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Abstract

In this study, the factor structure and psychometric properties of a French adaptation of the well-established Loneliness and Aloneness Scale for Children and Adolescents (LACA) was investigated in a French-speaking sample of Belgian adolescents (N = 641; Mage = 14.35, SD = 2.03; 53.4% girls). In addition, measurement invariance analyses across the two main language groups in Belgium (i.e., Dutch-speaking and French-speaking) and across age and gender were conducted on a combined sample of French-speaking and Dutch-speaking Belgian adolescents (N = 1282; Mage = 14.36 years, SD = 2.03; 53.6% female). Subsequently, group mean differences across language, age, and gender groups were investigated. Convincing support was found for the expected four-factor structure of the French adaptation of the LACA and the measure showed good reliability. Results further indicated that Belgian adolescents from the two principal language groups and from different age and gender groups interpreted the items of the LACA similarly. Therefore, analyses of group mean differences could be compared. Given the small effect sizes that accompanied the obtained effects, replication research is needed to further investigate these group mean differences.

Keywords: Loneliness; Attitudes toward aloneness; Measurement invariance; Regional differences; Belgium

Loneliness and Attitudes Toward Aloneness in Belgian Adolescents:

Measurement Invariance Across Language, Age, and Gender Groups

Loneliness is "the unpleasant experience that occurs when a person's network of social relations is deficient in some important way, either quantitatively or qualitatively" (Perlman & Peplau, 1981, p. 31). Loneliness is a universal phenomenon that occurs throughout the lifespan, but is particularly salient during adolescence (Qualter et al., 2015). More specifically, loneliness in the relationships with peers and with parents tends to peak during adolescence (Marcoen & Goossens, 1993). Adolescents are typically confronted with numerous changes in their social world, such as a more pronounced preoccupation with their social status and higher expectations about social relationships in the peer realm, and greater autonomy in their relationship with their parents (Heinrich & Gullone, 2006; Laursen & Hartl, 2013). These changes make adolescents highly vulnerable to experiencing feelings of loneliness, which in turn is associated with several negative mental and physical health problems (Heinrich & Gullone, 2006).

Aloneness is the objective experience of being without company (Long & Averill, 2003) and is not the same as loneliness. One can feel lonely when alone but also when surrounded by people. From early adolescence onwards, young people spend a greater amount of time alone and their experience of being alone changes substantially (Larson, 1997; Larson & Richards, 1991). Aloneness emerges as a constructive domain of experience in adolescents' life, represented by a positive association between time spent alone and adolescents' well-being (Larson, 1997). In addition, adolescents may have more or less positive or negative attitudes toward aloneness. These attitudes toward aloneness may function as moderators in the relationship between aloneness and feelings of loneliness. For example, adolescents who spend a lot of time alone, but have negative attitudes toward aloneness, may be more likely to experience feelings of loneliness (Goossens, 2016).

A Multidimensional Measure to Assess Loneliness and Attitudes Toward Aloneness

The Loneliness and Aloneness Scale for Children and Adolescents (LACA; Marcoen, Goossens, & Caes, 1987) is a frequently used questionnaire that builds on a hybrid multidimensional model of loneliness (Marcoen et al., 1987). According to this model, loneliness can take on multiple forms and varies in intensity and function across relationships (Goossens et al., 2009; Majorano, Musetti, Brondino, & Corsano, 2015). The LACA measures two types of loneliness, that is, parent-related loneliness and peer-related loneliness, and two attitudes toward aloneness, that is, positive and negative attitudes. It was originally developed in Belgium for use with Dutch-speaking adolescents from ages 10 to 19 (Marcoen et al., 1987). The psychometric properties of this Dutch version of the LACA are well-established (Goossens, 2016). For example, convincing support has been found for the supposed four-factor structure of the LACA (Maes, Klimstra, Van den Noortgate, & Goossens, 2015). In addition, the Dutch version of the LACA shows good reliability (Maes, Van den Noortgate, & Goossens, 2015) and shows measurement invariance across age and gender (Maes et al., 2015).

The LACA is not only available in Dutch, but has been translated into numerous other languages as well (i.e., Arabic, Chinese, English, Greek, Hebrew, Italian, Spanish, and Portuguese; Maes, 2016). However, until now, a French version of the LACA was lacking. Because French is an important language in several countries, there was a clear need to translate the LACA for use with French-speaking adolescents. More specifically, French is an important language in France, Switzerland, and Canada, but also in Belgium, where the two principal languages are Dutch (used by approximately 60% of the Belgian population) and French (used by approximately 40% of the Belgian population; European Commission, 2005). By establishing a French version of the LACA in addition to the already existing Dutch version, regional differences in loneliness and attitudes toward aloneness across Belgium can

be investigated. However, before meaningful comparisons across regions can be made, one should establish measurement invariance (Chen, 2007; Van de Schoot et al., 2012).

Language, Age, and Gender Differences in Loneliness and Attitudes Toward Aloneness

Until now, research about differences in loneliness and attitudes toward aloneness in the two linguistic regions in Belgium has been lacking. A limited number of studies has investigated regional differences in the prevalence of internalizing problems in Belgium. More specifically, research on generalized anxiety disorder and major depression in patients in primary care in Belgium indicated that the prevalence of these disorders is much higher in the French-speaking part of Belgium, compared to the Dutch-speaking part of Belgium (Ansseau, Fischler, Dierick, Mignon, & Leyman, 2005; Ansseau et al., 2008). These results continued to be significant when controlling for socioeconomic differences. However, explanations for these regional differences remain unclear. Given that there are regional differences in the prevalence of other internalizing problems in Belgium, it might be possible that adolescents from the French- and Dutch-speaking part of Belgium also differ in their mean loneliness levels.

Using the LACA with both language groups will further allow us to examine whether age and gender differences in loneliness and attitudes toward aloneness take on a similar form in Dutch-speaking and French-speaking adolescents in Belgium. Regarding age differences in loneliness and attitudes toward aloneness, theoretical notions suggest an increase in parent-related loneliness and positive attitudes toward aloneness and a decrease in peer-related loneliness and negative attitudes toward aloneness (Marcoen & Goossens, 1993; Marcoen et al., 1987). Parent-related loneliness is expected to increase as a result of diminished parental attention accompanied by a continued need for parental guidance throughout adolescence. Peer-related loneliness is expected to decrease because of adolescents' increased capacity and need for relational intimacy (Marcoen & Goossens, 1993). In addition, positive and negative

attitudes toward aloneness are expected to increase and decrease, respectively, because adolescents spend an increasing amount of time alone and use this time alone in a more constructive way (Larson 1997; Larson and Richards 1991). However, earlier cross-sectional studies regarding age differences in loneliness and attitudes toward aloneness yielded inconsistent results. Given that earlier studies failed to consistently confirm these theoretical expectations, age differences in loneliness and attitudes toward aloneness remain unclear. In addition, longitudinal research on the developmental trends of loneliness and attitudes toward aloneness is scarce and has focused mainly on peer-related loneliness (Ladd & Ettekal, 2013; van Roekel, Scholte, Verhagen, Goossens, & Engels, 2010).

Regarding gender differences in peer- and parent-related loneliness, a recent meta-analysis found no gender differences in loneliness in children and adolescents (Maes, 2017). This finding is in line with the evolutionary theory of loneliness (Cacioppo et al., 2006), which considers loneliness as a universal, biologically inherited warning system that signals to both males and females when their universal need to belong (Baumeister & Leary, 1995) is not being met. In contrast, less is known about gender differences in attitudes toward aloneness. The limited number of studies on this topic showed inconsistent results. Some studies, for example, reported no gender differences for positive attitudes toward aloneness in adolescence (Goossens, 2016), whereas others reported that adolescent girls are more positive towards aloneness than boys (Corsano, Majorano, & Champretavy, 2006; Goossens & Marcoen, 1999; Scharf, Wiseman, & Farah, 2011). Regarding negative attitudes toward aloneness, some studies found no gender differences (Goossens & Marcoen, 1999; Scharf et al., 2011), whereas others found more negative attitudes toward aloneness in adolescent girls (Maes et al., 2015). These inconsistent results and the lack of a clear theory indicate the need for more research regarding gender differences in attitudes toward aloneness.

The Current Study

The current empirical effort had three objectives. First, this study sought to investigate the factor structure and psychometric properties of a French version of the LACA. We expected the French version of the LACA would have a four-factor structure comparable to the four-factor structure of the Dutch version of the LACA. Second, this study aimed to investigate whether adolescents from the two main language groups in Belgium (i.e., Dutch and French), the two genders, and different age groups interpreted the LACA items in a similar way by conducting measurement invariance analyses. Third, if the LACA showed measurement invariance across language, gender, and age groups, this study aimed to investigate whether adolescents from Belgium's main linguistic regions differed in their experiences of loneliness and their attitudes toward aloneness, whether there were age and gender differences in loneliness and attitudes toward aloneness in Belgian adolescents, and whether these age and gender differences took on a different form in the two linguistic regions. Because no studies have investigated regional differences in loneliness in Belgium, our analyses regarding the regional differences in reported feelings of loneliness and attitudes toward aloneness among Belgian adolescents were exploratory in nature. Regarding age differences, theoretical notions suggest an increase in parent-related loneliness and positive attitudes toward aloneness and a decrease in peer-related loneliness and negative attitudes toward aloneness. However, given that the results of previous studies were inconsistent, we only expected small age differences in line with the theoretical notions in both the French-speaking and Dutch-speaking sample. Concerning gender differences in loneliness, based on the results of a meta-analysis on gender differences and in line with the evolutionary theory of loneliness, we expected no gender differences in Belgian adolescents. Finally, given the lack of a clear theory regarding gender differences in attitudes toward aloneness and given that results of earlier studies were inconsistent, our analyses on this topic were purely exploratory.

Method

Participants and procedure

This study used two samples of adolescents from the two main linguistic regions in Belgium, that is, the French-speaking and the Dutch-speaking region. Regarding the French-speaking sample, in a first step, four secondary schools offering the academic track were invited to participate in a study on the development of a French version of the LACA. Two schools, a governmental and a non-governmental school were willing to participate. The participating schools were located in the city center of Brussels, the capital city of Belgium, and a suburb of Brussels, respectively. The first city quarter is generally regarded as economically deprived and the second one as affluent.

Adolescents from Grades 7 (M_{age} = 11.95 years, SD = 0.58) through 12 (M_{age} = 17.16 years, SD = 0.78) were invited to participate. A total of 644 adolescents participated in the study. Three adolescents were dropped from the current analyses because they had more than two-thirds of missing data on one or more subscales. The final French-speaking sample consisted of 641 adolescents (M_{age} = 14.35 years, SD = 2.03), of whom 53.4% were girls. The majority of adolescents in this sample were born in Belgium (80,5%) and lived with both of their parents (63.8%). Only 2.3% of the data was missing. Little's MCAR Test (Little, 1988) was significant, but the normed chi square was acceptable (i.e., $\chi2/df$ < 2; Ulman, 2013) indicating that the data were missing completely at random. Therefore, missing values could be imputed by means of the Expectation-Maximization procedure in SPSS 24.0.

The Dutch-speaking sample was drawn from a much larger data set (N = 9,676) by means of a matching procedure. More specifically, for every French-speaking participant, a one-by-one match was drawn from the larger Dutch-speaking sample based on age and gender. This matching procedure resulted in a sample of 641 Dutch-speaking adolescents (M_{age} = 14.36 years, SD = 2.03; 53.7% girls). The French-speaking and Dutch-speaking sample did not differ significantly from one another in terms of average age (t (1277) = -0.04, p = .97) or the percentage of female adolescents (χ^2 = 0.00, p = .98). All participating

adolescents in the Dutch-speaking sample were following the academic track. No additional

background information of the Dutch-speaking sample was available. Because none of the

Dutch-speaking adolescents had more than two-thirds of missing data on one or more

subscales, none of the participants were dropped from the current analyses. Only 0.23% of the

data was missing. In addition, Little's MCAR Test (Little, 1988) was non-significant and the

normed chi square was acceptable (i.e., $\chi2/df < 2$; Ulman, 2013) indicating that the data were

missing completely at random. Therefore, missing values could be imputed by means of the

Expectation-Maximization procedure in SPSS 24.0.

Both samples were combined into a single sample of Belgian adolescents ($N = 1,282$;

$M_{age} = 14.36$, $SD = 2.03$, 53.6% female). To investigate measurement invariance across age,

three different age groups were created. The early adolescent group contained Belgian

adolescents with ages ranging from 11 to 13 years ($n = 489$; 54% girls). The middle

adolescent group comprised Belgian adolescents aged 14 to 16 years ($n = 553$; 52.1% girls)

and the late adolescent group contained Belgian adolescents aged 17 to 20 years ($n = 237$;

55.3% girls). These three age groups represent the three phases of development in

adolescence (WHO, 2014; Clark-Lempers, Lempers, & Ho, 1991).

Permission for the data collection in the French sample was obtained in 2015 from the

ethical committee of the Erasmus Hospital in Brussels, the capital city of Belgium. The large

Dutch dataset, from which a random sample was drawn for this study, results from an

integration of different studies that took place between 1993 and 2003 (Goossens, 2016). Data

collection conformed to the ethical standards that were held during that time period. In both

regions, active informed consent was obtained from the participating adolescents prior to data

collection. Adolescents filled out the LACA at school during regular school hours. A research

assistant or master student in psychology was present to introduce the study and to answer

questions when needed. The voluntary and anonymous character of the participation was

emphasized. In addition, adolescents were informed that they could discontinue their

participation at any time, but none of them opted to do so.

Measure

Loneliness and attitudes toward aloneness were assessed using the multidimensional

Loneliness and Aloneness Scale for Children and Adolescents (LACA; Marcoen et al., 1987).

The LACA consists of 48 items which are equally divided over four subscales. Those

subscales measure (a) loneliness in relation to parents (12 items, e.g., "I feel left out by my

parents"), (b) loneliness in relation to peers (12 items, e.g., "I feel left out by my friends", (c)

negative attitudes toward aloneness (12 items, e.g., "When I am alone, I feel bad"), and (d)

positive attitudes toward aloneness (12 items, e.g., "I want to be alone"). Participants were

asked to respond to the items on a Likert scale ranging from (1) *'never'* to (4) *'often'*. Higher

mean scores represent greater loneliness and more pronounced negative or positive attitudes

toward aloneness, respectively. The reliability and validity of the Dutch-language version of

the LACA are well-established (Goossens, 2016; Maes, Van den Noortgate, & Goossens,

2015).

The LACA was translated into French by means of a committee approach (Furukawa,

Driessnack, & Colclough, 2014). Two native French speakers, one from the Université Libre

de Bruxelles (ULB) and another one from the Université de Liège, and a Dutch-speaking

expert in loneliness who co-developed the original LACA, all Belgian nationals, translated the

items of the Dutch version of the LACA into French. These translations were compared and

refined by the committee until a consensus was reached. The final French version of the

LACA is included as an appendix at the end of this manuscript.

Plan of Analysis

First, we examined the dimensionality of the French version of the LACA by running

several confirmatory factor analyses (CFA) in Mplus Version 7.31 (Muthén & Muthén, 1998-

2012) using the robust Maximum Likelihood estimator (MLR) to account for non-normality.

First, a single-factor model was tested. Second, we tested a model with two factors to see

whether we could distinguish a loneliness and an attitude toward aloneness factor. Third, a

three-factor model comprising a general attitude toward aloneness factor and the two types of

loneliness as separate factors, that is, parent-related and peer-related loneliness, was

examined. Fourth, a three-factor model consisting of a general loneliness factor, a positive

attitude toward aloneness factor, and a negative attitude toward aloneness factor was tested.

Fifth, a four-factor model comprising loneliness in relationship with parents and peers, and

positive and negative attitudes toward aloneness was evaluated.

The different models were evaluated by means of several fit indices. Chi-square

statistics (χ^2), among which the Satorra-Bentler scaled chi-square statistic (S-Bχ2 ; Satorra

and Bentler 2001), are recommended when reporting on model fit (Hayduk, Cummings,

Boadu, Pazderka-Robinson, & Boulianne, 2007; Vandenberg & Lance, 2000). Nevertheless,

an important limitation of this index is its high sensitivity to sample size. When large samples

are used, the χ^2-statistic will easily be significant, suggesting a rejection of the model (Barrett,

2007). Therefore, it is important to consider other fit indices as well, that is, the normed Chi-

square statistic (χ^2/df), the Root Mean Square Error of Approximation (RMSEA), the

Standardized Root Mean Square Residual (SRMR), and the Comparative Fit Index (CFI)

(Boomsma, 2000). There is no clear consensus regarding an acceptable ratio for the normed

chi-square statistic. Values below 2 or 3 (Ulman, 2013) up to below 5 (Schumacker & Lomax,

2004) are suggested as reflecting acceptable fit. According to the guidelines of Hu and Bentler

(1999), a model shows good fit when the RMSEA and SRMR are lower than .06 and .08,

respectively, and the CFI exceeds .95. In addition, the Akaike Information Criterion (AIC)

and Bayesian Information Criterion (BIC) were used to compare the different models, with a

lower AIC/BIC value indicating a better trade-off between model fit and complexity (Kline, 2005; Neath & Cavanaugh, 2012; van de Schoot, Lugtig, & Hox, 2012).

Second, we conducted measurement invariance analyses across the language, age, and gender groups. In these analyses, we investigated whether the LACA items are interpreted in a similar way by Belgium's two main language groups, by boys and girls, and by early, middle, and late adolescents. A first step in all measurement invariance analyses implied that the model that was retained in the first step of the analysis was tested in all groups separately and its model fit evaluated to determine whether configural invariance was established (van de Schoot et al., 2012). Subsequently, configural, metric, and scalar invariance were tested in the multigroup sample. To test for metric invariance, the fit of a multigroup model without any constraints (i.e., the configural model) was compared to a multigroup model with factor loadings constrained to be equal in both groups (i.e., the metric model). Scalar invariance was examined by comparing the metric model with a model in which both the factor loadings and intercepts were constrained to be equal across language, age, or gender groups (i.e., the scalar model).

Metric invariance was evaluated by comparing three fit indices, that is, CFI, SRMR, and RMSEA of the configural model with the same fit indices of the metric model. According to the guidelines of Chen (2007), a difference in CFI equal to or more than -.010, accompanied by a change in SRMR or RMSEA equal to or above .030 and .015, respectively, indicates metric noninvariance. Scalar invariance, in turn, was evaluated by calculating the differences in fit indices between the metric and scalar model. A difference in CFI equal to or above -.010, accompanied by a difference in SRMR or RMSEA equal to or above .010, and .015, respectively, indicates scalar noninvariance.

Third, if scalar invariance could be established, group mean differences were examined in SPSS 24.0 by means of multivariate analyses of variance (MANOVAs) and

subsequent analyses of variance (ANOVAs) for each subscale separately. Significant

ANOVAs were followed up by means of post-hoc comparisons based on Tukey HSD tests.

Significant effects were evaluated using a Benjamini-Hochberg adjusted alpha value of .03 to

control for multiple testing (Benjamini & Hochberg, 1995).

Because analyses based on a large number of items can lead to overly complex models

(Little, Cunningham, Shahar, & Widaman, 2002), we used the item-to-construct balance

(ICB) parceling method in all confirmatory factor analyses and measurement invariance

analyses. By creating parcels, individual items are aggregated into a combined score. As a

consequence, the number of indicators determining a latent factor decreases. This approach

has the advantage of model parsimony and is also supposed to be more realistic and to result

in more representative results than the use of individual items (Little et al., 2002; Rushton,

Brainerd, & Pressley, 1983). Because the optimal number of parcels is three (Little et al.,

2002; Matsunaga, 2008), we created three parcels each consisting of four items for each

subscale of the LACA.

Results

Psychometric Properties and Dimensionality of the French LACA

Fit indices for the different models examined in the French-speaking sample are

represented in Table 1. Based on the rules of thumb of Hu and Bentler (1999) and the fact

that the AIC and BIC values for the final model were lower than the respective values for all

other models, we concluded that only the four-factor model showed a good fit to the data.

Correlations among the subscales and Cronbach's alphas for both samples are represented in

Table 2. All of the values obtained were very similar across the linguistic groups. According

to the benchmarks proposed by Cohen (1988), low correlations (i.e., $r < .30$) were found

among the four expected subscales, except for a moderate correlation between peer-related

loneliness and positive attitude toward aloneness. Using the criteria proposed by De Vellis

(2003), all four subscales had a good internal consistency (i.e., Cronbach's alpha ≥ .80).

Measurement Invariance Across Language, Age, and Gender Groups

First, results on configural invariance across groups are represented in Table 3. This

type of invariance was established in the two language groups and in the different gender and

age groups. In other words, the expected four-factor structure of the LACA fitted the data well

in all of these groups separately.

Second, measurement invariance analyses were conducted to investigate configural,

metric, and scalar invariance across groups and the results are represented in Table 4. The

LACA showed configural, metric, and scalar invariance across language, age, and gender

groups. Scalar invariance indicates that the items of the LACA have the same unit of

measurement and the same intercept in the different groups. In other words, all of these

groups interpreted the items in a similar way (Chen, 2007; van de Schoot et al., 2012).

Mean Differences in Language Groups, Age, and Gender

First, it is important to note that the effect sizes of the main and interaction effects of

both the MANOVA and subsequent ANOVAs were all rather small ($\eta^2_{partial}$ ranging between

.001 and .06). This might raises questions regarding the practical relevance of the significant

effects described below.

Results of a 2 (Gender) x 2 (Language group) x 3 (Age) MANOVA showed

significant main effects for language group (F (4, 1261) = 25.44, $p < .001$, $\eta^2_{partial} = .08$),

gender (F (4, 1261) = 3.34, $p = .01$, $\eta^2_{partial} = .01$), and age (F (8, 2524) = 15.59, $p < .001$,

$\eta^2_{partial} = .05$). In addition, a significant Language group x Gender interaction effect was found

(F (4, 1261) = 2.74, $p < .03$, $\eta^2_{partial} = .01$). The Language group x Age (F (8, 2524) = 1.09, p

$>.05$, $\eta^2_{partial} < .001$) and Age x Gender (F (8, 2524) = 0.94, $p >.05$, $\eta^2_{partial} < .001$) interactions

were not significant. In addition, no significant three-way interaction effect (i.e., Language group x Age x Gender) was found (F (8, 2524) = 1.35, $p < .05$, $\eta^2_{partial} < .001$).

Subsequently, univariate ANOVAs were conducted on all four subscales of the LACA in which main effects of language group, gender, and age and a Language x Gender interaction effect were included. Results of the main effects in these analyses are represented in Tables 5, 6, and 7. Significant main effects of language group were obtained on all four subscales of the LACA. More specifically, Dutch-speaking Belgian adolescents reported more parent-related and peer-related loneliness as well as more positive and negative attitudes toward aloneness. Regarding gender effects, univariate ANOVAs showed significant main effects of gender on positive attitudes toward aloneness and peer-related loneliness. On both subscales, girls tended to score higher. Finally, regarding age effects, late adolescents scored significantly higher than middle adolescents who, in turn, scored higher than early adolescents on both parent-related loneliness and positive attitudes toward aloneness. In addition, early adolescents scored significantly higher than middle adolescents on negative attitudes toward aloneness, with late adolescents scoring in between.

The previously described results have to be interpreted with caution, because a significant Language group x Gender interaction effect was found for parent-related loneliness (F (1, 1270) = 5.77, $p < .05$, $\eta^2_{partial} = .01$) and positive attitudes toward aloneness (F (1, 1270) = 6.06, $p < .05$, $\eta^2_{partial} = .01$). These interactions indicated that Dutch-speaking adolescents reported more parent-related loneliness and more positive attitudes toward aloneness, but the difference between the language groups was more pronounced for boys than for girls.

Discussion

The present study clearly contributes to the extensive body of literature on the LACA by (a) examining the factorial validity and psychometric properties of a French version of the

LACA, which was, until now, lacking, (b) investigating measurement invariance of this

French version of the LACA across language, age, and gender groups, and (c) investigating

possible differences in loneliness and attitudes toward aloneness between adolescents from

the two main linguistic communities in Belgium, that is, the French- and Dutch-speaking

communities, and Belgian adolescents from different age and gender groups.

Confirmatory factor analyses indicated that the supposed four-factor structure of the

LACA fitted the data well and showed a superior fit compared to the model fit of alternative,

more parsimonious models. A similar approach has been used to test the dimensionality of the

Dutch version of the LACA with the same results (Maes et al., 2015). In addition, results

regarding the intercorrelations among the subscales and the reliability of the subscales are in

line with a meta-analysis on the reliability of the LACA (Maes, Van den Noortgate, &

Goossens, 2015). Because we found the expected factor structure of the LACA in the test

scores of the French sample, we are more certain that the two types of loneliness and attitudes

toward aloneness that are assessed with the French version of the LACA are the actual

constructs intended by the developers of the scale (Piedmont, 2014). Given the good factorial

validity and reliability, we consider this French version of the LACA an appropriate measure

to assess loneliness and attitudes toward aloneness in French-speaking adolescents. By

establishing this French version of the LACA, in addition to the already existing Dutch

version, loneliness and attitudes toward aloneness can be assessed in the two principal

language groups in Belgium. This brings us one step closer to investigating possible

differences in loneliness and attitudes toward aloneness across Belgium's principal language

groups and, if these differences appear to be non-existent, to drawing conclusions about

loneliness and attitudes toward aloneness in Belgian adolescents as a whole.

However, prior to comparing group means, it is important to make sure that an

instrument measures the intended concept or concepts in the same way across the different

groups (Kim & Yoon, 2011). By means of measurement invariance analyses, previous research had already shown that Dutch-speaking adolescent boys and girls, and Dutch-speaking participants from different age groups across adolescence interpret the items of the LACA in a similar way (Maes et al., 2015). However, until now, it was unknown whether Dutch-speaking and French-speaking Belgian adolescents interpret the items of the LACA in a similar way and whether Belgian adolescents in general (i.e., both Dutch-speaking and French-speaking) from different age and gender groups interpret the items of the LACA similarly. Therefore, in this study, measurement invariance analyses across language groups, and across age and gender in the combined Belgian sample, were conducted. By means of multigroup confirmatory factor analyses, configural, metric, and scalar measurement invariance were established for the different language, age, and gender groups. This means that the LACA measures the same constructs with the same structure in all of the investigated groups. In other words, the items of the LACA and the underlying latent factors are being interpreted in a similar way by Belgian adolescents from different language groups, genders, and ages. Consequently, valid comparisons can be made on the various subscales across all of the language, age, and gender groups (van de Schoot et al., 2012).

Concerning the language group differences, results show that Dutch-speaking Belgian adolescents report more loneliness and more pronounced attitudes toward aloneness than French-speaking Belgian adolescents. These results are not in line with earlier studies about regional differences in Belgium regarding other internalizing problems, which indicated that people from the French-speaking part of Belgium report more internalizing problems (Ansseau et al., 2005; Ansseau et al., 2008). However, given the small effect sizes for the language group differences in this study (i.e., accounting for 5% of the variance or less), caution is warranted when interpreting these language group differences. More specifically, the practical relevance of these findings is probably limited. Given that this is the first study

that investigated regional differences in loneliness and attitudes toward aloneness in Belgium replication research is clearly needed to further investigate these language group differences.

The findings further suggest an increase in parent-related loneliness and positive attitudes toward aloneness and a decrease in negative attitudes toward aloneness, which are in line with theoretical notions (Marcoen & Goossens, 1993) and confirm our hypotheses. These main age effects do not differ in the different language groups. Therefore, we can consider these age differences as general trends that are applicable to a wider group of Belgian adolescents regardless of the language group they belong to. In addition, in contrast to our hypothesis, no decrease in peer-related loneliness was found. Regarding these age effects, it is again important to note that the effect sizes were very small, which suggests the practical relevance of these results are limited.

In line with a meta-analysis on gender differences in loneliness across the lifespan (Maes, 2016), we expected no gender differences in parent- and peer-related loneliness. Our results showed that boys reported more parent-related loneliness than girls, but this difference was not statistically significant. Therefore, it remains unclear whether there are differences in parent-related loneliness between boys and girls. For peer-related loneliness a significant effect was found, which indicated that girls report more peer-related loneliness. However, because only 1% of the variance in peer-related loneliness is explained by gender, we believe that the large sample size is responsible for the significant gender effect and we therefore doubt the practical relevance of the effect. Because there was a lot of inconsistency in the current literature regarding possible gender differences in positive and negative attitudes toward aloneness, we did not put forward specific hypotheses. Results showed that girls reported a more negative attitude toward aloneness than boys, but this difference was not statistically significant. Therefore, it remains unclear whether there are gender differences in negative attitude toward aloneness. Regarding positive attitude toward aloneness, girls report

a more positive attitude toward aloneness than boys. However, the effect size was again very small (i.e., 1% of the variance in positive attitude toward aloneness is explained by gender), which again raises questions about the practical relevance of the effect.

Finally, significant Language group x Gender interactions indicated that there is a larger difference between adolescent boys from the different language groups than for adolescent girls regarding parent-related loneliness and positive attitude toward aloneness. However, the effect sizes associated with these Language group x Gender interactions were again very small (i.e., 1% of the variance in parent-related loneliness and positive attitude toward aloneness is explained by the interaction) which leads us to question the practical relevance of these effects. For this reason, we will not further elaborate on these findings.

Limitations

The present study has some clear strengths, such as its relatively large samples that were carefully matched in order to control for potential confounding variables and its strong methodological approach. Despite these strengths, this study also has some limitations that are important to mention and that can offer suggestions for future research.

A first limitation concerns the cross-sectional design of the study. A longitudinal study using latent growth curve analyses would provide less biased information on age trends in adolescent loneliness and attitudes toward aloneness by ruling out possible cohort effects.

A second limitation concerns the composition of the samples. Participants from the French-speaking sample all attended school in Brussels, the capital city of Belgium, which is a bilingual region. Adolescents from Wallonia, that is, the region in Belgium where people speak French exclusively, were not represented in the French-speaking sample. Therefore, results of this study cannot be generalized to the whole French-speaking community in Belgium. In addition, we only included adolescents from the academic track in our study. Although most students in the different regions of Belgium follow the academic track, a

substantive number of students also follow the technical or vocational track. Given that there might be differences between adolescents from the different educational tracks regarding loneliness and attitudes toward aloneness, we cannot generalize our findings to the general population of Belgian secondary school students (See Online Resource 1 for more information). Moreover, in the Dutch-speaking sample, no background information about the participants was available. Due to this lack of information, the results obtained could be biased by confounding variables that we are not aware of.

Third, it is important to acknowledge that there is a time gap ranging from 13 to 23 years between data collection for the Dutch-speaking sample and the French-speaking sample. Because several societal changes took place during this time frame that might have impacted on feelings of loneliness and attitudes toward aloneness (e.g., an increase in the use of internet and social media), we cannot rule out the existence of confounding cohort effects (See Online Resource 2 for more detailed information).

Fourth, it is important to keep in mind that there are subtle language differences between the French spoken in Brussels and Wallonia, on the one hand, and the French spoken in other countries. As a result, caution is warranted when using this French version of the LACA with French-speaking adolescents that do not live in Belgium. Future research could, for example, examine whether the items of the French version of the LACA are interpreted in a similar way by French-speaking adolescents from different countries by means of measurement invariance analyses.

Conclusion

By establishing a French version of the LACA, the current study filled an important gap in the literature on the LACA. Based on the results of this study, we can conclude that the French adaptation of the LACA is appropriate to assess loneliness and attitudes towards aloneness in French-speaking adolescents in Belgium. In addition, the results of this study

indicate that one can validly compare mean scores of the different subscales of the LACA across Belgian adolescents from different language, gender, and age groups.

Compliance with Ethical Standards

Ethical approval: This article does not contain any studies with animals performed by any of the authors. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

References

Ansseau, M., Fischler, B., Dierick, M., Albert, A., Leyman, S., & Mignon, A. (2008). Socio-economic correlates of generalized anxiety and major depression in primary care: The GADIS II study (Generalized Anxiety and Depression Impact Survey II). *Depression and Anxiety, 25*, 506-513. doi:10.1002/da.20306

Ansseau, M., Fischler, B., Dierick, M., Mignon, A., & Leyman, S. (2005). Prevalence and impact of generalized anxiety and major depression in primary care in Belgium and Luxemburg: The GADIS study. *European Psychiatry, 20*, 229-235. doi:10.1016/j.europsy.2004.09.035

Barrett, P. (2007). Structural equation modelling: Adjudging model fit. *Personality and Individual Differences, 42*, 815-824. doi:10.1016/j.paid.2006.09.018

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117*, 497-529. doi:10.1037/0033-2909.117.3.497

Clark-Lempers, D. S., Lempers, J. D., & Ho, C. (1991). Early, middle, and late adolescents'
      perceptions of their relationships with significant others. *Journal of Adolescent
      Research, 6*, 296-315. doi:10.1177/074355489163003

Boomsma, A. (2000). Reporting analyses of covariance structures. *Structural Equation
      Modeling: A Multidisciplinary Journal, 7*, 461-483. doi:10.1207/
      S15328007SEM0703_6

Cacioppo. J. T., Hawkley, L. C., Ernst, J. M., Burleson, M., Bertson, G. G., Nouriani, B., &
      Spiegel, D. (2006). Loneliness within a nomological net: An evolutionary perspective.
      Journal of Research in Personality, 40, 1054-1085. doi:10.1016/j.jrp.2005.11.007

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance.
      Structural Equation Modeling: A Multidisciplinary Journal, 14, 464-504.
      doi:10.1080/10705510701301834

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale,
      NJ: Erlbaum.

Corsano, P., Majorano, M. L, & Champretavy, C. (2006). Psychological well-being in
      adolescence: The contribution of interpersonal relations and experience of being alone.
      Adolescence, 41, 341-353.

De Vellis, R. F. (2003). *Scale development: Theory and applications* (2nd ed.). Thousand
      Oaks, CA: Sage.

European Commission (2005). *Europeans and languages: Eurobarometer 63.4*. Retrieved
      from http://ec.europa.eu/public_opinion/archives/ebs/ebs_237.en.pdf

Furukawa, R., Driessnack, M., & Colclough, Y. (2014). A committee approach maintaining
      cultural originality in translation. *Applied Nursing Research, 27*, 144-146,
      doi:10.1016/j.apnr.2013.11.01

Goossens, L. (Ed.). (2016). *Leuvense Eenzaamheidsschaal voor Kinderen en*

Adolescenten: Handleiding [Loneliness and Aloneness Scale for Children and

    Adolescents: Manual]. Leuven, Belgium: Acco.

Goossens, L., Lasgaard, M., Luyckx, K., Vanhalst, J., Mathias, S., & Masy, E. (2009).

    Loneliness and solitude in adolescence: A confirmatory factor analysis of alternative

    models. *Personality and Individual Differences, 47*, 890-894.

    doi10.1016/j.paid.2009.07.011

Goossens, L., & Marcoen, A. (1999). Relationships during adolescence: Constructive vs.

    negative themes and relational dissatisfaction. *Journal of Adolescence, 22*, 65-79.

    doi:10.1005/jado.1998.0201

Hayduk, L., Cummings, G., Boadu, K., Pazderka-Robinson, H., & Boulianne, S. (2007).

    Testing! testing! one, two, three: Testing the theory in structural equation models!

    Personality and Individual Differences, 42, 841-850. doi:10.1016/j.paid.2006.10.001

Heinrich, L. A., & Gullone, E. (2006). The clinical significance of loneliness: A literature

    review. *Clinical Psychology Review, 26*, 695-718. doi:10.1016/j.cpr.2006.04.002

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure

    analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling:

    A Multidisciplinary Journal, 6*, 1-55. doi:10.1080/10705519909540118

Kim, E. S., & Yoon, M. (2011). Testing measurement invariance: A comparison of multiple-

    group categorical CFA and IRT. *Structural Equation Modeling, 18*, 212-228.

    doi:10.1080/10705511.2011.557337

Kline, R. B. (2005). *Principles and practice of structure equation modelling.* New York, NY:

    Guilford Press.

Ladd, G. W., & Ettekal, I. (2013). Peer-related loneliness across early to late adolescence:

    Normative trends, intra-individual trajectories, and links with depressive symptoms.

    Journal of Adolescence, 36, 1269-1282. doi:10.1016/j.adolescence.2013.05.004

Larson, R. W. (1997). The emergence of solitude as a constructive domain of experience in

early adolescence. *Child Development, 68*, 80-93. doi:10.2307/1131927

Larson, R., & Richards, M. H. (1991). Daily companionship in late childhood and early

adolescence: Changing developmental contexts. *Child Development, 62*, 284-300.

doi:10.2307/1131003

Laursen, B., & Hartl, A. C. (2013). Understanding loneliness during adolescence:

Developmental changes that increase the risk of perceived social isolation. *Journal of

Adolescence, 36*, 1261-1268. doi:10.1016/j.adolescence.2013.06.003

Little, T. D., Cunningham, W. A., Shahar, G., & Widaman, K. F. (2002). To parcel or not to

parcel: Exploring the question, weighing the merits. *Structural Equation Modeling, 9*,

151-173. doi: 10.1207/S15328007SEM0902_1

Long, C. R., & Averill, J. R. (2003). Solitude: An exploration of benefits of being alone.

Journal for the Theory of Social Behaviour, 33, 21-44. doi:10.1111/1468-5914.00204

Maes, M. (2016). *Loneliness in adolescence: Types of loneliness, measurement, and a meta-

analytic perspective on group differences* (Unpublished doctoral dissertation). KU

Leuven, Leuven, Belgium.

Maes M., Klimstra T., Van Den Noortgate W., Goossens L. (2015). Factor structure and

measurement invariance of a multidimensional loneliness scale: Comparisons across

gender and age. *Journal of Child and Family Studies, 24*, 1829-1837.

doi:10.1007/s10826-014-9986-4

Maes, M., Van Den Noortgate, W., & Goossens, L. (2015). A reliability generalization study

for a multidimensional loneliness scale: The Loneliness and Aloneness Scale for

Children and Adolescents. *European Journal of Psychological Assessment*, *31*, 294-

301. doi:10.1027/1015- 5759/a000237

Maes, M., Qualter, P., Vanhalst, J., Van den Noortgate, W., & Goossens, L. (2017). Gender

differences in loneliness across the lifespan: A meta-analysis. Manuscript submitted

for publication.

Majorano, M., Musetti, A., Brondino, M., & Corsano, P. (2015). Loneliness, emotional

autonomy and motivation for solitary behavior during adolescence. *Journal of Child

and Family Studies, 24*, 3436-3447. doi:10.1007/s10826-015-0145-3

Marcoen, A., & Goossens, L. (1993). Loneliness, attitude toward aloneness, and solitude: Age

differences and developmental significance during adolescence. In S. Jackson & H.

Rodriguez-Tome (Eds.), *Adolescence and its social worlds (pp. 197-227)*. Hove, UK:

Erlbaum.

Marcoen, A., Goossens, L., & Caes, P. (1987). Loneliness in pre through late adolescence:

Exploring the contributions of a multidimensional approach. *Journal of Youth and

Adolescence, 16*, 561-577. doi:10.1007/BF02138821

Matsunaga, M. (2008). Item parceling in structural equation modeling: A primer.

Communication Methods and Measures, 2, 260-293.

doi:10.1080/19312450802458935

Muthén, L. K., & Muthén, B.O. (1998-2012). *Mplus user's guide* (7th ed.). Los Angeles, CA:

Muthén & Muthén.

Neath, A. A., & Cavanaugh, J. E. (2012). The Bayesian information criterion: Background,

derivation, and applications. *Wiley Interdisciplinary Reviews: Computational

Statistics, 4*, 199-203. doi:10.1002/wics.199

Perlman, D., & Peplau, L. A. (1981). Toward a social psychology of loneliness. In S. Duck &

R. Gilmour (Eds.), *Personal relationships in disorder* (Vol. 3, pp. 31-56). London,

UK: Academic Press.

Piedmont, R. L. (2014). Factorial validity. In A. C. Michalos (Ed.), *Encyclopedia of quality of*

life and well-being research (pp. 2148-2149). New York, NY: Springer.

doi:10.1007/978-94-007-0753-5_984

Qualter, P., Vanhalst, J., Harris, R. A., van Roekel, E., Lodder, G., Bangee, M., …Verhagen,

M. (2015). Loneliness across the life span. *Perspectives on Psychological Science, 10*,

250-264. doi:10.1177/1745691615568999

Rushton, J. P., Brainerd, C. J., & Pressley, M. (1983). Behavioral development and construct

validity: The principle of aggregation. *Psychological Bulletin, 94*, 18-38.

doi:10.1037/0033-2909.94.1.18

Satorra, A., & Bentler, P. M. (2001). A scaled difference chi-square test statistic for moment

structure analysis. *Psychometrika, 66*, 507–514. doi:10.1007/BF02296192

Scharf, M., Wiseman, H., & Farah, F. (2011). Parent-adolescent relationships and social

adjustment: The case of a collectivistic culture. *International Journal of Psychology,

46*, 177-190. doi:10.1080/00207594.2010.528424

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation

modeling.* New Jersey, NJ: Erlbaum.

Ulman, J. B. (2013). Structural equation modeling. In B. G. Tabachnick & L. S. Fidell (Eds.),

Using multivariate statistics (6th ed., pp. 681–785). Boston, MA: Pearson Education.

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement

invariance literature: Suggestions, practices, and recommendations for organizational

research. *Organizational Research Methods, 3*, 4-69. doi:10.1177/109442810031002

van de Schoot, R., Lugtig, P., & Hox, J. (2012). A checklist for testing measurement

invariance. *European Journal of Developmental Psychology, 9*, 486-492. doi:

10.1080/17405629.2012.686740

van Roekel, E., Scholte, R. H., Verhagen, M., Goossens, L., & Engels, R. C. (2010).

Loneliness in adolescence: Gene x environment interactions involving the serotonin

transporter gene. *Journal of Child Psychology and Psychiatry, 51*, 747-754. doi:

10.1111/j.1469-7610.2010.02225.x

World Health Organization (2014). *Health for the world's adolescents: A second chance in

the second decade*. Retrieved from http://apps.who.int/adolescent/second-decade/

Appendix

Échelle de Solitude de Louvain pour Enfants et Adolescents
LLCA-FR

Moi et les autres

Sur les pages suivantes, vous trouverez un nombre de déclarations. Veuillez indiquer dans quelle mesure ces déclarations s'appliquent à vous (jamais, rarement, parfois ou souvent) en encerclant le numéro correspondant.

1   Jamais

2   Rarement

3   Parfois

4   Souvent

1.   Je me sens très à lié(e) à mes parents. (R)

     1   2   3   4

2.   Je me retire pour faire des choses qui ne peuvent être faites quand on est nombreux.

     1   2   3   4

3.   Mes parents prennent le temps de s'occuper de moi. (R)

     1   2   3   4

4.   Je pense que j'ai moins d'ami(e)s que les autres.

     1   2   3   4

5.   Je me sens isolé(e) des autres.

     1   2   3   4

6.   Je veux être seul(e).

     1   2   3   4

7.   Je me sens exclu(e) par mes camarades de classe

1   2   3   4

8.   Quand je suis tout(e) seul(e), je m'ennuie.

1   2   3   4

9.   Je veux être davantage intégré(e) à ma classe.

1   2   3   4

10.   Quand je suis seul(e), je me sens mal.

1   2   3   4

11.   Je me sens mis(e) de côté par mes parents.

1   2   3   4

12.   Quand je me sens seul(e), je vais voir mes ami(e)s.

1   2   3   4

13.   Je cherche un moment pour être seul(e) pour réfléchir.

1   2   3   4

14.   Quand je m'ennuie, je suis malheureux(se).

1   2   3   4

15.   J'ai du mal à me faire des ami(e)s.

1   2   3   4

16.   Je trouve du réconfort auprès de mes parents. (R)

1   2   3   4

17.   J'ai peur que les autres ne me laissent pas m'intégrer.

1   2   3   4

18.   Je trouve qu'il est difficile de parler avec mes parents.

1   2   3   4

19.   Quand je me sens isolé(e), je veux être seul(e) pour y réfléchir.

1   2   3   4

20. Quand je me sens seul(e), je ne sais pas quoi faire.

    1   2   3   4

21. Quand j'ai une dispute avec quelqu'un, je veux être seul(e) pour y réfléchir.

    1   2   3   4

22. Pour m'amuser réellement j'ai besoin d'être avec mes ami(e)s.

    1   2   3   4

23. Je me sens seul(e) à l'école.

    1   2   3   4

24. Quand je suis seul(e), le temps dure une éternité et aucune activité ne m'attire.

    1   2   3   4

25. Je peux bien m'entendre avec mes parents. (R)

    1   2   3   4

26. Quand je suis seul(e), je me calme.

    1   2   3   4

27. Je pense que je n'ai aucun(e) ami(e) à qui je peux tout raconter.

    1   2   3   4

28. Pour penser à quelque chose sans être dérangé(e), j'ai besoin d'être seul(e).

    1   2   3   4

29. Quand je suis seul(e), j'aimerais avoir d'autres personnes autour de moi.

    1   2   3   4

30. Mes parents sont prêts à m'écouter et à m'aider. (R)

    1   2   3   4

31. Je suis content(e) quand je suis seul(e) à la maison parce que ça me donne l'occasion

de réfléchir calmement.

    1   2   3   4

32. Quand je m'ennuie, je vais voir un(e) ami(e).

   1   2   3   4

33. Je me sens abandonnée par mes ami(e)s.

   1   2   3   4

34. Je me sens malheureux(se) quand je dois faire les choses seul(e).

   1   2   3   4

35. Je me sens laissé(e) de côté par mes ami(e)s.

   1   2   3   4

36. Je veux être seul(e) pour faire certaines choses.

   1   2   3   4

37. J'ai le sentiment d'avoir ma place auprès de mes parents. (R)

   1   2   3   4

38. Mes parents partagent mes centres d'intérêt. (R)

   1   2   3   4

39. Quand je me sens seul(e), je vais voir d'autres personnes.

   1   2   3   4

40. Je reste à l'écart des autres parce qu'ils me dérangent avec leurs bruits.

   1   2   3   4

41. Je me sens triste parce que personne ne veut se joindre à moi.

   1   2   3   4

42. Quand je m'ennuie, je me sens seul(e).

   1   2   3   4

43. Mes parents me montrent beaucoup d'intérêt. (R)

   1   2   3   4

44. Être seul(e) me permet de reprendre courage.

1   2   3   4

45.   J'ai l'impression que mes parents ne m'aiment pas vraiment.

1   2   3   4

46.   À la maison, je cherche des moments pour être seule pour faire des choses tout(e)

seul(e).

1   2   3   4

47.   Je suis triste parce que je n'ai pas d'ami(e)s.

1   2   3   4

48.   À la maison, je me sens à l'aise. (R)

1   2   3   4

Note. R indique que le score doit être inversé.

Table 1

Fit Indices for Various Factor Models (French-Speaking Sample)

Model	Number of Factors	Description	χ^2	*df*	CFI	RMSEA	SRMR	AIC	BIC
1	1	No distinctive subscales	2,035.17***	54	.39	.24	.18	12,599.39	12,760.06
2	2	Parent+peer/negative+positive	1,629.60***	53	.52	.22	.19	12,153.44	12,318.57
3	3	Parent+peer/negative/positive	1,360.50***	51	.60	.20	.16	11,830.54	12,004.60
4	3	Parent/peer/negative+positive	885.53***	51	.69	.18	.16	11,365.95	11,540.01
5	4	Four distinct subscales	126.98***	48	.98	.05	.04	10,563.89	10,751.34

Note. CFI = Comparative fit index; RMSEA = Root mean square error of approximation; SRMR = Standardized root mean squared residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.

*** $p < .001$.

Table 2

Intercorrelations Among Subscales and Reliability (Cronbach's Alpha)

Subscale	2.	3.	4.	α
French-speaking Sample				
Peer-related loneliness	.14**	.37**	.19**	.83
Parent-related loneliness	-	.19**	.03	.86
Positive attitude toward aloneness		-	.03	.80
Negative attitude toward aloneness			-	.83
Dutch-speaking Sample				
Peer-related loneliness	.13**	.36**	.09*	.90
Parent-related loneliness	-	.07	.06	.91
Positive attitude toward aloneness		-	-.06	.85
Negative attitude toward aloneness			-	.80

* p < .05. ** p < .01.

Table 3

Configural Invariance Across Language, Age, and Gender Groups

Model	χ^2	df	CFI	RMSEA	SRMR	AIC	BIC
Language Group							
Dutch-speaking	110.894***	48	.983	.045	.036	9,896.946	10,084.393
French-speaking	126.984***	48	.976	.051	.037	10,563.891	10,751.338
Age							
Early Adolescence	127.702***	48	.971	.058	.047	7,909.461	8,085.541
Middle Adolescence	105.103***	48	.983	.046	.038	8,540.326	8,721.571
Late Adolescence	101.116***	48	.963	.068	.048	3,528.917	3,674.576
Gender							
Boys	115.488	48	.980	.049	.038	9,593.623	9,777.801
Girls	150.313***	48	.976	.056	.042	10,572.252	10,762.549

Note. CFI = Comparative fit index; RMSEA = Root mean square error of approximation; SRMR = Standardized root mean squared residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.

*** $p < .001$.

Table 4

Measurement Invariance of the LACA Across Language Groups, Age, and Gender (Both Samples Combined)

Model	χ^2	df	CFI	ΔCFI	RMSEA	ΔRMSEA	SRMR	ΔSRMR	AIC	BIC
Language										
Configural invariance	296.609***	96	.973		.057		.044		19,917.769	20,350.888
Metric invariance	336.269***	104	.969	.004	.059	.002	.052	.008	19,945.425	20,337.295
Scalar invariance	462.824***	112	.953	.016	.070	.011	.053	.001	20,066.277	20,415.897
Age										
Configural invariance	434.242***	156	.963		.065		.058		20,647.973	20,060.436
Metric invariance	344.568***	160	.975	.012	.052	.013	.047	.011	19,959.437	20,526.358
Scalar invariance	401.087***	176	.970	.005	.055	.003	.048	.001	20,470.213	19,985.752
Gender										
Configural invariance	265.945***	96	.978		.053		.040		20,641.990	20,208.871
Metric invariance	277.246***	104	.977	.001	.051	.002	.044	.004	20,597.204	20,205.334
Scalar invariance	287.227***	112	.977	.000	.049	.002	.044	.000	20,549.186	20,198.566

Note. CFI = Comparative fit index; RMSEA = Root mean square error of approximation; SRMR = Standardized root mean squared residual; AIC = Akaike information criterion; BIC = Bayesian information criterion.

*** $p < .001$.

Table 5

Mean Scores by Language Group

| Subscale | Language Group | | | | | | | *F (1, 1270)* | η^2_p |
| | Dutch group | | | French group | | | | |
	Mean (*SD*)	*SE*	95% CI	Mean (*SD*)	*SE*	95% CI		
Peer-related loneliness	21.17 (7.11)	0.27	20.64 – 21.71	19.04 (6.63)	0.27	18.50 – 19.56	31.46***	.02
Parent-related loneliness	20.53 (6.80)	0.25	20.03 – 21.03	18.70 (5.99)	0.25	18.20 -19.19	29.28***	.02
Positive attitude toward aloneness	31.15 (6.32)	0.26	30.65 – 31.66	29.77 (6.66)	0.26	29.25 – 30.26	16.32***	.01
Negative attitude toward aloneness	31.72 (5.81)	0.24	31.26 – 32.19	29.00 (6.25)	0.24	28.52 – 29.46	64.34***	.05

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

Table 6

Mean Scores by Gender (Both Samples Combined)

	Gender						$F (1,1270)$	η^2_p
	Girls			**Boys**				
Subscale	Mean (*SD*)	*SE*	95% CI	Mean (*SD*)	*SE*	95% CI		
Peer-related loneliness	20.58 (7.13)	0.27	20.06-21.09	19.57 (6.71)	0.29	19.01-20.13	6.77**	.01
Parent-related loneliness	19.60 (6.40)	0.25	19.11-20.08	19.64 (6.56)	0.27	19.12-20.16	0.02	.00
Positive attitude toward aloneness	30.96 (6.47)	0.25	30.46-31.43	29.89 (6.54)	0.27	29.36-30.41	8.69**	.01
Negative attitude toward aloneness	30.68 (6.17)	0.24	30.20-31.12	30.01 (6.18)	0.25	29.51-30.51	3.72	.00

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

Table 7

Mean Scores by Age Group (Both Samples Combined)

	Early adolescence			Middle adolescence			Late adolescence			F (2, 1270)	η^2_p
Subscale	Mean (*SD*)	*SE*	95% CI	Mean (*SD*)	*SE*	95% CI	Mean (*SD*)	*SE*	95% CI		
Peer	20.63 (7.55)[a]	0.31	20.00-21.23	19.77 (6.80)[a]	0.30	19.19-20.35	19.84 (6.23)[a]	0.45	18.95-20.72	2.22	.00
Parent	17.92 (5.79)[a]	0.29	17.35-18.46	20.12 (6.42)[b]	0.27	19.60-20.65	21.96 (6.99)[c]	0.41	21.15-22.76	36.71***	.06
Positive	29.53 (6.63)[a]	0.29	28.93-30.07	30.46 (6.56)[b]	0.27	29.94-31.02	32.38 (5.76)[c]	0.42	31.56-33.21	15.86***	.02
Negative	30.97 (6.03)[a]	0.28	30.41-31.51	29.92 (6.35)[b]	0.26	29.41-30.43	30.18 (6.00)[a,b]	0.40	29.40-30.97	4.01*	.01

Note. Peers = peer-related loneliness; Parent = parent-related loneliness; Positive = positive attitude toward aloneness; Negative = negative attitude toward aloneness.

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