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Abstract

Research on peer-related loneliness in adolescence has paid insufficient attention to the distinction between intimate loneliness (i.e., in a dyadic relationship with a friend) and relational loneliness (i.e., in the broader peer group). This study examined the correlations among a broad set of loneliness scales. A sample of adolescents from Belgium ($n = 282$; 60% female) completed 8 subscales of 6 established loneliness measures. Results revealed high correlations among these measures. At the same time, confirmatory factor analysis revealed the two expected factors, reflecting intimate and relational loneliness. Furthermore, it was found that boys experienced on average more intimate loneliness than girls, and girls experienced on average more relational loneliness than boys. As different types of loneliness are related to problems in different domains, and adolescents may experience one type of loneliness but not the other, it is essential to know which loneliness measure taps into which type of loneliness. The present study not only provides evidence for the distinction between intimate and relational loneliness, but also shows which type is covered by which of six commonly used loneliness measures. Based on these findings, researchers can now make a more deliberate selection of scales for future research, and can better interpret and integrate findings from previous studies that used different loneliness measures.

Keywords: intimate loneliness, relational loneliness, confirmatory factor analysis, gender differences, measurement invariance.

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Intimate and Relational Loneliness in Adolescence

The need to belong is a universal phenomenon reflecting that every human has a fundamental desire to form social attachments (Baumeister & Leary, 1995). When something is missing in these social attachments, people experience a form of social pain, that is, loneliness (J. T. Cacioppo et al., 2015). Experiences of loneliness occur throughout the lifespan, but have been found to peak during adolescence (Qualter et al., 2015), possibly due to various changes in social expectations, roles, and relationships (Heinrich & Gullone, 2006). Moreover, during adolescence, the peer context becomes increasingly important (Meeus & Deković, 1995), and adolescents can experience loneliness in some types of peer relationships (e.g., a dyadic relationship with a best friend), but not in other types (e.g., within the broader peer group). Previous research emphasized the importance of distinguishing among types of loneliness, as different types of loneliness are related to problems in different domains and to different forms of psychopathology (e.g., DiTommaso, Brannen, & Best, 2004; Lasgaard, Goossens, Bramsen, Trillingsgaard, & Elklit, 2011; Maes, Vanhalst, Spithoven, Van den Noortgate, & Goossens, 2016). Several questionnaires have been developed to measure loneliness, but it is not always clear which type they tap into.

Loneliness is defined as the unpleasant feeling that occurs when people perceive their network of social relationships to be deficient in a quantitative or qualitative way (Perlman & Peplau, 1981). During adolescence, especially in Western cultures, the tension between social connection and individuation peaks (Larson, Richards, Moneta, Holmbeck, & Duckett, 1996). On the one hand, adolescents are expected to conform to the peer group and have close and intimate friends. On the other hand, gaining independence is a central developmental task in this phase of life. Adolescents may struggle to find a balance regarding this issue, which may lead to increased feelings of loneliness. Previous research demonstrated the detrimental

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effects of loneliness by showing that lonely people have more psychological problems, such as depression and anxiety, experience more physical problems, such as sleep problems and cardiovascular incidents, become ill more quickly, and pass away at an earlier age (for reviews, see Ernst & Cacioppo, 1999; Goossens et al., 2015; Heinrich & Gullone, 2006; Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015).

Sources of loneliness differ across the lifespan. For adolescents, the peer context becomes increasingly important (Qualter et al., 2015). Within the peer context, different types of peer relationships exist, including dyadic friendships and peer groups (Ladd, Kochenderfer, & Coleman, 1997; Rubin, Bukowski, & Bowker, 2015). According to the social needs perspective, different types of social relationships may fulfill different social needs (Sullivan, 1953; Weiss, 1973). Weiss (1973) distinguished different types of provisions that may be offered by different relationships, such as attachment, social integration, reassurance of worth, and guidance. Whereas certain provisions may be offered by both dyadic friendships and the peer group (e.g., reassurance of worth), other provisions may be offered particularly by dyadic friendships (e.g., attachment) or by the peer group (e.g., social integration). Given that adolescents develop different types of peer relationships which offer different provisions, and given that loneliness can be attributed to unmet social provisions, loneliness may be limited to one type of peer relationship only. For example, when provisions offered by the peer group are not met, one may feel lonely in this regard, without experiencing loneliness in the relationship with a dyadic friend.

A growing body of research distinguishes among different types of loneliness, but is inconsistent in the labels that are used (e.g., peer network loneliness versus dyadic loneliness, or social versus emotional loneliness). Until recently, an overarching framework connecting the different types of loneliness from different research traditions was missing. S. Cacioppo, Grippo, London, Goossens, and Cacioppo (2015) recently proposed such a framework, and

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distinguished between intimate and relational loneliness, which corresponds to Weiss' (1973) distinction between emotional and social loneliness. Intimate loneliness is the feeling of lacking a close, intimate attachment to another person (e.g., a best friend). Relational loneliness is the feeling of lacking a network of social relationships (e.g., a peer group). No loneliness measures have been developed based on this theoretical framework, but many existing and well-validated measures can be categorized into one of these two types of loneliness based on theoretical grounds.

Six loneliness questionnaires are commonly used to examine loneliness as experienced by adolescents in different types of peer relationships, including both dyadic relationships with a friend and the broader peer group. Two of these measures have explicitly been developed to distinguish between intimate and relational loneliness, that is, the Peer Network and Dyadic Loneliness Scale (PNDLS; Hoza, Bukowski, & Beery, 2000) and the Relational Provisions Loneliness Questionnaire (RPLQ; Hayden, 1989). Two other loneliness questionnaires, that is, the Children's Loneliness Scale (CLS; Asher & Wheeler, 1985) and the peer-related loneliness subscale of the Loneliness and Aloneness Scale for Children and Adolescents (LACA; Marcoen, Goossens, & Caes, 1987) have not explicitly been developed to tap into a specific type of loneliness. However, based on item content, both scales assess relational loneliness only. The last two loneliness questionnaires, that is, the UCLA Loneliness Scale (Russell, Peplau, & Cutrona, 1980) and the Rasch-Type Loneliness Scale (RTLs; De Jong Gierveld & Kamphuis, 1985), have not explicitly been developed to tap into a specific loneliness type, either. Based on item content, these scales assess both intimate and relational loneliness. For researchers who want to assess loneliness, it is important to realize that different established loneliness measures may tap into different types of loneliness, even though they have not been developed as such. Adolescents may experience one type of

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loneliness, but not the other (Maes et al., 2016), so it depends on the measure used which group of adolescents is captured and which one is not.

In addition to knowing which measures assess which type of loneliness, it is important to know how the different measures relate to each other if one wants to integrate or compare findings from studies using different loneliness instruments. Empirical findings on correlations among different loneliness measures are rare in the published literature, as most researchers simply select a single scale from the multitude of instruments available. The CLS showed higher correlations with relational loneliness than intimate loneliness, as measured by the PNDLS ($r = .74$ and $r = .47$, respectively; Hoza et al., 2000) in a sample of 200 US early adolescents. A similar pattern of correlations was found between the CLS and relational and intimate loneliness, as measured by the RPLQ (weighted average across two studies: $r = .70$ and $r = .47$, respectively; Goossens & Beyers, 2002; Terrell-Deutsch, 1993), based on a total of 1,200 Belgian and Canadian children. Similarly, the peer-related loneliness subscale of the LACA showed higher correlations with relational loneliness than intimate loneliness, as measured with the RPLQ (weighted average across two studies: $r = .59$ and $r = .38$, respectively; Goossens & Beyers, 2002; Terrell-Deutsch, 1993). The peer-related loneliness subscale of the LACA was further highly correlated with the CLS (weighted average across three samples: $r = .70$; Goossens & Beyers, 2002) in Belgian children. No study has documented correlations between the subscales of the PNDLS and the RPLQ.

The UCLA Loneliness Scale and the RTLS proved highly correlated in 200 Canadian university students ($r = .74$; Cramer & Barry, 1999). They were also related to the peer-related loneliness subscale of the LACA in 500 Belgian adolescents ($r = .76$ and $r = .65$, respectively; Goossens et al., 2009). The UCLA Loneliness Scale was further related to both PNDLS subscales (about $r = .70$; Lasgaard, 2007) in a sample of 300 Danish adolescents. No data were

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available for the RTLS regarding correlations with the two loneliness scales that tap into both intimate and relational loneliness (i.e., the PNDLS and the RPLQ).

This fragmented picture of the correlations among extant loneliness measures poses a problem for researchers who wish to compare or integrate findings across studies that used different loneliness measures. A comparison across studies will be more meaningful when researchers know how the different measures relate to each other. As there are no known correlations between several loneliness measures, including the two most popular scales (i.e., the UCLA Loneliness Scale and the CLS), it is unclear whether the findings obtained with these different instruments can be compared (Koenig & Abrams, 1999).

Gender differences in loneliness have frequently been examined, but these studies yielded inconsistent results, as described in a review on loneliness in children and adolescents (Weeks & Asher, 2012). As gender differences may vary according to loneliness type, this may be one explanation for this observed inconsistency. Substantial differences in peer experiences have been found between girls and boys. Girls tend to orient more toward dyadic, intimate attachments, whereas boys tend to orient more toward the larger group (Baumeister & Sommer, 1997; Gardner & Gabriel, 2004). Similarly, girls' peer relationships have been found to be more intense and exclusive than those of boys, whereas boys' peer groups have been found to be larger than girls' peer groups (Rose & Rudolph, 2006). Because girls focus more on intimate relationships, they might experience less intimate loneliness than boys. Similarly, because boys focus more on the group, they might experience less relational loneliness than girls. However, one could also argue that precisely because girls value dyadic relationships, they are especially vulnerable in this regard and may experience more intimate loneliness than boys. Similarly, boys may be especially vulnerable for experiencing relational loneliness, as they value the group more than girls do.

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Empirical support for these opposing hypotheses is limited. In line with the first line of reasoning, one study found that boys reported higher dyadic loneliness than did girls on the PNDLS (Hoza et al., 2000). No results on gender differences were available for the RPLQ. Gender differences in loneliness as measured by the other scales have also been examined, but results were largely inconsistent. For example, studies using the peer-related loneliness scale of the LACA have found no gender differences (Bossaert, Colpin, Pijl, & Petry, 2012; Marcoen et al., 1987), higher scores for girls (Corsano, Majorano, & Champretavy, 2006; Goossens & Marcoen, 1999), and higher scores for boys (Scharf, Wiseman, & Farah, 2011; Wols, Scholte, & Qualter, 2015).

The present study aimed to examine the associations among the six loneliness instruments that are used most commonly in adolescent samples. Assuming overall comparability among similar measures within each category, that is, intimate and relational loneliness, one can expect a particular pattern of correlations to emerge. All correlations can be expected to be high, except for the “cross-correlations” among the two types of loneliness. This pattern of correlations, in turn, would translate into a two-factor structure, with one factor identifiable as intimate loneliness (i.e., with high loadings for the intimate loneliness subscales of the PNDLS and the RPLQ) and the other one as relational loneliness (i.e., with high loadings for the relational loneliness subscales of the PNDLS and the RPLQ, for the peer-related loneliness subscale of the LACA, and for the CLS). The two general measures, the UCLA Loneliness Scale and the RTLS, were expected to show substantial loadings on both factors. We further aimed to examine gender differences in these two types of loneliness, as experiences in peer relationships differ for boys and girls. Because the results of previous studies have been largely inconsistent, we did not have strong a priori hypotheses in this regard.

Method

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Participants

Data were collected in 2010 in a secondary school in the Dutch-speaking part of Belgium. This school offered both the academic and technical track, from which 14 classes were randomly selected. In all, 289 adolescents filled out the questionnaires, but 7 of them had missing data for one or more subscales and were therefore dropped from the current analyses. Of the remaining adolescents, 253 (89.7%) had complete data, whereas the others were missing one (8.2%) or a few items (2.2%). Little's MCAR Test (Little, 1988) revealed a normed χ^2 (χ^2/df) of 1.08, which, according to guidelines by Bollen (1989; normed $\chi^2 < 2$), indicates that the data were missing completely at random. Therefore, we imputed missing values by means of the Expectation–Maximization procedure in SPSS 22.0.

The final analytic sample comprised 282 adolescents from Grade 7 ($n = 143$) and Grade 8 ($n = 139$). Participants were between 12 and 15 years old ($M = 12.65$, $SD = 0.63$). With regard to gender, there were 114 boys (40.4%) and 168 girls (59.6%). Exact information on the ethnic background or the socioeconomic status of the students was not available, but the school seemed to attract mostly Caucasian students.

Procedure

The school principal was informed about the goal and procedure of the study and was provided with the questionnaire that we aimed to administer. After the school principal gave permission to conduct the study, parents were informed in a letter about the purpose of the study and could indicate in writing that they did not want their child to participate in the study (i.e., a passive form of parental consent was used). This procedure was approved by the Institutional Review Board (IRB) at the researchers' institution. Only three parents did not give their consent for their child to participate in the study. At the start of each testing session, participants were informed about the goal and procedure of the study, and they were told that their anonymous answers would be treated confidentially and that they could refuse to

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participate further at any time if they so desired (i.e., a passive form of assent was used). None of the participants refused to take part in the study. Moreover, an undergraduate student in psychology was present during data collection to answer any questions the adolescents had. Adolescents completed the questionnaires in their classroom during a regular class period, which takes 50 minutes in Belgian secondary schools.

Measures

The participants filled out eight subscales of six established loneliness questionnaires that are described below. All measures were in Dutch, the students' native language. When questionnaires included the word "children", this was replaced with the more age-appropriate term "youth".

Peer Network and Dyadic Loneliness Scale (PNCLS). The PNCLS (Hoza et al., 2000) has been developed for children and comprises two 8-item subscales that tap into intimate and relational loneliness, as experienced within the peer context. The response format is modeled after Harter's (1985) Self-Perception Profile for Children (SPPC), which is meant to minimize the effects of social desirability response sets. The respondents were presented with pairs of sentences describing children who differ in friendships or network relationships. They were first asked to select which type of children they resembled most and then to indicate whether the description selected is *sort of true* or *really true* for them. Essentially, all items were answered on a 4-point scale ranging from (1) *very low* to (4) *very high*. A sample item for the Peer dyadic loneliness subscale (PCLS) is "Some youth have someone their age who is a really close friend BUT Other youth don't have anybody their age who is a really close friend". A sample item for the Peer network loneliness subscale (PNLS) is "Some youth feel like they really fit in with other youth BUT Other youth don't feel like they fit in very well with other youth". Earlier research showed good internal consistency for both subscales (i.e., $\alpha = .80$) and a two-factor structure (Hoza et al., 2000). This scale had not

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been used in Dutch before, and was translated for the purpose of the present study. An expert in loneliness and a master student in psychology independently translated the items.

Differences in translation were resolved by consensus. In the current sample, Cronbach's alpha was good for the two subscales (in both cases $\alpha = .85$).

Relational Provisions Loneliness Questionnaire (RPLQ). The RPLQ (Hayden, 1989) is a 28-item multidimensional scale developed for children. In the present study, the Dutch translation (Goossens & Beyers, 2002) of two of the subscales, that is, peer personal intimacy (PPI; e.g., "I have a friend I can tell everything to") and peer group integration (PGI; e.g., "I feel in tune with other youth"), was used. Both scales comprised 7 items, which could be answered on a 5-point scale ranging from (1) *not at all* to (5) *always*. In earlier research, all RPLQ subscales showed good internal consistency (i.e., $\alpha > .80$; Terrell-Deutsch, 1999) and substantial concurrent validity (Goossens & Beyers, 2002; McDougall & Hymel, 1998; Rubin, Chen, McDougall, Bowker, & McKinnon, 1995). Cronbach's alpha in the current sample was good for both the Peer personal intimacy subscale ($\alpha = .86$) and the Peer group integration subscale ($\alpha = .90$).

Children's Loneliness Scale (CLS). The CLS (Asher & Wheeler, 1985) is a 16-item unidimensional scale developed to examine children's feelings of loneliness in the school context. In the present study, we used the Dutch version of the CLS (Goossens & Beyers, 2002). Example items are "I get along with other youth" (reverse coded) and "I don't have any friends". Each item could be answered on a 5-point scale ranging from (1) *not at all* to (5) *always*. Earlier research indicated that the measure exhibits good internal consistency (i.e., $\alpha > .80$; Asher, Hymel, & Renshaw, 1984). Cronbach's alpha in the current sample was good ($\alpha = .91$).

Loneliness and Aloneness Scale for Children and Adolescents (LACA). The LACA (Marcoen et al., 1987) is a 48-item Dutch multidimensional scale developed in Belgium for use with children and adolescents. In the present study, only the peer-related loneliness subscale

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(L-Peers; e.g., “I feel abandoned by my friends”) was included. This subscale consisted of 12 items, which could be answered on a 4-point scale ranging from (1) *never* to (4) *often*. In earlier research, the peer subscale showed good internal consistency (i.e., $\alpha > .80$; Maes, Van den Noortgate, & Goossens, 2015) and factorial validity (Maes, Klimstra, Van den Noortgate, & Goossens, 2015). Cronbach’s alpha in the current sample was good ($\alpha = .92$).

UCLA Loneliness Scale. The UCLA Loneliness Scale (Russell et al., 1980) is a 20-item unidimensional scale, originally developed for use with college students and adults. The scale also has been used and validated in research with adolescents. A Dutch translation of the scale was used (Goossens, Beyers, Emmen, & Van Aken, 2002). Example items are “There is no one I can turn to” and “I feel part of a group of friends” (reverse coded). Each item could be answered on a 5-point scale ranging from (1) *completely disagree* to (5) *completely agree*. Earlier research indicated that the measure showed good internal consistency (i.e., $\alpha > .80$; Vassar & Crosby, 2008). Cronbach’s alpha in the current sample was good ($\alpha = .88$).

Rasch-Type Loneliness Scale (RTLs). The RTLs (De Jong Gierveld & Kamphuis, 1985) is a Dutch 11-item scale for adults, developed in the Netherlands as a multidimensional scale, but used primarily as a unidimensional scale. The measure has occasionally been used with adolescents, including a Dutch sample (e.g., Kef, Hox, & Habekothé, 2000; Whitehouse, Durkin, Jaquet, & Ziatas, 2009). Moreover, in a study on Belgian adolescents, the RTLs showed a high correlation with a brief version of the UCLA Loneliness Scale (Goossens et al., 2009). Example items are “I wish I had a really close friend” and “I miss having people around me”. Each item could be answered on a 5-point scale ranging from (1) *completely disagree* to (5) *completely agree*. Earlier research showed good internal consistency (i.e., $\alpha > .80$) in a sample of 2,900 older adults (Dykstra, Van Tilburg, & De Jong Gierveld, 2005). Cronbach’s alpha in the current sample was good ($\alpha = .86$).

Data Analyses

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Before comparing groups, such as boys and girls, researchers have to establish measurement invariance across these groups (Chen, 2007; Van de Schoot, Lugtig, & Hox, 2012). We ran several Confirmatory Factor Analyses in Mplus 7.31 (Muthén & Muthén, 1998-2015), using the Maximum Likelihood Robust (MLR) estimator. MLR has been shown to be the most accurate estimator when the distribution of scores slightly deviates from a normal distribution (Satorra & Bentler, 1994), which was the case with the scores on the subscales. We examined metric and scalar invariance across gender for each of the six loneliness measures. Metric invariance (i.e., testing whether the factor loadings are equal across groups) was examined by comparing the fit of a multigroup CFA model without constraints across boys and girls to a multigroup CFA model in which the factor loadings were constrained to be equal across boys and girls. Scalar invariance (i.e., testing whether not only the factor loadings, but also the item intercepts are equal across groups) was examined by comparing the fit of a multigroup CFA model with only the factor loadings constrained to be equal across groups (cf. metric invariance) to a multigroup CFA in which both factor loadings and item intercepts were constrained to be equal across groups. To evaluate model fit, we relied on three commonly used fit indices (Chen, 2007; Vandenberg & Lance, 2000), that is, the comparative fit index (CFI), the root mean square error of approximation (RMSEA), and the standardized root mean squared residual (SRMR). Following the guidelines of Chen (2007), we regarded metric invariance as established if the difference in CFI (Δ CFI) between models with group-specific or common factor loadings was smaller than .010, Δ RMSEA was smaller than .015, and Δ SRMR was smaller than .030. We regarded scalar invariance as established if Δ CFI, Δ RMSEA, and Δ SRMR between models with group-specific or common intercepts were smaller than .010, .015, and .010, respectively. If measurement invariance was established, a multivariate analysis of variance (MANOVA) was conducted for the eight loneliness subscales separately to examine gender differences.

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To examine whether the different loneliness subscales reflected the two hypothesized dimensions of loneliness, we conducted confirmatory factor analyses. To evaluate model fit, the use of multiple criteria has been advocated by Vandenberg and Lance (2000), as different criteria can provide information on different sources of model misspecification. Because the χ^2 -statistic is well known to be overly sensitive to sample size and model complexity (e.g., Cheung & Rensvold, 2002), we relied on four other commonly used fit indices (Chen, 2007), that is, CFI, RMSEA, SRMR, and the Akaike information criterion (AIC). The χ^2 -value should be as low as possible and preferably non-significant. With regard to CFI, .90 represents acceptable fit and .95 good fit. RMSEA should not exceed .06 in well-fitting models, SRMR should not be larger than .08 in such models, and AIC should be as low as possible (Hu & Bentler, 1999). To examine gender differences, standardized latent mean scores were compared.

Results

Individual Measures: Factor Structure and Measurement Invariance

Descriptive statistics of the eight loneliness subscales are presented in Table 1. Confirmatory Factor Analyses (CFA) were conducted for each of the six individual loneliness measures. Acceptable to good fit was obtained for the two-factor models of the PNDLS and the RPLQ, and the one-factor models of the L-Peers and the RTLS. For the CLS and the UCLA Loneliness scale, model fit was not acceptable (CFA = .844, RMSEA = .099, and SRMR = .063 for the CLS, and CFA = .837, RMSEA = .072, and SRMR = .069 for the UCLA Loneliness Scale). Previous research on the factor structure of the CLS and UCLA Loneliness Scale emphasized the importance of taking item wording into account (Ebesutani et al., 2012; Russell, 1996). In samples of Belgian adolescents, model fit of both scales also improved when taking item wording into account (Goossens, Klimstra, Luyckx, Vanhalst, & Teppers, 2014; Maes, Van den Noortgate, Vanhalst, Beyers, & Goossens, 2015). Therefore,

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for both the CLS and the UCLA Loneliness scale, correlated error terms for the reverse coded items were added to correct for item wording. This correction resulted in an acceptable model fit for the UCLA Loneliness Scale, but not for the CLS (CFI = .880, RMSEA = .094, and SRMR = .059). Based on the modification indices, we added an error correlation between two items that were very similar in wording, that is, between Item 1 (“It's easy for me to make new friends at school”) and Item 4 (“It's hard for me to make new friends at school”). This addition resulted in a good model fit. Model fit indices for the final models are presented in Table 2.

The results of the measurement invariance analyses across gender are also presented in Table 2. Both metric and scalar invariance across gender held for all six measures. These findings, therefore, supported the expected structure of all six measures, and indicated that boys and girls interpret the items of all measures in a similar way. The MANOVA with the eight subscales as dependent variables showed a significant gender difference, $F(8, 273) = 8.10, p < .001, \eta^2_p = .19$. Subsequent univariate ANOVAs, as presented in Table 3, revealed significant gender differences for the subscales PNLS and PPI. On average, girls scored higher than boys on the PNLS, whereas boys scored higher than girls on the PPI. Effect sizes, however, were rather small.

Intimate and Relational Loneliness

Correlations (see Table 1) among measures that reflect intimate loneliness (i.e., PDLs and PPI) and among measures that reflect relational loneliness (i.e., PNLS, PGI, CLS, and L-Peers) were generally high (r ranged from .73 to .84). As expected, correlations between measures reflecting intimate loneliness and measures reflecting relational loneliness were somewhat lower (r ranged from .45 to .60). The two measures that tap into both intimate and relational loneliness, that is, the UCLA Loneliness Scale and RTLS, correlated highly with all other measures (r ranged from .64 to .87).

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A 1-factor model was tested in which all subscales loaded on this single factor. In addition, we tested a 2-factor model, with unique loadings on the Intimate loneliness factor for the PDLS and PPI and on the Relational loneliness factor for the PNLS, PGI, CLS, and L-Peers. The UCLA Loneliness Scale and the RTLS could load on both factors, because these scales reflected both intimate and relational loneliness in their item wordings. Factor loadings of the loneliness scales for both models tested are presented in Table 4. The subscales PDLS and PPI loaded highly on intimate loneliness, and the subscales PNLS, PGI, CLS, and L-Peers loaded highly on relational loneliness (i.e., all above .80). The two other scales, that is, the UCLA Loneliness Scale and the RTLS, loaded on both factors, but had a higher loading on relational loneliness. The two factors correlated substantially ($r = .73, p < .001$). Both models showed acceptable fit (Table 5), but the model fit indices of the 2-factor model proved superior to the 1-factor model. The Satorra-Bentler scaled chi-square difference test (Satorra & Bentler, 2001) also suggested a superior fit of the 2-factor model over the 1-factor model ($\Delta\chi^2(3) = 131.06, p < .001$). Examining gender differences in the final 2-factor model revealed that boys experienced on average more intimate loneliness than girls (standardized difference in estimated latent means = $-0.42, SE = 0.19, p = .023$), and girls experienced on average more relational loneliness than boys (standardized difference in estimated latent means = $0.21, SE = 0.10, p = 0.036$).

Discussion

The present study provides empirical evidence for the distinction between intimate and relational loneliness, as recently proposed in an overarching framework on different types of loneliness (S. Cacioppo et al., 2015). Although no loneliness measures have been developed based on this framework, we could sort the six loneliness instruments that are used most commonly with adolescent samples as tapping into intimate or relational loneliness, or both. Most of these loneliness measures showed high intercorrelations, both within and across the

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categories distinguished, including some measures that had never been used together in a single study. At the same time, confirmatory factor analysis indicated that a distinction could be made, as expected, between intimate and relational loneliness. Gender differences were found, with boys experiencing on average more intimate loneliness than girls, and girls experiencing on average more relational loneliness than boys.

To interpret findings from studies using different loneliness instruments, it is important to know which type of loneliness is captured by which measure and how these measures relate to each other. Moreover, it is important to know which instrument taps into which type of loneliness, when selecting an instrument. Researchers who want to study the type of loneliness that results from poor relationships with a best friend may opt for a measure reflecting intimate loneliness (i.e., the intimate loneliness subscale of the PNDLS or RPLQ). Researchers who want to concentrate on the type of loneliness that results from a less successful integration into the peer group may be advised to use a measure reflecting relational loneliness (i.e., the CLS, the L-Peers, or the relational loneliness subscale of the PNDLS or RPLQ). Other researchers who are less interested in specific types of loneliness and who wish to administer one scale tapping into general loneliness, would be well-advised to use global measures of the construct, such as the UCLA Loneliness Scale or the RTLS. Strikingly, neither of the two most popular loneliness measures, that is, the UCLA Loneliness Scale and the CLS, have been explicitly developed to tap into either intimate or relational loneliness, or have been thought of as such. The present results showed that whereas the UCLA Loneliness Scale covers both types of loneliness, the CLS tends to focus on relational loneliness only. When comparing results across studies using these measures, researchers are advised to keep this difference in mind.

Moreover, the present findings have implications for researchers who want to conduct meta-analyses in the domain of loneliness. One could argue that all measures used in the

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present study can be incorporated in such quantitative reviews of the literature, without making a distinction between measures, as the 1-factor model showed a good fit and all correlations were medium to high in size (i.e., r ranges between .45 and .87). However, the fit of the 2-factor model was somewhat better and correlations between measures tapping into the same type of loneliness were large for intimate loneliness ($r = .73$) and relational loneliness (r ranges between .76 and .84). Thus, in addition to looking at an overall loneliness score, researchers may want to zoom in on the two types of loneliness, for example, by performing a multivariate meta-analysis that includes the type of loneliness measure as a potential moderator.

Regarding gender differences in loneliness, boys experienced on average more intimate loneliness, whereas girls experienced on average more relational loneliness. It could be that because girls tend to focus more on dyadic, intimate attachments than boys (Baumeister & Sommer, 1997; Gardner & Gabriel, 2004), they experienced less intimate loneliness than boys. Similarly, because boys tend to orient more toward the larger group than girls, they experienced less relational loneliness than girls. However, when examining gender differences for the loneliness subscales separately, the differences were small and not consistent across measures. Gender differences in types of loneliness have not yet been examined extensively and future research is needed to replicate the current findings and to examine whether they also hold for individuals of different ages in different countries.

Limitations and Suggestions for Future Research

The present study has a number of limitations that lead to suggestions for future research. Most importantly, the third type of loneliness as hypothesized by the model by S. Cacioppo et al. (2015), that is, collective loneliness, has not received much attention in the literature yet. Collective loneliness refers to one's valued social identities and how one is connected with similar others at a distance. We know of just a single subscale that taps into

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this type of loneliness, that is, the Group Loneliness subscale of the Differential Loneliness Scale (DLS; Schmidt & Sermat, 1983). This subscale, however, has been administered only once in an adolescent sample and evidence for the proposed factor structure of the DLS is lacking. We suggest future research to examine the validity and reliability of this subscale, which refers to participants' community, in an adolescent sample, and to examine its relation with intimate and relational loneliness. Furthermore, future research is needed at the conceptual level, as it is not clear yet which people or which communities represent "similar others at a distance". These "others at a distance" might include different contexts and are bound to change with age. For example, for children, this context might include the school, whereas for adolescents, the neighborhood or the larger cultural group might be more important. As such, we suggest future research to clarify the definition of collective loneliness, bearing in mind developmental differences.

Another limitation of the present study is that the research was conducted in a single school in a specific country on a sample of mainly Caucasian adolescents. Belgium can be regarded as a rather individualistic country, scoring 75 on the individualism dimension of Hofstede's (2001) model of national culture, a score that can range from 0 to 100. Our results may not generalize to other countries or to adolescents with a different ethnic background. A related limitation concerns the translation and adaptation of the loneliness questionnaires. The LACA and RTLS have been developed in Dutch, but the other questionnaires have been developed in English. The PNDLS was translated into Dutch for the purpose of the present study, but no back-translation procedure was used and no information on the psychometric properties of this translated version is available yet. The other scales have been used with Belgian adolescents before, providing some preliminary evidence for the reliability and construct validity of these Dutch versions (Goossens & Beyers, 2002; Goossens et al., 2002, 2009; Vanhalst et al., 2013). However, more work is needed to examine to what extent the

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different loneliness measures can be used across different cultures, including studies examining possible biases, testing for measurement invariance, and deriving normative data (Fernandez, Boccaccini, & Noland, 2007; Geisinger, 1994; Van de Vijver & Tanzer, 2004). Furthermore, our study only examined adolescents in Grades 7 and 8 and care should be taken, therefore, not to extend our findings to other developmental periods. For example, the association found between the UCLA Loneliness Scale and CLS in this age group does not necessarily mean that the two scales are similarly associated with each other when used in different age groups. Items from a particular questionnaire may be interpreted in a different way by different age groups. A next step, therefore, is to establish measurement invariance of loneliness measures across development. Another limitation of the present study is that the participants filled out the questionnaires in the same order, so we cannot rule out order effects. Reliability scores, however, did not show a particular pattern across these measures and were in fact high for all scales (α ranging from .85 to .92).

Finally, in the present study, we focused on the peer context, but other loneliness measures that have been used in adolescent samples focus on other contexts, such as the family. Within the family context, a distinction between intimate and relational loneliness can also be made. Some measures have been developed to tap into loneliness regarding a specific family member (cf. intimate loneliness), including a subscale from the RPLQ. Other measures tap into loneliness regarding the family as a whole (cf. relational loneliness), such as subscales from the RPLQ, the DLS, and the Social and Emotional Loneliness Scale for Adults (SELSA; DiTommaso & Spinner, 1993). An interesting avenue for future research, therefore, is to differentiate intimate and relational loneliness across different measures in the family context.

To summarize, the present study clearly indicates that the different loneliness measures that are commonly used in adolescent samples are related to one another and that

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two types of loneliness, that is, intimate and relational loneliness in the peer context, can be distinguished. The key distinction between loneliness as it emerges in a dyadic relationship with a friend and in the broader peer group may guide the selection of scales in future research in a more consistent and deliberate manner and may assist researchers who wish to compare or integrate findings from studies using different loneliness measures.

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Table 1

Descriptive Statistics for the Eight Loneliness Subscales

| Subscale | <i>M</i> | <i>SD</i> | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|------------|----------|-----------|-----|-----|-----|-----|-----|-----|-----|
| 1. PNLS | 13.32 | 4.30 | - | | | | | | |
| 2. PDLS | 12.56 | 4.63 | .59 | - | | | | | |
| 3. PGI | 13.73 | 5.03 | .76 | .59 | - | | | | |
| 4. PPI | 11.98 | 5.29 | .45 | .73 | .59 | - | | | |
| 5. CLS | 26.94 | 9.85 | .78 | .55 | .83 | .55 | - | | |
| 6. L-Peers | 19.36 | 7.31 | .80 | .60 | .77 | .52 | .84 | - | |
| 7. UCLA | 36.15 | 10.90 | .80 | .71 | .78 | .65 | .79 | .83 | - |
| 8. RTLS | 19.74 | 7.62 | .74 | .71 | .77 | .64 | .76 | .82 | .87 |

Note. *M* = mean; *SD* = standard deviation; PNLS = Peer Network Loneliness Scale; PDLS = Peer Dyadic Loneliness Scale; PGI = Peer Group Integration; PPI = Peer Personal Intimacy; CLS = Children's Loneliness Scale; L-Peers = Peer-Related Loneliness; UCLA = University of California Los Angeles Loneliness Scale; RTLS = Rasch-Type Loneliness Scale. All correlations were significant ($p < .001$).

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Table 2

Measurement Invariance Across Gender for Six Loneliness Measures

| Subscale | | CFI | Δ CFI | RMSEA | Δ RMSEA | SRMR | Δ SRMR |
|----------------------|---------------|------|--------------|-------|----------------|------|---------------|
| PNDLS ^a | Unconstrained | .918 | | .062 | | .065 | |
| | Metric | .920 | .002 | .059 | .003 | .081 | .016 |
| | Scalar | .909 | .011 | .061 | .002 | .085 | .004 |
| RPLQ ^a | Unconstrained | .911 | | .081 | | .067 | |
| | Metric | .917 | .006 | .076 | .005 | .073 | .006 |
| | Scalar | .910 | .007 | .076 | <.001 | .076 | .003 |
| CLS ^b | Unconstrained | .932 | | .071 | | .051 | |
| | Metric | .938 | .006 | .065 | .006 | .064 | .013 |
| | Scalar | .937 | .001 | .063 | .002 | .065 | .001 |
| L-Peers ^b | Unconstrained | .951 | | .069 | | .043 | |
| | Metric | .952 | .001 | .065 | .004 | .055 | .012 |
| | Scalar | .947 | .005 | .066 | .001 | .059 | .004 |
| UCLA ^b | Unconstrained | .903 | | .065 | | .057 | |
| | Metric | .902 | .001 | .063 | .002 | .068 | .011 |
| | Scalar | .886 | .016 | .066 | .003 | .072 | .004 |
| RTL ^b | Unconstrained | .946 | | .064 | | .056 | |
| | Metric | .943 | .003 | .062 | .002 | .073 | .017 |
| | Scalar | .910 | .033 | .074 | .012 | .083 | .010 |

Note. PNDLS = Peer Network and Dyadic Loneliness Scale; RPLQ = Relational Provisions Loneliness Questionnaire; CLS = Children's Loneliness Scale; L-Peers = Peer-Related Loneliness; UCLA = University of California Los Angeles Loneliness Scale; RTL = Rasch-Type Loneliness Scale. CFI = Comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

a Two-factor model.

b One-factor model.

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Table 3

Loneliness Scores as a Function of Gender

| Subscale | Girls | | Boys | | <i>F</i> (1, 280) | η^2_p |
|----------|----------|-----------|----------|-----------|-------------------|------------|
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | | |
| PNLS | 13.76 | 4.79 | 12.69 | 3.39 | 4.25* | .02 |
| PDLS | 12.13 | 4.64 | 13.20 | 4.57 | 3.66 | .01 |
| PGI | 13.98 | 5.16 | 13.36 | 4.85 | 1.01 | .00 |
| PPI | 10.75 | 4.41 | 13.79 | 5.93 | 24.26*** | .08 |
| CLS | 27.37 | 10.18 | 26.30 | 9.37 | 0.79 | .00 |
| L-Peers | 20.06 | 7.66 | 18.33 | 6.68 | 3.82 | .01 |
| UCLA | 36.26 | 11.64 | 35.99 | 9.75 | 0.04 | .00 |
| RTLS | 19.98 | 7.92 | 19.39 | 7.18 | .53 | .00 |

Note. *M* = mean; *SD* = standard deviation; PNLs = Peer Network Loneliness Scale; PDLS = Peer Dyadic Loneliness Scale; PGI = Peer Group Integration; PPI = Peer Personal Intimacy; CLS = Children's Loneliness Scale; UCLA = University of California Los Angeles Loneliness Scale; RTLS = Rasch-Type Loneliness Scale; L-Peers = Peer-Related Loneliness.

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

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Table 4

Factor Loadings of the Loneliness Measures

| Subscale | One-Factor Model | Two-Factor Model | |
|----------|------------------|---------------------|-----------------------|
| | Loneliness | Intimate loneliness | Relational loneliness |
| PNLS | .85 | | .87 |
| PDLS | .73 | .88 | |
| PGI | .87 | | .87 |
| PPI | .66 | .81 | |
| CLS | .88 | | .90 |
| L-Peers | .90 | | .92 |
| UCLA | .93 | .35 | .65 |
| RTLS | .91 | .38 | .60 |

Note. PNLs = Peer Network Loneliness Scale; PDLS = Peer Dyadic Loneliness Scale; PGI = Peer Group Integration; PPI = Peer Personal Intimacy; CLS = Children's Loneliness Scale; L-Peers = Peer-Related Loneliness; UCLA = University of California Los Angeles Loneliness Scale; RTLS = Rasch-Type Loneliness Scale.

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Table 5

Fit Indices for two Factor Models of Loneliness

| Model | <i>df</i> | χ^2 | CFI | RMSEA | SRMR | AIC |
|------------------|-----------|----------|-----|-------|------|----------|
| One-factor model | 20 | 177.86 | .91 | .17 | .05 | 12749.06 |
| Two-factor model | 17 | 65.30 | .97 | .10 | .02 | 12610.62 |

Note. CFI = Comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized root mean squared residual; AIC = Akaike's information criterion. All chi-squares were significant ($p < .001$).