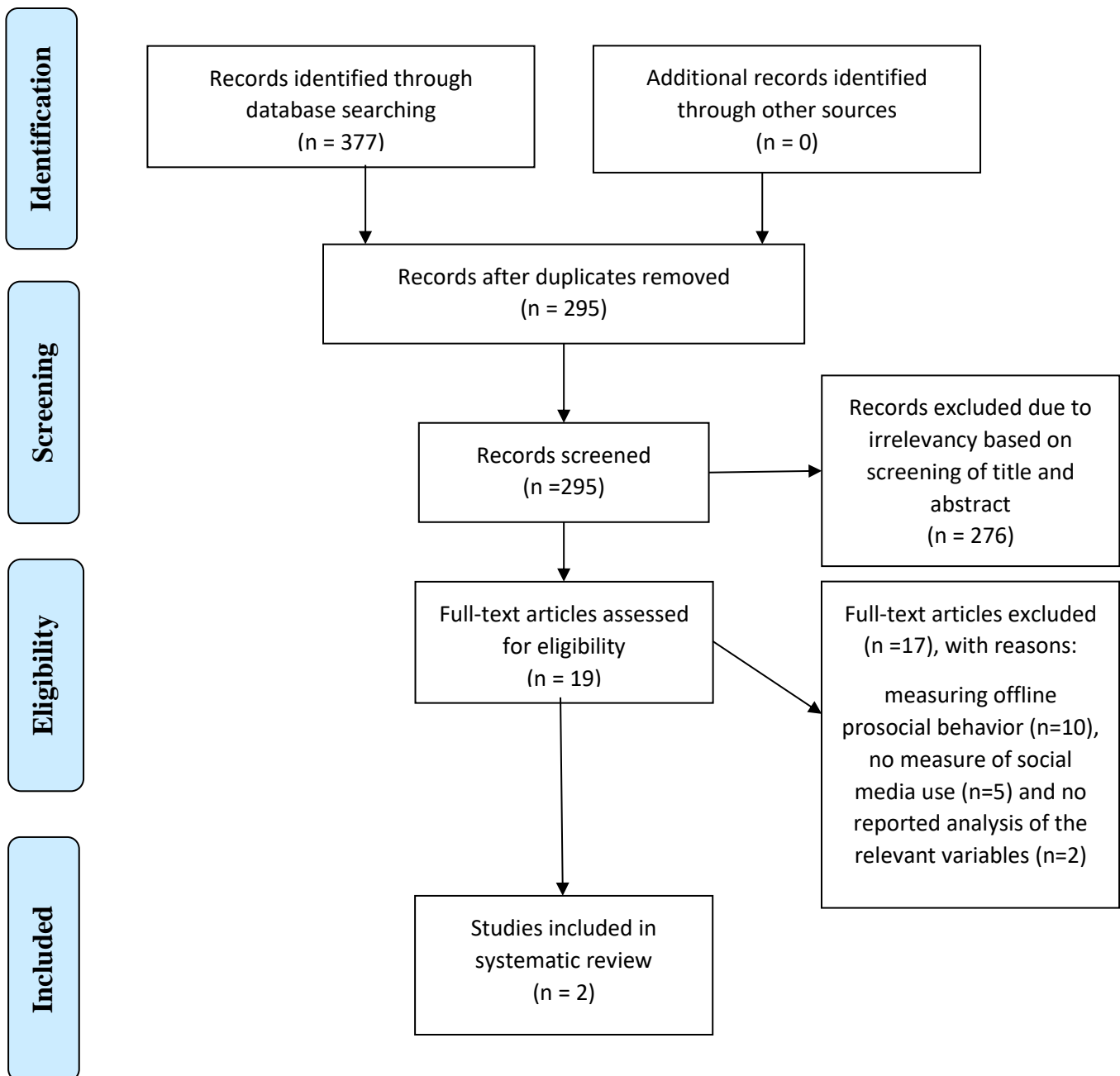


Figure 1. Flow diagram of the search process. PRISMA 2009.

## Appendix B

## A detailed description of the risk of bias assessment

<b>Criteria</b>	<b>Assesment</b>	<b>With reference to:</b>
<b>Erreygers et al. (2019)</b>		
<b>Representativeness of the sample</b>	Convenience sampling	Quote: "36 families were recruited by the first two authors via four secondary schools, two universities, and social media ... 100 additional families were recruited via a market research agency" Comment: eligibility criteria for participation in the study were strict. However, no report of random sampling technique or estimation of representativeness to the target group.
<b>Sample size</b>	Small sample size and sample size justification not reported	Quote: "The participants were 136 adolescents (67 boys, 69 girls) and 234 working parents" and "our relatively small sample size limited statistical power, which precluded including other possible relevant control variables". Comment: whether the sample size is based on calculations is not described.
<b>Non-respondents</b>	Basic summary of non-respondent characteristics in sampling frame is described *	Quote: "resulted in the following missing data rates: 22 (3.2%) of the adolescents', 8 (1.2%) of the mothers', and 7 (1.4%) of the fathers' entries at T1; and 51 (7.5%) of the adolescents' entries at T2". Comment: there are few missing data and adequate measures for handling of the missing data were reported.
<b>Ascertainment of the exposure</b>	Use of unvalidated self-report measure constructed by the researchers.	Quote: "use of digital technologies for interpersonal contact (e.g., use of social network sites, instant messaging, emailing, texting) throughout the day, on a 5-point Likert-type scale"
<b>Comparability</b>	Not controlled for confounders/level of adjustment	Comment: the main aim of the study was not to investigate the SM-OPB relationship, and the variable of SM use in itself was included due to it being a possible confounder. Therefore, not adjusting for possible confounders in the association between SM and OPB is not evident of low quality in this study, but of the high risk of bias concerning the results reported regarding the OPB-SM relationship.
<b>Assessment of outcome</b>	Use of shortened self-report questionnaire based on a validated measurement of OPB *	Quote: "The OPBS was shortened and modified for diary use. On a 5-point Likert-type scale ranging from 1 (Not at all) to 5 (Very much)"

<b>Criteria</b>	<b>Assesment</b>	<b>With reference to:</b>
		Comment: the use of OPBS or a shortened version of it, is a strength. As to my knowledge, the OPBS is the only validated instrument for measuring OPB.
<b>Statistical tests</b>	Statistical test used to analyse the data were appropriate, clearly described and measures of association presented included confidence intervals and probability level (p value). *	Comment: descriptive data were reported, alongside confidence intervals and p-value. Adequate measures were conducted to answer the researchers' hypothesizes.
<b>Erreygers et al. (2017)</b>		
<b>Representativeness of the sample</b>	Truly representative of the average in the target population *	Quote: " <i>Participants were recruited through their schools. Schools were randomly selected from a province in Flanders. Twenty-nine schools were contacted, 13 of which agreed to participate ... 1720 Dutch-speaking adolescents participated</i> ".
<b>Sample size</b>	Not justified with sample size calculations, though satisfactory. *	Quote: see above. Comment: no reported sample size calculation. However, the sample size is more than big enough to satisfy a conservative assumption about the nature of the true population value.
<b>Non-respondents</b>	No summary data on non-respondents, although it did handle missing data with statistical procedures. (*-)	Quote: <i>Maximum likelihood estimation was used to handle missing data.</i> Comment: the authors only reported the method of handling missing data and not a summary of the missing data itself.
<b>Ascertainment of the exposure</b>	Adapted version of validated self-report measure on internet use.	Quote: " <i>Our survey contained a scale on Internet use based on items used in the Belgian version of the EU Kids Online (2014) questionnaire. On a 6-point scale, participants had to indicate how often they had used digital media in the past six months for 11 activities</i> ".
<b>Comparability</b>	Not controlled for confounders/level of adjustment	Comment: the main aim of the study was not to investigate the SM-OPB relationship, and the variable of SM use in itself was included due to it being a possible confounder. Therefore, not adjusting for possible confounders in the association between SM and OPB is not evident of low quality in this study, but of the high risk of bias concerning the results reported regarding the OPB-SM relationship.
<b>Assesment of outcome</b>	Use of validated self-report measure of OPB *	" <i>We developed a scale to measure engagement in prosocial and antisocial behavior online. The scale consisted of two parts: The first part assessed which behaviors the adolescents had done themselves ("performing"), the second (equivalent) part assessed which behaviors the adolescents</i>

<b>Criteria</b>	<b>Assesment</b>	<b>With reference to:</b>
		<p><i>had received from others ("receiving"). Each part consisted of 11 antisocial and 14 prosocial behaviors... The online prosocial behavior items consisted of five items adapted from the items used by Wright and Li (2011)... 9 items from two measures of offline prosocial behavior: Caprara and Pastorelli's (1993) Prosocial Behaviour Scale and Carlo and Randall's (2002) Prosocial Tendencies Measure... two items were poorly understood and we did not include them".</i></p> <p>Comment: at that point, no validated instrument to measure OPB existed. The authors measured both giving and receiving OPB. However, no peer- or parental report of OPB, only self-report.</p>
<b>Statistical tests</b>	<p>Statistical test used to analyse the data were appropriate, clearly described and measures of association presented included confidence intervals and probability level (p value). *</p>	<p>Comment: descriptive data alongside confidence intervals and p-value, factor-analysis, structural equation model for testing association, and post-hoc for mediating variables, were described and properly conducted. The arguments for reporting and conducting the statistical tests were clear.</p>

*Note.* This is a more detailed account of the process in which the risk of bias-assessment was based on. OPB = Online prosocial behavior, SM = Social media (use), OPBS = The Online Prosocial Behavior Scale.