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Designing and validating the friendship quality on social network sites questionnaire

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Abstract

Social network sites (SNSs) provide adolescents with the opportunity to expand their social circle, which is associated with increased social capital. However, the social capital adolescents built depends on the quality of their friendships on SNSs. As no instruments are available to capture the quality of friendships on SNSs, this study designed and validated the Friendship Quality on Social Network Sites questionnaire (*FQSNS-questionnaire)*. The questionnaire consists of five dimensions: satisfaction, companionship, help, intimacy, and self-validation. Explorative and confirmative factor analyses were applied on data of 1.695 friendships (i.e., offline-to-online, online-to-offline, and online friendships) gathered from 1.087 adolescents. Results pointed to a five-factor solution, applicable to any kind of friendship on SNSs and reflecting the proposed five dimensions of friendship quality. Multiple group confirmatory factor analyses supported measurement invariance across younger and older adolescents, and across boys and girls, at the levels of equal factor structure and loadings. Cronbach's alphas indicated a good internal consistency of each dimension. Correlation analysis indicated that the dimensions were strongly correlated to each other, which is unsurprising because they reflect the overall friendship quality. Based upon these results, we can conclude that dimensions of friendship quality can validly and reliably be assessed using the *FQSNS-questionnaire*.

Keywords: social network sites - Facebook – adolescents - friendship quality - validity - reliability

1. Introduction

Most studies on young people's internet use unanimously conclude that social network sites (SNSs) play an increasingly important role in the daily lives of adolescents (e.g., Lenhart et al., 2015; Staksrud, Ólafsson, & Livingstone, 2013; Tsitsika et al., 2014; Valkenburg & Peter, 2011). The popularity of SNSs among adolescents should not entirely come as a surprise because, compared to other age groups, adolescents typically attach more importance to their friends (Brown & Larson, 2009; Mesch & Talmud, 2006; Mikami, Szwedo, Allen, Evans, & Hare, 2010). SNSs respond to this by offering adolescents opportunities not only to stay connected with friends they know from the offline world, but also to expand their social circle by meeting new people online. In addition, adolescence is a life phase in which individuals are greatly concerned about the impressions they make on their peers and the extent to which they feel accepted by others (Steinberg, 1996).

The increased SNS use by adolescents is also reflected in (inter)national descriptive studies. Research conducted by the Pew Research Center indicated that, in the United States, Facebook is the most popular SNS. Among adults (18 years or older) 68% use Facebook (Greenwood, Perrin, & Duggan, 2016), and among adolescents (13-17 years old) it is 71% (Lenhart et al., 2015). In Flanders, 87% of adolescents (12-18 years old) have Facebook accounts (Apestaartjaren, 2016).

The ability for adolescents to expand their contact opportunities on SNSs is associated with increased social capital, which is the benefit individuals derive from their social interactions (Ellison, Steinfield, & Lampe, 2011). Putnam (2000) distinguishes two forms of social capital, namely bonding and bridging. Bonding social capital is the benefit individuals derive from close personal friendships (i.e., strong ties), such as companionship. Bridging social capital is the benefit derived from loose connections (i.e., weak ties), such as receiving useful information about job opportunities. This distinction between bonding and bridging shows that the social capital adolescents built is associated with the quality of their social interactions or friendships on SNSs (Burke, Kraut, & Marlow, 2011; Putnam, 2000). As explained by Baker (2012), the access to social capital is determined by who you know (i.e., the quality, size, and diversity of your network). Consequently, research gives more and more attention to the quality of adolescents' friendships on SNSs (e.g., Antheunis, Valkenburg, & Peter, 2012; Baker & Oswald, 2010; Mesch & Talmud, 2006). However, compared to instruments in the context of offline friendships (e.g., the Friendship Quality Questionnaire (FQQ; Parker & Asher, 1993), the Friendship Qualities Scale (FQS; Bukowski, Hoza, & Boivin, 1994), the Friendship Features Interview for Young Children (FFIYC; Ladd, Kochenderfer, & Coleman, 1996), and the McGill Friendship questionnaires (MFQ-RA and MFQFF; Mendelson & Aboud, 1999, 2012)), no research instruments are available that can validly and reliably capture friendship qualities on

SNSs. Previous research assessing the quality of friendships on SNSs (e.g., Baker & Oswald, 2010; Marsden & Campbell, 1984; Mesch & Talmud, 2006) often used a limited number of items which do not capture the broad dimensions examined within offline friendships (e.g., companionship and help).

As no instruments are available for measuring the quality of friendships on SNSs, this study aimed to design and validate the *Friendship Quality on Social Network Sites questionnaire (FQSNS-questionnaire).* Thereby, we mainly focused on the content and construct validity and the reliability of the questionnaire by conducting explorative and (multiple group) confirmative factor analyses, a correlation analysis, and a multilevel analysis. When designing the questionnaire, we kept in mind that adolescents have various types of friends on SNSs and that our questionnaire has to be suitable to all these friendships. More specifically, the connection someone has on a SNS can have different origins – online and offline (Ellison, Steinfield, & Lampe, 2007). Previous studies usually made a limited differentiation between online and offline friendships. Antheunis and colleagues (2012) compared in their study the quality of mixed-mode friendships with that of online and offline friendships. Nevertheless, it is recommended to split up mixed-mode friendships by asking people whether they first met online or offline. This distinction will better reflect the reality of friendship formation and maintenance. In this way, three types of friendships can be distinguished on SNSs: (1) friendships that originated offline but extend on SNSs (i.e., offline-to-online friendships); (2) friendships that originated on SNSs but do not extend offline (i.e., exclusively online friendships); and (3) friendships that originated on SNSs and extend offline (i.e., online-to-offline friendships).

The added value of the *FQSNS-questionnaire* is that it provides a research instrument for further research in the field of adolescents' friendships on SNSs. This is important because research has demonstrated that friendship quality experienced by young people during adolescence sets the stage for their relation quality in later life. Moreover, good friendships enhance many aspects of adolescents' well-being and mental health (e.g., self-esteem) (Berndt, 2002; Ellison et al., 2007; Johnston, Tanner, Lalla, & Kawalski, 2013; Steinfield, Ellison, & Lampe, 2008). The questionnaire also provides more insight into online friendships. Friending strangers on SNSs (i.e., online friends) is often perceived as a dangerous act (e.g., Bossler, Holt, & May, 2012; Lenhart et al., 2011). However, forming friendships on SNSs may also have positive consequences. For instance, when adolescents do not receive sufficient support (e.g., companionship, help, intimacy, and self-validation) in their friendship network, they might search for friends online to compensate for this lack of support (Smahel, Brown, & Blinka, 2012).

2. Friendship quality

When defining friendship quality, it is important to make a distinction between friendship features and friendship quality itself. Throughout the literature, these terms are often used interchangeable (Bagwell & Schmidt, 2013). According to Berndt (1996, p. 346), friendship features refer to "the attributes or characteristics" of a friendship, including various dimensions such as "intimacy, companionship, and conflict". A friendship may thus consist of multiple positive and negative features (Berndt, 1996, 2002). All such features taken together, define the quality of a friendship (Berndt, 1996). Contrary to friendship features, friendship quality is evaluative in nature (Bagwell & Schmidt, 2013; Berndt, 1996) indicating that "friendships are higher in quality when they have more positive features and lower in quality when they have more negative features" (Berndt, 1996, p. 347). When measuring quality, research in various contexts increasingly focuses on perceived features (or dimensions) (e.g., Kao & Lin, 2016; Prochazka, Weber, & Schweiger, 2018; Shin, 2018; Shin, 2017). This focus on perceived features (or dimensions) is also reflected in several research instruments available for measuring offline friendship qualities (see Table 1 for an overview). Commonly used and cited instruments include the Friendship Quality Questionnaire (FQQ; Parker & Asher, 1993), the Friendship Qualities Scale (FQS; Bukowski et al., 1994), the Friendship Features Interview for Young Children (FFIYC; Ladd et al., 1996), and the McGill Friendship questionnaires (MFQ-RA and MFQFF; Mendelson & Aboud, 1999, 2012). We purposely do not describe instruments measuring the quality of other types of relationships , such as relationships with family members, because they constitute different types of close relationships compared to the quality of friendships (on SNSs) (Bukowski, Newcomb, & Hartup, 1998).

First, we discuss the FQQ, a questionnaire exclusively for measuring older children's quality perceptions of their friendships (Parker & Asher, 1993). The questionnaire consists of 40 items whereby children from elementary school have to indicate to what extent each of these dimensions of friendship quality apply to a particular friend: (1) validation and caring: the extent to which the friendship is characterized by caring, interest, and support; (2) conflict and betrayal: the level to which the friendship consists of argument, disagreement, mistrust, and annoyance; (3) companionship and recreation: the degree to which friends spend enjoyable time together, in and out of school; (4) help and guidance: the level of friends' effort to assist each other with challenging and routine tasks; (5) intimate exchange: the degree to which the friendship is characterized by disclosure of feelings and personal information; and (6) conflict resolution: the extent to which disagreements are resolved on an efficient and fairly matter (Parker & Asher, 1993). Factor analysis confirmed the six-factor solution of the questionnaire and the internal consistency for each subscale was satisfactory (Cronbach's alpha range = .73 to .90). The correlation between the subscales ranged from .16 to .75 (Parker & Asher, 1993).

While the FQQ (Parker & Asher, 1993) is designed with an exclusive focus on children, Bukowski and his colleagues (1994) developed the FQS, a questionnaire for measuring five dimensions of children's and early adolescents' friendships. For this purpose, the questionnaire makes use of 23 items. The five dimensions are: (1) companionship: the amount of voluntary time spend together; (2) conflict: the degree to which someone gets into fights and arguments with a friend, to which they annoy each other, and to which there exist disagreements; (3) help: the extent to which a friend is willing to help when someone is bothering the other one (protection from victimization), and the degree to which the friendship is characterized by mutual help and assistance (aid); (4) security: the belief that someone, in times of need, can rely upon a friend and this friend can be trusted (reliable alliance), and the belief that the friendship can withstand negative events, such as a fight (transcending problems); and (5) closeness: someone's feelings about the friendship (affective bond) and the feelings someone derives from the friendship, and how important someone is for their friend (reflected appraisal) (Bukowski et al., 1994). Reliability analysis pointed to high levels of internal consistency within each dimension (Cronbach's alpha range = .71 to .80) and the questionnaire distinguished between mutual and non-mutual friends, and stable and non-stable friends. The correlation between the subscales ranged from .13 to .61 (Bukowski et al., 1994). Contrary to the FQQ (Parker & Asher, 1993), the FQS (Bukowski et al., 1994) includes items measuring someone's feeling about the friendship (i.e., the affective bond), which is analogous to someone's satisfaction with the friendship. Parker and Asher (1993) assessed friendship's satisfaction with a separate questionnaire and did not include this dimension in the FQQ.

Since none of the described instruments above is appropriate for young children, Ladd, Kochenderfer and Coleman (1996) developed the Friendship Features Interview for Young Children (FFIYC) for children from kindergarten. They discern six dimensions which are measured on the basis of 30 questions: (1) companionship: the degree to which a friend includes someone in school-related activities; (2) validation: the extent to which someone receives positive feedback or support from a friend; (3) aid: the level to which someone receives assistance in the face of emotional or instrumental problems; (4) self-disclosure: the extent to which private information or feelings are shared; (5) conflict: the level to which someone argues with a friend, and (6) exclusivity: the extent to which someone perceives that a friend is selective in his liking (Ladd et al., 1996). However, factor analysis did not support the six-factor structure. The final version of the FFIYC consists of 24 items measuring five dimensions, namely validation, aid, disclosing negative affect, exclusivity, and conflict. Two additional subscales were added measuring satisfaction and affective climate (i.e., the extent to which a friend influences someone's feelings about school) (Ladd et al., 1996). Compared to the FQQ (Parker

& Asher, 1993) and the FQS (Bukowski et al., 1994), the FFIYC (Ladd et al., 1996) is more restricted in scope due to its focus on children and their classroom friends.

More in line with our target group (i.e., adolescents) are the McGill questionnaires (Mendelson & Aboud, 1999, 2012) which are appropriate for older adolescents and young adults: one measuring the quality of friendships and one measuring feelings toward a friend. The McGill Friendship Questionnaire – Friend's Functions (Mendelson & Aboud, 1999, 2012) consists of 30 items (or 48 items in the long version) measuring six adolescents' and young adults' friendship functions which are analogous to those of the FFIYC (Ladd et al., 1996). Some items are adopted from the FQQ (Parker & Asher, 1993) and the FQS (Bukowski et al., 1994). The following dimensions distinguish between friends and non-friends: (1) stimulating companionship: doing funny and exciting things together; (2) help: providing aid, such as guidance and information, to meet needs or goals; (3) intimacy: providing a context wherein personal thoughts and feelings can be expressed; (4) reliable alliance: being able to count on the continuing availability and loyalty of a friend; (5) self-validation: helping to maintain someone's self-image as a competent and worthwhile person; (6) and emotional security: providing comfort and confidence in novel or threatening situations (Mendelson & Aboud, 1999, 2012). Factor analysis confirmed the factor structure, except for emotional security. However, the internal consistency for each subscale was high (Cronbach's alpha range = .84 to .90). The correlation between the subscales ranged from .44 to .78. A striking difference between the MFQ-FF (Mendelson & Aboud, 1999, 2012) and the other instruments, is that the MFQ-FF does not include items measuring conflict (resolution) and only focuses on positive dimensions. The McGill Friendship Questionnaire – Respondent's Affection (Mendelson & Aboud, 1999, 2012) consists of 16 items measuring adolescents' and young adults' positive feelings for and satisfaction with friends(ships). After removing one item, factor analysis pointed to the two-factor solution and their internal consistency appeared to be good (Cronbach's alpha range = .93 to .96). The correlation between the subscales was .66 (Mendelson & Aboud, 1999, 2012).

Table 1
Overview instruments measuring offline friendship quality

	Appropriate for	Dimensions
FQQ (40 items)	Children (elementary school)	Validation and caring Conflict and betrayal Companionship and recreation Help and guidance Intimate exchange Conflict resolution
FQS (23 items)	Children and early adolescents	Companionship Conflict Help (aid and protection from victimization) Security (reliable alliance and transcending problems) Closeness (affective bond and reflective appraisal)
FFIYC (24 items)	Children (kindergarten)	Validation Aid Disclosing negative affect Conflict Exclusivity Satisfaction Affective climate
MFQ-RA (16 items)	Adolescents and young adults	Positive feelings Satisfaction
MFQ-FF (30 items)	Adolescents and young adults	Companionship Help Intimacy Reliable alliance Self-validation Emotional security

Based upon these existing instruments, it can be concluded that the quality of offline friendships can be measured mainly on the basis of five dimensions: companionship, help, intimacy/self-disclosure, validation, and satisfaction. These friendship dimensions are similar to the four friendship behaviors formulated by Hays (1984), namely companionship, consideration or utility, communication or self-disclosure and affection, and can been seen as positive friendship features. Given that SNSs offer adolescents opportunities to stay connected with friends they know from the offline world and to expand their social circle by meeting new people online, we believe that the five dimensions are important as well on SNSs. Except for the McGill questionnaires (Mendelson & Aboud, 1999, 2012), the other instruments also include items measuring the degree to which a friendship is characterized by conflict (and resolution). However, according to Mendelson and Aboud (1999, 2012), conflict is not analogous to the other dimensions (i.e., negative friendship feature).

Compared to instruments developed in the context of offline friendships, no fully developed instruments are available that can validly and reliably capture the quality of friendships on SNSs. So far, when researchers examined the quality of friendships on SNSs, they used a limited number of items which do not capture the broad dimensions of a friendship described above. For example, Antheunis and colleagues (2012) measured the quality of online, offline, and mixed-mode friendships among adolescent users of a SNS using four items from Marsden's and Campbell's scale to measure tie strength (1984): "I feel close to this person", "This person is important for me", "If I had a personal problem, I would ask this person for help", and "I trust this person". This scale as well as the set of items used by Antheunis and colleagues (2012), has a restricted scope, focusing mainly on the closeness of a friendship and to some extent on help. Mesch and Talmund (2006) also investigated the quality of online friendships within this specific scope by asking adolescents to indicate how close they felt to their friend, how important their friend was, how much they would ask their friend for help, and how far they trusted their friend. As a last example, Baker and Oswald (2010) investigated online friendship quality by using a modified version of Asendorpf and Wilpers' (1998) relationship questionnaire. They asked adolescents to report their relationship satisfaction (i.e., How satisfied are you with the time you spend with this person?), the relationship importance (i.e., How important do you consider this relationship?), and closeness (i.e., How close are you with this person?). As no fully developed instruments are available for measuring the quality of friendships on SNSs, this study designed and validated the *FQSNS-questionnaire*. The questionnaire consists of five dimensions: satisfaction, companionship, help, intimacy, and self-validation.

3. The current study

In this study, we describe the validation and reliability process of the *FQSNS-questionnaire*. Within this process, we mainly focused on the content and construct validity, and reliability of the dimensions. The following research questions were addressed: (1) "Can dimensions of friendship quality validly be assessed using the *FQSNS-questionnaire*?", and (2) "Can dimensions of friendship quality reliably be assessed using the *FQSNS-questionnaire*?".

4. Method

4.1 Development of the questionnaire

When designing our questionnaire (see Appendix A, next to each Dutch item there is an English translation), we had two points of interest. First of all, we aimed to focus on those dimensions of quality representing the positive friendship features. Within each of the dimensions, it was intended to have a balanced number of items to ensure the content validity of the questionnaire. In addition, we aimed to develop a questionnaire that can be used for the three types of

friendships distinguished on SNSs (i.e., offline-to-online, online-to-offline, and exclusively online friendships).

After exploring several relevant theoretical frameworks or instruments largely covering the same dimensions, we decided to adapt the MFQ-FF (Mendelson & Aboud, 1999, 2012). This questionnaire (which is inspired by the FQQ (Parker & Asher, 1993) and FQS (Bukowski et al., 1994)) is most in line with our target group and contains the highest levels of internal consistency (Mendelson & Aboud, 1999, 2012). The MFQ-FF includes items measuring the degree of companionship, help, intimacy, and self-validation within adolescents' friendships, which seem to be the basic features of a friendship. After all, adolescence is a life phase in which individuals are greatly concerned about the extent to which they feel accepted by peers, and wherein the development of intimacy with peers constitutes one of the key tasks (Family Online Safety Institute, 2013; Steinberg, 1996).

From the original MFQ-FF (Mendelson & Aboud, 1999, 2012), we selected three or four items for each dimension (i.e., companionship, help, intimacy, and self-validation) and adapted them for our questionnaire. As reported in the research paper of Mendelson and Aboud, (1999, 2012), we selected the items that loaded highest on a particular dimension and lowest on the other dimensions. We excluded items measuring the dimension reliable alliance because we focused on dimensions reflecting the positive friendship features (e.g., the item "he/she would still want to stay my friend even if we argued" assumes that there had been a conflict). However, the concept of reliable alliance (i.e., the belief that in times of need you can rely upon a particular friend; see the FQS (Bukowski et al., 1998)) is captured within our questionnaire within the dimension help. We also excluded items measuring the dimension emotional security because, in the short version of the MFQ-FF (30 items), four of the emotional security items did not load on any dimension while the fifth item loaded on intimacy (Mendelson & Aboud, 1999, 2012)

Furthermore, we measured adolescents' satisfaction with their friends using three adapted items from the MFQ-RA (Mendelson & Aboud, 1999, 2012). These items were initially framed as items measuring someone's positive feelings for a friend (Cronbach's alpha = .93). We consciously chose to measure respondents' feelings for a friend instead of the feelings for the friendship itself. By doing this, the items were more in line with those items measuring the other four dimensions. As there were no factor loadings reported for this dimension in the research paper of Mendelson and Aboud (1999, 2012), we selected the items that were most appropriate within an online context (e.g., the item "I would miss him/her if she left" refers to a meeting in real life, which does not apply to an online context).

The above described process resulted in the *FQSNS-questionnaire,* consisting of five dimensions and 16 items. We opted for a short questionnaire as, in our study, respondents had to fill in the questionnaire three times (i.e., separately for offline-to-online, online-to-offline, and

online friendships). It is also recommended that a questionnaire takes no longer than 15 minutes to fill in (Worthington & Whittaker, 2006). Table 2 provides an overview of the dimensions of quality included in the *FQSNS–questionnaire* and the number of items within each dimension.

Table 2
Dimensions and the number of items

Dimension of quality	Description	Items
Satisfaction	The degree to which someone has positive feelings about their friend	3
Companionship	The degree to which someone finds the friendship enjoyable	4
Help	The degree to which someone receives aid to meet needs or goals	3
Intimacy	The degree to which personal information can be shared	3
Self-validation	The degree to which someone receives positive feedback	3

Similar to previous research (e.g., Antheunis et al., 2012; Baker & Oswald, 2010; Mesch & Talmud, 2006), the participants in our study had to fill in the questionnaire with a limited number of friends in mind. More specifically, the participants were asked to think of three random friends from their Facebook network: one they first knew through face-to-face interactions (i.e., offline-to-online), one they only knew through Facebook (i.e., exclusively online), and one they first knew through Facebook before meeting this individual in person (i.e., online-to-offline). Due to the large number of Facebook friends most people have, it is impossible to measure the quality of all friendships from someone's Facebook network. Hence, we opted to ask respondents to pick a random friend. Purposely instructing participants to think about a random friend ensured that our sample would be as close as possible to a true random sample. The participants were then asked to answer questions on the discerned dimensions of friendship quality for each of the selected friends. By keeping a particular friend in mind, participants could easily answer the questions. Participants responded using a fully labeled five-point Likert scale ranging from "*totally disagree*" (1) to *"totally agree"* (5).

4.2 Participants and data collection

This study drew upon data from a larger "Best Friends Forever on SNS" project. In November and December 2015, a paper and pencil survey was conducted among 1.290 adolescents in 14 Flemish schools, including 626 (48.5%) girls and 642 (49.8%) boys (22 adolescents did not indicate their sex) with an average age of 14.18 years (*SD* = 1.48 years). The schools were randomly chosen from the different Flemish provinces. In the survey, we focused on the SNS

Facebook because this is the most popular SNS among adolescents (Apestaartjaren, 2016; Lenhart et al., 2015).

Of the 1.290 adolescents, 1.087 (84.3%) had Facebook profiles. A minority did not have Facebook accounts ($n = 163$ or 12.6%), had deactivated their profiles ($n = 18$ or 1.4%) or did not indicate whether they had own profiles ($n = 22$ or 1.7%), and they were excluded from the sample. The final sample included 1.087 adolescents (528 or 48.6% girls, and 540 or 49.7% boys) with an average age of 14.36 ($SD = 1.44$).

Prior to the study, we sought approval from the school board. If this was granted, we sought permission from the parents of the selected adolescents by asking their consent for their son or daughter to participate in the study. When the researcher entered the class, the adolescents had the right to refuse to participate in the study or to withdraw at any time. The study protocol was submitted to and received approval from the Ethics Committee for the Social Sciences and Humanities of the University of Antwerp.

4.3 Data analyses

To gain insights into the validity and reliability of the *FQSNS-questionnaire,* we applied several validation and reliability analyses. All analyses were carried out in the statistical program R.

4.3.1 Validity

4.3.1.1 Factor analyses

To determine the construct validity of the *FQSNS-questionnaire* (i.e., the extent to which the items are compatible with the theoretical construct; Shin, 2017), we conducted an exploratory factor analysis (EFA). This analysis was conducted across all data from the three types of friendships (i.e., offline-to-online, online-to-offline, and online friendships). To assess whether a factor analysis was appropriate for our data, we computed both the Kaiser-Meyer-Olkin test (KMO-test) and Bartlett test for sphericity. A KMO-test with a value of .80 and above (Hutcheson & Sofroniou, 1999), and a significant Bartlett test were used as a prerequisite (Field, Miles, & Field, 2012). When conducting the EFA, an oblique rotation was applied because we expected that the factors would correlate as they reflect the overall friendship quality (Field et al., 2012). To determine the number of factors, we looked at (1) Kaiser's eigenvalue test, (2) Cattell's scree test, and (3) Horn's parallel analysis (Field et al., 2012; Ledesma, 2007). If the three tests provided different factor solutions, all solutions were explored further through confirmatory factor analyses (CFAs). Cut-off values of .40 were used as a minimum for significant factor loadings (Stevens, 2012).

Studies using EFA often conclude with the recommendation that future research should confirm factor models with CFAs (for an overview, see Gignac, 2009). Therefore, we conducted

CFAs based on the models resulting from the EFA. These analyses were as well conducted across all data from the three types of friendships. Several goodness-of-fit tests were applied to evaluate the model fit of each model (i.e., relying on fit indices that have different measurement properties; Jackson, Arthur, & Purc-Stephenson, 2009). The comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean squared residual (SRMR) were used as these are the most widely accepted (Brown & Moore, 2012) and most commonly reported measures of fit (Jackson et al., 2009). Hu and Bentler's (1999) cut-off values were used as indications for a good model fit: CFI and TLI values between .90 and .95 or greater, RMSEA values between .08 and .06 or below, and SRMR values between .10 and .08 or below. To determine the best fitting model, differences in the Chi-square test and the Akaike information criterion (AIC) were examined.

In a next step, three CFAs were conducted upon each type of friendship on SNSs (i.e., offline-to-online, exclusively online, and online-to-offline). For this matter, the factor-solution of the best fitting model was used.

4.3.1.2 Multiple group factor analyses

Additional multiple group CFAs were conducted to see whether components of the best fitting model were invariant (equal) across the younger (12-15 years old) and older (16-19 years old) adolescents, and across male and female adolescents. Therefore, we made use of a stepwise procedure with different models: (1) a model testing the CFA model separately in each group; (2) simultaneous test of equal form (i.e., configural invariance); (3) test of equal factor loadings (i.e., metric invariance); (4) test of equal intercepts (i.e., scalar invariance); and (5) test of equal error variance (i.e., strict invariance) (Brown, 2006). For the stepwise procedure, the Chi-square and the AIC of the previous model were constantly compared to those from the following model. For all analyses, the significance level was set at .05 for the p-value and at 1.96 for the t-value.

4.3.2 Reliability

To determine the reliability of the *FQSNS-questionnaire,* we examined the internal consistency of each final dimension using Cronbach's alpha (Field et al., 2012). Values of .60 to .80 were seen as acceptable and values lower than .60 as unreliable. A Pearson correlation analysis was conducted to indicate how the dimensions were related to each other. Cohen's (1988) rules of thumb were used to interpret the correlations' strength. Values of .10 to .30 were seen as small correlations, values of .30 to .50 as moderate correlations, and values of .50 to 1.00 as large correlations. As we aimed to design a questionnaire to measure the quality of each friendship itself, an additional multilevel analysis was conducted to estimate the degree of dependency of each dimension of quality (level one) on a given person (level two).

5. Results

Most of the adolescents (*n* = 1.037) had friends on Facebook they first met through face-to-face interactions (Table 3). Of the 1.037 adolescents, 896 individuals (86.4%) indicated that more than half of their friend list was made up of these friendships. For 141 (13.6%) adolescents, this was less than half. Friendships that first emerged on Facebook and exclusively online friendships were less common, especially the latter ones (these findings are in line with previous research by Heirman and colleagues (2016) who asked adolescents to indicate the percentage of exclusively online friends in their SNS friend lists). A total of 355 adolescents indicated that they had at least one friend which they first met online before meeting this friend offline. Of these 355 adolescents, 31 individuals (8.7%) had a friend list which consists of more than half of people they first met on Facebook. A total of 303 adolescents indicated that they had at least one friend on Facebook which they only know through online interactions. Of these 303 adolescents, 16 individuals (5.3%) had a friend list containing more than half of the people they exclusively knew online.

Table 3
Types of friendships on the SNS Facebook

	No	Less than half	More than half	Missing
Offline-to-online friendships	32	141	896	18
Online-to-offline friendships	696	324	31	36
Exclusively online friendships	755	287	16	29

5.1 Validity

5.1.1 Factor analyses

In total, we gathered data from 1.695 friendships. In order to design a widely used questionnaire which can validly and reliably measure friendship quality, we conducted factor analyses across these 1.695 friendships. Since the KMO-test verified the sampling adequacy (.97) and the Bartlett's test of sphericity was significant (χ^2 = 30956.19, df = 120, *p* = .00), factor analyses were appropriate for our data. Across the 1.695 friendships, we conducted an EFA with oblique rotation. Kaiser's eigenvalue test, Cattell's scree test, and Horn's parallel analysis each provided different factor solutions. The eigenvalue test indicated a single-factor solution, the inflexion point of the scree plot occurred after two factors, and parallel analysis suggested a five-factor solution. All of the factor solutions consisted of factors with minimum three items and factor loadings above the cut-off value of .40. The single-factor solution explained 69% of the total variance, the two-factor solution 73%, and the five-factor solution 80%.

Next, we conducted CFAs based on the models resulting from the EFA. The results from the goodness-of-fit tests indicated an insufficient model fit for the single-factor solution (CFI = .87, TLI = .85, RMSEA = .15, SRMR = .05) and the two-factor solution (CFI = .93, TLI = .92, RMSEA = .11, SRMR = .04). The model fit for the five-factor solution (CFI = .98, TLI = .97, RMSEA = .07, SRMR = .03) pointed to a good model.

Table 4 provides an overview of the five-factor solution conducted with an EFA, while Figure 1 provides a visual representation of the five-factor solution conducted with a CFA.
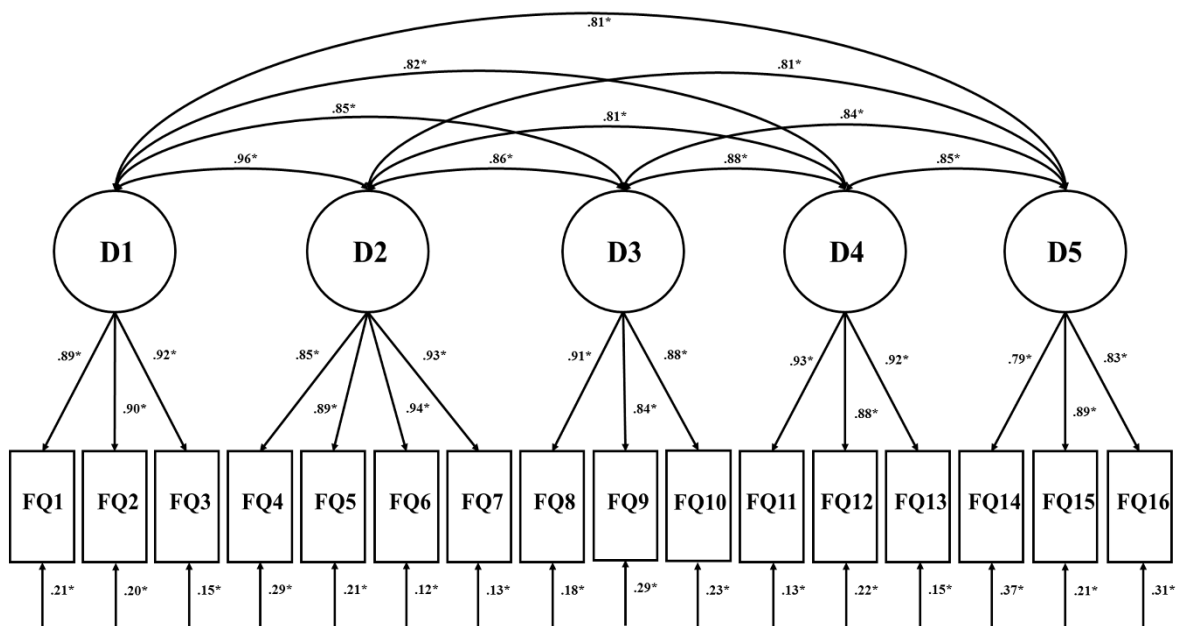
[insert Table 4 about here]

Figure 1. Five-factor solution CFA with standardized coefficients.

Table 4
Five-factor solution EFA with standardized values

Friendship quality	D1	D2	D3	D4	D5
FQ1	**.63**	.08	.09	.12	.04
FQ2	**.84**	.01	.03	.04	.04
FQ3	**.48**	.35	.04	.01	.10
FQ4	.14	**.50**	.26	-.01	.01
FQ5	.02	**.72**	.12	.02	.06
FQ6	.05	**.86**	-.02	.04	.04
FQ7	.11	**.71**	.02	.09	.04
FQ8	.03	.24	**.52**	.19	-.01
FQ9	.03	.07	**.76**	.02	.00
FQ10	.03	-.06	**.87**	.02	.07
FQ11	.05	.-06	.03	**.92**	.01
FQ12	-.12	.17	.12	**.65**	.11
FQ13	.04	.02	-.03	**.90**	.00
FQ14	.08	-.07	.07	-.04	**.77**
FQ15	-.03	.03	-.02	.03	**.92**
FQ16	.07	.24	.02	.11	**.45**
Explained variance	13%	21%	15%	17%	14%

D1 = satisfaction, D2 = companionship, D3 = help, D4 = intimacy, D5 = self-validation

A comparison between the various factor solutions also determined the five-factor solution as the best fitting model. Differences in the Chi-square test and the AIC are given in Table 5.

Next, we conducted CFAs with a five-factor solution on smaller samples. Therefore, the data was split up in three samples, reflecting the three types of friendships on SNSs. Upon 1.037 offline-to-online friendships (CFI = .97, TLI = .96, RMSEA = .06, SRMR = .04) and 355 online-to-offline friendships (CFI = .97, TLI = .96, RMSEA = .07, SRMR = .04), all fit indices represented a good model fit. Among the 303 exclusively online friendships (CFI = .96, TLI = .95, RMSEA = .09, SRMR = .03), the results from the goodness-of-fit tests indicated that the RMSEA value was above the cut-off value of .08. The other values indicated a good model fit.

Table 5
Model comparisons

Model	Df	AIC	Chi²	Sig. difference in Chi²
Single-factor solution	104	49107	3364.9	
Two-factor solution	103	47498	1753.2	1611.8* (.00)
Two-factor solution	103	47498	1753.2	
Five-factor solution	94	46648	666.5	1086.6* (.00)

p-value < .05

5.1.2 Multiple group factor analyses

Multiple group CFAs were used to see whether there existed measurement invariance across younger (12-15 years old) and older (16-19 years old) adolescents, and across boys and girls at the levels of equal factor structure, factor loadings, intercepts, and error variances (see Tables 6 and 7). First, we tested the five-factor solution model separately in each group. The results from the goodness-of-fit tests indicated a sufficient model fit for the male (CFI = .97, TLI = .97, RMSEA = .07, SRMR = .03) and female (CFI = .98, TLI = .97, RMSEA = .07, SRMR = .03) adolescents, and the younger adolescents (CFI = .98, TLI = .97, RMSEA = .07, SRMR = .03). Among the older adolescents (CFI = .96, TLI = .95, RMSEA = .09, SRMR = .03), the results from the goodness-of-fit tests indicated that the RMSEA value was above the cut-off value of .08. The other values indicated a good model fit. Second, we constructed a model across the whole sample to investigate the configural invariance (i.e., equal factor structure) by fitting the five-factor solution on the data for younger and older adolescents, and male and female adolescents. In this model, the factor loadings were freely estimated and not forced to be the same across groups. The five-factor solution provided a good fit for the different age groups (CFI = .97, TLI = .97, RMSEA = .07, SRMR = .03) and the different sexes (CFI = .98, TLI = .97, RMSEA = .07, SRMR = .03). Third, we constructed a model to examine the metric invariance (i.e., equal factor loadings). In this model, the factor loadings were forced to be the same across groups. Goodness-of-fit tests indicated that the metric invariance model fitted well for the different age groups (CFI = .97, TLI = .97, RMSEA = .07, SRMR = .03) and the different sexes (CFI = .98, TLI = .97, RMSEA = .07, SRMR = .03). The Chi-square difference between the metric invariance model and the configural invariance model for both comparisons was above the significance level of .05, indicating that there was metric invariance. Additionally, the AIC-values of the metric invariance models were also lower. Fourth, we constructed a model to investigate the scalar invariance (i.e., equal intercepts). In this model, the intercepts were constrained to be equal across groups. The results indicated a sufficient model fit for the different

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age groups (CFI = .97, TLI = .97, RMSEA = .07, SRMR = .03) and the different sexes (CFI = .98, TLI = .97, RMSEA = .07, SRMR = .03). The Chi-square difference between the scaler invariance model and the metric invariance model turned out to be significant, indicating that there was no scalar invariance. The AIC-values of the scaler invariance models were also higher. Briefly, these results supported measurement invariance across younger and older adolescents, and across boys and girls at the levels of equal factor structure and loadings.

Table 6
Measurement invariance younger and older adolescents

Model	TLI	RSMEA	SRMR	CFI	Df	AIC	Chi^2	Sig. difference in Chi^2
Overall (five factor solution)	.97	.07	.03	.98	/	/		/
Male adolescents	.97	.07	.03	.98	/	/		/
Female adolescents	.95	.09	.03	.96	/	/		/
Configural invariance	.97	.07	.03	.97	188	46105.71	862.61	/
Metric invariance	.97	.07	.03	.97	199	46101.43	880.33	17.72 (.09)
Scalar invariance	.97	.07	.03	.97	210	46102.08	902.98	22.64* (.02)

*p-value < .05

Table 7
Measurement invariance male and female adolescents

Model	TLI	RSMEA	SRMR	CFI	Df	AIC	Chi^2	Sig. difference in Chi^2
Overall (five factor solution)	.97	.07	.03	.98	/	/		/
Male adolescents	.97	.07	.03	.97	/	/		/
Female adolescents	.97	.07	.03	.98	/	/		/
Configural invariance	.97	.07	.03	.98	188	45221.36	779.11	/
Metric invariance	.97	.07	.03	.98	199	45208.84	788.58	9.47 (.58)
Scalar invariance	.97	.07	.03	.97	210	45225.43	827.18	38.60* (.00)

*p-value < .05

5.2 Reliability

Table 8 provides an overview of the Cronbach's alphas, the mean scores, and the standard deviation for each dimension in the five-factor structure. The internal consistency of each

dimension appeared to be good (Cronbach's alpha range = .87-.94). In our sample, adolescents' friendships on the SNS Facebook were characterized mostly by satisfaction and companionship. The average scores on help, intimacy, and self-validation were slightly lower.

Table 8
Dimensions and their Cronbach's alpha, mean score, and standard deviation

Dimension	α	M	SD
1. Satisfaction	.93	4.00	1.10
2. Companionship	.94	4.00	1.06
3. Help	.91	3.65	1.19
4. Intimacy	.94	3.52	1.32
5. Self-validation	.87	3.51	1.14

Results of the correlation analysis (see Table 9) indicated that the dimensions were strongly correlated to each other.

Table 9
Pearson correlation matrix

Dimension		1	2	3	4	5
1. Satisfaction	R	1				
	Sig.					
2. Companionship	R	.90*	1			
	Sig.	.00				
3. Help	R	.79*	.82*	1		
	Sig.	.00	.00			
4. Intimacy	R	.77*	.79*	.82*	1	
	Sig.	.00	.00	.00		
5. Self-validation	R	.72*	.75*	.74*	.78*	1
	Sig.	.00	.00	.00	.00	

*p-value < .05

Note: correlations are based on scale scores

Results of the multilevel analysis indicated that the judgments about the dimensions of quality did not vary significantly at the adolescent level (see Table 10). The Intraclass Correlation Coefficient (ICC) for the dimensions satisfaction, companionship, help, and intimacy equaled

.00. For the dimension self-validation, this was .05. Thus, only 5% of the variance of the scores for self-validation could be attributed to the adolescents, which means that the variance is more due to the friendship itself.

Table 10
Multilevel analysis

Dimension	Intercept	Variance friendship	Variance adolescence level	T-value	ICC
1. Satisfaction	4.00	1.22	.00	147.60	.00
2. Companionship	4.03	1.13	.00	153.60	.00
3. Help	3.65	1.42	.00	124.50	.00
4. Intimacy	3.52	1.74	.00	108.50	.00
5. Self-validation	3.52	1.24	.06	122.00	.05

6. Discussion and conclusion

The aim of this study was to develop a questionnaire which can validly and reliably assess dimensions of friendship quality on SNSs - the Friendship Quality on Social Network Sites questionnaire (*FQSNS-questionnaire*). The questionnaire consists of five dimensions: satisfaction, companionship, help, intimacy, and self-validation. These dimensions were chosen and developed in a well-considered way based on existing instruments. It was intended to have a balanced number of items divided over these five dimensions. In this way, we wanted to ensure the content validity of the questionnaire.

Several validation and reliability analyses were applied on data of 1.695 friendships (i.e., offline-to-online, online-to-offline, and online friendships) gathered from 1.087 adolescents in 14 Flemish schools. To determine the construct validity of the *FQSNS-questionnaire*, we first conducted an EFA. Thereafter, we conducted CFAs based on the models resulting from the EFA. Results pointed to a five-factor solution, reflecting the proposed five dimensions of quality during the design process. Multiple group CFAs were used to see whether components of the model were invariant across age groups and sexes. The multiple group analyses supported measurement invariance across younger (12-15 years old) and older (16-19 years old) adolescents, and across boys and girls at the levels of equal factor structure and loadings. Cronbach's alphas were computed to examine the internal consistency of each dimension, which

appeared to be good (i.e., above the cut-off value of .60). A correlation analysis indicated that the dimensions were strongly correlated to each other. This is in line with our expectations as the dimensions reflect the overall friendship quality (Berndt, 2002). CFAs with a five-factor solution were conducted separately upon each type of friendship. Results indicated that the fit indices of each model were good. Although the RMSEA value of .09 attributed to the model with exclusively online friendships was higher than the cut-off value of .08, the model fit seemed sufficient due to the other good fit indices for CFI, TLI, and SRMR. It is stated that an RMSEA value between .08 and .10 indicates a fit which is neither good nor bad (Cangur & Ercan, 2015). In addition, multilevel analysis was conducted because we intended to design a questionnaire for measuring the quality of each friendship itself. Results of the multilevel analysis indicated that the judgments about the dimensions of quality showed minimal to no variation at adolescent level and that the variance was more due to the friendship itself.

Based upon these results, we can conclude that within different types of friendships, the dimensions of friendship quality can validly (research question 1) and reliably (research question 2) be assessed using the *FQSNS-questionnaire*. Since no research instruments are available for measuring friendship qualities on SNSs, this study contributes to research on social and personal friendships in general. The added value of the questionnaire is that it provides a research instrument for future research in the field of adolescents' and adults' friendships on SNSs. This is important because research has demonstrated that friendship quality experienced by young people during adolescence sets the stage for their relation quality in later life. Also, good friendships enhance many aspects of adolescents' well-being and mental health (e.g., self-esteem) (Berndt, 2002; Ellison et al., 2007; Johnston et al., 2013; Steinfield et al., 2008). The advantage of the FQSNS-questionnaire is the general formulation of the items. This is important in a world where SNSs are highly subjected to change and in which each SNS has different features.

Besides the insight into the dimensions of quality, the questionnaire provides a better understanding of what kind of social capital can be gathered on SNSs. In our sample, average scores were the highest on satisfaction and companionship. The average scores on help, intimacy, and self-validation were slightly lower, but still high. This suggests that the benefits derived from bonding (strong ties) and bridging (weak ties) can be closely coupled within a high-quality friendship on SNSs.

7. Limitations

Nevertheless, there are some limitations associated with our study. It is recommended to repeat the validation and reliability analyses with various adolescents' and adults' samples as the usage of SNSs by adults has increased in recent years (Pew Research Center, 2017). In this way, the

external validity of the questionnaire is examined. Although Facebook is the most popular SNS among adolescents (Apestaartjaren, 2016; Lenhart et al., 2015) and adults (Pew Research Center, 2017), other SNSs, such as Twitter or Instagram, are also worth to consider. It is also recommended to repeat the validation and reliability analyses with a translated version of the FQSNS-questionnaire, which has now been designed in Dutch. Other measures of validity can also be explored further, such as predictive validity. Future research could investigate whether low friendship qualities are predictive for unfriending someone (i.e., longitudinal perspective). Another way of validating the FQSNS-questionnaire, is to explore the relationship with other instruments, such as the Facebook specific Social Capital Scales from Ellison and colleagues (2014), and Parks' and Floyd's scale (1996) for measuring the development of friendships.

8. References

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Appendix A 'Friendship Quality on Social Network Sites questionnaire (FQSNS-questionnaire)'

Dimension	Item		Translation
Satisfaction	FQ1	Ik geef om hem/haar	I care about him/her
	FQ2	Ik vind hem/haar heel leuk	I like him/her a lot
	FQ3	Ik geniet ervan om hem/haar als mijn vriend te beschouwen	I enjoy it to consider him/her as my friend
Companionship	FQ4	Hij/zij heeft goede ideeën over wat leuke dingen zijn om te doen	He/she has good ideas about entertaining things to do
	FQ5	Hij/zij doet mij dikwijls lachen	He/she makes me laugh often
	FQ6	Ik vind het leuk om met hem/haar te praten	I like to talk with him/her
	FQ7	Ik vind het leuk om in zijn/haar gezelschap te zijn	I like to be in his/her company
Help	FQ8	Hij/zij helpt mij wanneer ik het nodig heb	He/she helps me when I need it
	FQ9	Hij/zij leent mij dingen die ik nodig heb	He/she lends me things I need
	FQ10	Hij/zij helpt mij om iets af te werken en te bereiken	He/she helps me to finish and achieve something
Intimacy	FQ11	Hij/zij is iemand tegen wie ik gevoelige dingen kan vertellen	He/she is someone I can tell delicate things to
	FQ12	Hij/zij weet goed wanneer ik overstuur ben	He/she knows when I'm upset
	FQ13	Hij/zij is iemand tegen wie ik geheimen kan vertellen	He/she is someone I can tell secrets to
Self-validation	FQ14	Hij/zij geeft mij het gevoel dat ik slim ben	He/she makes me feel smart
	FQ15	Hij/zij geeft mij het gevoel dat ik speciaal ben	He/she makes me feel special
	FQ16	Hij/zij geeft me een compliment als ik iets goed doe	He/she compliments me when I do something well