Citation	Maes, M., Van den Noortgate, W., Fustolo-Gunnink, S., Rassart, J., Luyckx, K., & Goossens, L. (2017). Loneliness in children and adolescents with chronic physical conditions: A meta-analysis. *Journal of Pediatric Psychology, 42*, 622-635. doi:10.1093/jpepsy/jsx046
Archived version	Author manuscript: the content is identical to the content of the published paper, but without the final typesetting by the publisher
Published version	http://dx.doi.org/10.1093/jpepsy/jsx046
Journal homepage	https://academic.oup.com/jpepsy/article/42/6/622/3066283
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(article begins on next page)

Abstract

Objective: This meta-analysis examines loneliness in children and adolescents with chronic physical conditions as compared to their peers. **Methods:** Multilevel meta-analyses were performed on 43 studies (69 samples), published between 1987 and 2015. A total of 2,518 individuals with chronic physical conditions and 1,463 control peers were included in the analyses. **Results:** Children and adolescents with chronic conditions are, on average, somewhat lonelier than their peers without such conditions. Moreover, the link between chronic conditions and loneliness varied according to the recruitment procedure employed for participant selection. Stronger links were found for studies that recruited from patient organizations as compared to clinical registers. **Conclusions:** Findings support the link between loneliness and chronic conditions. To take into account the heterogeneity within patient groups, we advocate an alternative approach that cuts across diagnostic boundaries and focuses on illness-related variables such as illness duration and visibility of the condition.

Keywords: loneliness, children, adolescents, chronic physical conditions, meta-analysis

Loneliness in Children and Adolescents With Chronic Physical Conditions: A Meta-Analysis

Loneliness is the unpleasant feeling that occurs when people perceive their social relations to be deficient in an important way, either quantitatively or qualitatively (Perlman & Peplau, 1981). Feelings of loneliness in children and adolescents have been associated with a wide range of negative outcomes, including school drop-out, depressive symptoms, social anxiety, suicide ideation, low self-esteem, eating disorders, and sleep problems (Hawkley & Capitanio, 2015; Heinrich & Gullone, 2006). In addition, for children and adolescents with chronic physical conditions, loneliness has been associated with disease-specific correlates, such as more cardiac symptoms (Vanhalst et al., 2013) and poorer illness adjustment (Curtin & Siegel, 2003). However, at present, it is not clear whether children and adolescents with chronic conditions feel lonelier than their healthy peers. The present meta-analysis aimed to synthesize the available evidence and to examine whether differences in loneliness between children and adolescents with chronic conditions and controls vary in size or direction according to sample and study characteristics, such as the type of chronic condition examined, the recruitment procedure, and the type of comparison group.

Loneliness in Children and Adolescents With Chronic Physical Conditions

The prevalence of chronic physical conditions in children and adolescents has increased since the 1980s, with an estimate of about 25% for US children and adolescents (Van Claeve, Gortmaker, & Perrin, 2010). Having a chronic condition is a non-normative stressor that may interfere substantially with daily life (La Greca & Bearman, 2000). Pediatric psychology research has long recognized the role of the family for these children and adolescents, but the peer context has received less attention. However, peer relations, and especially peer group acceptance and close friendship support, are critical to social and emotional functioning (Rubin, Bukowski, & Bowker, 2015). Lower acceptance and peer

support have consistently been associated with increased feelings of loneliness (Baskin, Wampold, Quintana, & Enright, 2010; Kingery, Erdley, & Marshall, 2011; Vanhalst, Luyckx, & Goossens, 2014). At present, there is no consensus on whether children and adolescents with a chronic physical condition are at increased risk for perceived deficits in their peer relations, and, as a consequence, are more likely to feel lonely.

Belonging to a peer group might be more challenging for children and adolescents with chronic physical conditions for several reasons. First, these children and adolescents have been found to be at risk for school absenteeism (Emerson et al., 2016). Being frequently absent from school limits the time spent with peers, thus reducing the amount of rewarding peer-related activities (Shute & Walsh, 2005). Impaired social functioning, such as lower quality friendships, less peer acceptance, and less support from peers, has indeed been observed in children and adolescents with chronic physical conditions (Martinez, Carter, & Legato, 2011; Pinquart & Teubert, 2012). Impaired social functioning, in turn, may lead to increased feelings of loneliness (Heinrich & Gullone, 2006). Second, reduced energy levels and actual or self-imposed physical restrictions accompanying their illness may further prevent these children and adolescents from engaging in social activities such as sports. Third, in some illnesses, treatment-related responsibilities may prevent full participation with peers and lead to feelings of isolation and loneliness. Type 1 diabetes, for instance, requires a complex regimen of diet, blood glucose monitoring, and daily insulin administrations, which makes it more difficult for these youngsters to join parties or simply go out for dinner with friends (Seiffge-Krenke, 2001). Finally, belonging to a peer group might also be more difficult for children and adolescents with a chronic physical condition as they may feel stigmatized and different from their peers (Emerson et al., 2016), are more often victims of physical violence (Jones et al., 2012), and are more often bullied (Pittet, Berchtold, Michaud, & Surís, 2010) due to their condition.

Empirical studies that examined loneliness in children and adolescents with chronic conditions have yielded inconsistent results. Some studies have found this group to be at increased risk for loneliness (e.g., Curtin & Siegel, 2003; Storch et al., 2009), whereas other studies have found no differences (e.g., Noll, Reiter-Purtill, Vannatta, Gerhardt, & Short, 2007; Storch et al., 2008). Because of this inconsistency in findings, the present meta-analysis will not only calculate a mean effect across studies, but also aims to examine several sample and study characteristics that may explain this inconsistency in findings.

Moderators of the Link Between Chronic Physical Conditions and Loneliness

Type of condition. Certain types of physical conditions may be especially likely to put children and adolescents at risk for experiencing loneliness. Previous studies have suggested that children and adolescents with chronic neurological conditions, such as spina bifida, are especially at risk for poorer well-being (Martinez et al., 2011; Pinquart & Teubert, 2012). Having a neurological condition often implies having impaired cognitive abilities, which are needed to understand social processes (Pinquart & Teubert, 2012). Another group that might be especially vulnerable for feelings of loneliness are individuals with hearing and visual impairments, as this type of condition impacts one's ability to communicate with others and can disrupt interpersonal relations (Cacioppo, Grippo, London, Goossens, & Cacioppo, 2015; Wallhagen, Strawbridge, Shema, Kurata, & Kaplan, 2001). The effect of having a chronic condition on loneliness might thus be especially strong for children and adolescents with a neurological condition or with hearing or visual problems.

Study quality. Previous inconsistent findings may also have resulted from differences in several indicators of study quality. Four of these indicators are the geographical representation within the sample, the recruitment procedure used, the type of comparison being made, and the attempted controls for potentially confounding factors.

First, as regards geographical representation, studies that sampled participants from just a single site or city might yield less representative results (leading to random error) than studies that sampled from multiple sites or cities in one area, or from multiple areas. Second, as regards the recruitment procedure used, results may differ for select samples (i.e., convenience samples) and aselect samples (i.e., samples recruited from a population registry). A previous meta-analysis on well-being in children of Holocaust survivors, for instance, found an effect for studies using convenience samples only (i.e., samples recruited through Holocaust survivor meetings). For studies using aselect samples, no effect was found (Van IJzendoorn, Bakermans-Kranenburg, & Sagi-Schwartz, 2003). Similarly, different effects (leading to systematic error) on psychological well-being can be expected when participants were sampled from patient organizations as compared to clinics or registries, as members of patient organizations may represent a selective subsample of the total population. Third, as regards the type of comparison group used, results may be different (leading to systematic error) for studies that relied on healthy peers or a community sample. Studies including a sample of healthy peers explicitly checked whether participants in this group had a chronic condition and excluded the participants that reported a chronic condition from the sample. Studies including a community sample as a control group did not explicitly check the presence of a chronic illness and therefore may include some participants with a chronic condition as well. Larger effect sizes can be expected when healthy peers were used, as compared with a community sample, but there is no research yet to confirm this.

Fourth, as regards the attempted controls for potentially confounding factors, results may be different depending on whether or not matching procedures (or proxies thereof) are used (leading to systematic error). Matching implies that for each individual with a chronic condition a healthy counterpart is selected based on demographic variables, such as gender and age. This procedure effectively rules out the potential confounding effects of these

variables. Few meta-analyses have examined the effect of matching, but it has been suggested that effect sizes are larger when matching was conducted (Boekaerts & Roder, 1999). As a proxy for matching, researchers can sample the control group from the same classroom as the group with chronic conditions. Classroom peers are likely to be of similar age and to live in similar neighborhoods. Similar to matching, therefore, sampling controls from the same classrooms as the target children or adolescents results in better estimates of the population effect.

Additional moderators. Other study and sample characteristics that may lead to different results include the year in which the study was published, the country in which it was conducted, the type of loneliness measure that was used, the gender ratio in the sample, and participants' age. However, research on these moderators has been largely lacking.

First, the year in which the study was published may lead to different results, because definitions and diagnoses of chronic conditions changed considerably over the years (Ferro & Boyle, 2013). Moreover, there is increasing attention to the psychosocial well-being of children and adolescents with a chronic condition in routine medical care (Kazak & Noll, 2015). Second, having a chronic condition might lead to different experiences and outcomes in different countries, for example, due to different care facilities. Research on this topic, however, is lacking. Third, different measures have different measurement characteristics, which may have an effect on the estimates obtained. Fourth, the link between chronic physical condition and loneliness may be different for boys and girls. However, we did not expect a large effect, because a previous meta-analysis on the link between chronic conditions and social functioning did not find a moderating effect of gender (Pinquart & Teubert, 2012). Gender ratio was coded as the proportion of males in the study. Fifth, the age of the participants might influence the results, as peers become more important and potential dissatisfaction in one's relationships with peers becomes more likely as children grow older

and move into adolescence (Qualter et al., 2015). However, few studies examined whether the impact of having a chronic condition on one's social life varies with age. Previous meta-analyses on children and adolescents with chronic physical conditions that examined the moderating effect of age yielded mixed results. Age did not moderate the association between having a chronic condition and depressive symptoms (Pinquart & Shen, 2011b) or social functioning (Pinquart & Teubert, 2012). However, larger associations between having a chronic condition and internalizing problems were found with increasing age (Pinquart & Shen, 2011a).

The Present Study

The aim of the present study was to conduct a meta-analysis on loneliness in children and adolescents with chronic physical conditions compared to their healthy peers, as empirical findings so far have been inconsistent. In addition to examining the overall effect of having a chronic condition on loneliness, we aimed to examine several study and sample characteristics that may moderate this effect, including the type of condition, the geographical representation within the sample, recruitment and matching procedures, publication year, the country the study was conducted in, the loneliness instrument used, and gender and age of the participants.

Method

Identification of Studies

The present meta-analysis is part of the MASLO project, where the acronym stands for Meta-Analytic Study of Loneliness (reference omitted for blind review). For this larger project, we aimed to include all studies that used one of the main standardized loneliness questionnaires (only standardized loneliness questionnaires were included to minimize bias in outcome assessment). These studies were obtained through a literature search (Figure 1) conducted in several data bases, using key terms that reflected the names of the loneliness

measures (key terms are available upon request from the first author). For example, for the UCLA loneliness Scale, we used the search strings ("UCLA Loneliness Scale" or "UCLA Loneliness Questionnaire") and ((UCLA) and (lonel* or "perceived social isola*")). The literature search has been described in more detail elsewhere (reference omitted for blind review). The literature search resulted in 3,658 studies, of which 1,589 were excluded because they did not use one of the loneliness measures, were written in a language other than Dutch, English, French, or German, or could not be retrieved. The remaining 2,069 studies were read in depth, after which 246 studies were excluded because of insufficient information.

The remaining 1,823 studies were coded using a coding protocol which was piloted and developed by different experts in the field of loneliness. Undergraduate and graduate students in psychology were trained by the first author to code the articles until they reached a sufficient level of expertise. All articles coded by the students were checked by the first author to verify that the rules described in the manual had been applied correctly. From these coded studies, we selected studies that included children and adolescents with chronic physical conditions. Studies were considered to include children when the mean age of the sample was below 12 years, and to include adolescents when the mean age was below 21 years and the participants did not attend college or university yet. In total, 57 such studies were found, but 18 were excluded from the present analyses because they were based on the same sample of participants as other included studies, did not provide the statistical information necessary for the present analyses, or included participants that were selected because they experienced problems in peer relations, which represents a confounder with our outcome measure of loneliness. Finally, we excluded studies that did not use the UCLA Loneliness Scale or the Children’s Loneliness Scale, because these two measures were the only ones that were found in sufficiently large numbers to allow a meaningful comparison. In June 2016, we conducted an update of this procedure, yielding an additional 9 studies. Of

these 9 studies, 5 studies were excluded, because they were based on the same sample as another study or did not include sufficient statistical information.

Data Set

Our final data set consisted of 43 studies that were published between 1987 and 2015 (see supplementary materials). These studies were conducted in seven different countries, namely Australia (*n* = 2), Belgium (*n* = 1), Canada (*n* = 4), China (*n* = 1), Denmark (*n* = 1), Greece (*n* = 1), India (*n* = 1), Israel (*n* = 3), Jordan (*n* = 1), and the US (*n* = 28). Most studies were cross-sectional (*n* = 31), but some were longitudinal (*n* = 12). About half of the studies included a control group (*n* = 23), whereas the others did not (*n* = 20). Samples included mainly children (*n* = 17) or adolescents (*n* = 26), but age ranges were often rather large, covering both childhood and adolescence. Sample sizes ranged from 10 to 429 per condition or control group. A total of 2,518 children and adolescents with a chronic physical condition and 1,463 healthy peers were included in the present meta-analysis, 51% of which were male. Information on socioeconomic status (SES) was often missing (*n* = 26), but some studies reported that more than 60% of the sample had low SES (*n* = 4), more than 60% of the sample had middle to high SES (*n* = 6), or the sample was more equally mixed regarding SES (*n* = 7). Information on ethnic background was also often missing (*n* = 22), but some studies reported that more than 75% of the sample came from an ethnic minority group (*n* = 2), more than 75% of the sample came from the ethnic majority group (*n* = 15), or the sample was more equally mixed regarding ethnic background (*n* = 4).

Coding of Studies

The present meta-analysis includes 43 studies (*n*) reporting on 69 samples (*k*) of which 23 were control samples. These studies were coded for all the moderators described in the Introduction.

Type of condition. To examine whether children and adolescents with certain types of conditions are more vulnerable for loneliness, we categorized the studies as follows: (1) neurological conditions (k = 6); (2) hearing and visual impairments (k = 8); and (3) other (k = 32). In addition, we examined a more specific division of condition types, including nine categories. These categories were primarily based on the organ system involved in the condition (e.g., blood in hemophilia), with the exception of cancer (different types of cancer were grouped together). Some conditions lead to problems in multiple organ systems, in which case they were classified according to their most prominent or debilitating symptom (e.g., cardiomyopathy in Barth syndrome). Conditions that could not be grouped according to this strategy were placed in an 'other conditions' group. The first category included children and adolescents with hearing (k = 7) or visual (k = 1) impairments. The second category included hematologic conditions (i.e., conditions which primarily affect the blood), such as hemophilia (k = 1) and sickle cell disease (k = 3). The third category included children and adolescents with cancer. All studies in that category (k = 3) included participants with different types of cancer with the majority of participants suffering from leukemia or lymphoma. The fourth category included neurological conditions (i.e., conditions that often affect the nervous system), such as cerebral palsy (k = 1), epilepsy (k = 1), neurofibromatosis Type 1 (k = 2), and spina bifida (k = 2). The fifth category included endocrine diseases (i.e., conditions that are associated with dysfunction of the endocrine system), such as cystic fibrosis (k = 2), obesity (k = 2), short stature (k = 1), and Type 1 diabetes (k = 2). Also, two other samples included multiple conditions, classified as nonobservable endocrine conditions (i.e., Type 1 diabetes and hypothyroidism) and observable endocrine conditions (i.e., short stature, gynecomastia, precocious puberty, and delayed puberty). The sixth category included (diseases associated with) heart conditions, such as Barth syndrome (k = 1) and congenital heart disease (k = 1). The seventh category included asthmatic and allergic conditions, such as

asthma only (k = 1), allergies (anaphylaxis and other severe allergies) only (k = 1), and a mixed condition with persons with asthma and/or allergies (k = 2). The eighth category was labeled ‘other conditions’ and included studies on chronic pain (k = 2), glycogen storage disease, migraine, primary focal hyperhidrosis, and rheumatoid arthritis (k =1 in each case). The final category, labeled ‘mixed’ comprised studies (k = 4) that included a broad range of conditions covering almost all of the above categories.

Study quality. Four indicators for study quality were used: The geographical representation within the sample, the recruitment procedure used, the type of comparison being made, and the attempted controls for potentially confounding factors. First, geographical representation was coded as follows: (1) participants were sampled in a single city (n = 6); (2) participants were sampled in multiple cities within one geographical area (n = 16); and (3) participants were sampled in multiple geographical areas (n = 7). For 14 studies, this information was missing. Second, we coded for the recruitment procedure used when sampling children and adolescents with chronic conditions, using three categories: (1) schools, including special schools for the hearing impaired, general schools, and special classes in general schools (n = 6); (2) clinical registers and databases (n = 26); and (3) patient organizations, joined voluntarily, such as local and national organizations, sport teams, camps, and conferences (n = 10). Third, we coded whether the control group consisted of a community sample (coded as 1; n = 9) or a sample of healthy peers (coded as 2; n = 14). Fourth, we coded whether the condition and control groups were matched on one or more demographic variables (1) or not (0). Because almost all studies (87%) employed a matching procedure, we did not include this moderator in the analyses. In addition, we coded whether participants in the condition and control groups came from the same classroom (coded as 1; n = 11) or not (coded as 0; n = 12).

Additional moderators. First, year of publication was included as a continuous variable, centered around the year of publication of the oldest article included (i.e., 1987). Second, to examine the moderator reflecting the country in which the study was conducted, three categories were used, that is, US (coded as 0; n = 28); Western non-US countries (coded as 1; n = 9); and non-Western countries (2; n = 6). Third, the loneliness questionnaire used was coded as (0) the Children's Loneliness Scale (n = 33); and (1) the UCLA Loneliness Scale as 1 (n = 10). Fourth, gender ratio was coded as the proportion of males in the study. Information was available for 41 studies and the proportion ranged from 0.21 to 1.00 (M = 0.51, SD = 0.17). Fifth, regarding age, we did not simply use the two categories of children and adolescents, because many studies recruited participants from both age groups. Rather, we included a continuous moderator representing the mean age of the sample. This information was available for 37 of the studies and the mean age ranged from 5.5 to 19.89 years (M = 12.98, SD = 2.80). To assist in the interpretation of the effect obtained, the moderator 'age' was centered around the age of 5 years.

Statistical Analyses

For all analyses, effect sizes (or standardized means) were weighted by the inverse variance (Lipsey & Wilson, 2001), meaning that samples with higher precision get a greater weight in the analyses. Effect sizes were calculated in two ways. First, we calculated standardized mean differences. We computed Hedges' g (Hedges, 1981) for each study, by subtracting the loneliness mean of the control peers from that of participants with chronic conditions and dividing the resulting scores by the pooled standard deviation (Lipsey & Wilson, 2001). A positive effect size, therefore, reflects higher loneliness scores for participants with chronic conditions compared to the control peers. For all effect sizes, we applied Hedges' small-sample correction (Lipsey & Wilson, 2001). We conducted analyses based on Hedges' g using a random effects model with, in addition to the sampling variance,

two random effects (Van den Noortgate, López-López, Marín-Martínez, & Sánchez-Meca, 2013). A first random effect was included to account for between-study variance, because we did not assume that there is a common population effect for all studies, but rather that characteristics of the study may influence the results. Because several studies reported on multiple chronic conditions and Hedges' *g* may vary over conditions, we included a second random effect, referring to the deviation of Hedges' *g* for a specific chronic condition from the study mean Hedges' *g*. A drawback of this approach is that only the 23 studies including a control group can be included in the analyses.

In the alternative approach (loneliness mean scores), we aimed to include the information from the 20 studies without a control group as well. The general strategy is not to engage in pairwise comparisons of target children and adolescents vs. controls using an effect size, such as Hedges' *g*, and to average these effect sizes. Rather, mean loneliness scores of the samples with children and adolescents with chronic conditions and of the samples with control peers are used as the outcome variable in a meta-regression analysis. A complication with this alternative approach is that the mean scores of the included studies could not be easily compared, because they were based on two different loneliness questionnaires, each with a different number of response categories. Therefore, we computed standardized means. To compute these standardized means, we first computed a pooled standard deviation across all control groups, for each loneliness measure separately. Second, we computed a weighted overall mean across all control groups, again separately for each loneliness measure. Next, we subtracted this overall mean from the means of each chronic condition and control group, and divided the resulting score by the pooled standard deviation. To examine the overall effect (i.e., the difference between target children and adolescents and controls), a predictor is added to this model which is coded as 0 = not having a chronic condition and 1 = having a chronic condition. In such a model, the intercept reflects the estimate for the mean expected loneliness

score across all control groups. The slope reflects the estimate for the mean difference in loneliness across the studies, between all control groups, on the one hand, and all chronic condition groups, on the other hand. Again, a random study effect was added, both for the intercept and the slope. As the effect of having a chronic condition (i.e., the slope) may depend on the particular condition participants have, a random effect reflecting the different chronic conditions was added to the slope as well. A likelihood ratio test was used for testing the heterogeneity between studies and between conditions.

To examine whether the effect of having a chronic condition varied according to study and sample characteristics, we conducted moderator analyses using mixed-effects models. This means that we included the same random effects as for the standardized effect size analyses described above, but also included fixed effects for the moderators. These moderator analyses were conducted using the standardized loneliness means, and each moderator was examined in a separate model. Analyses were conducted with the procedure Mixed from SAS 9.3 using restricted maximum likelihood (REML) as estimation method (Littell, Milliken, Stroup, Wolfinger, & Schabenberger, 2006). Mean and moderating effects were statistically tested by means of a Wald test, comparing the ratio of the estimate over the corresponding standard error estimate to a *t*-distribution, with degrees of freedom estimated using the Satterthwaite (1946) method.

Results

Loneliness in Children and Adolescents With Chronic Physical Conditions

The analyses based on the standardized mean differences from the 23 studies with a control group yielded a significant, but very small effect of $g = 0.13$ ($SE = 0.06$, $p = .035$, and 95% CI [0.01, 0.26]). Recall that a positive effect size indicates higher loneliness scores for participants with chronic conditions than the control peers. Including the same 23 studies, the alternative strategy using standardized means yielded an effect of 0.12 ($SE = 0.06$, $p = .083$,

and 95% CI [-0.02, 0.25]). As these results are very similar, we further discuss only the results of the alternative strategy, enabling us to include information from all 43 studies. A caterpillar plot of all standardized means, separately for the control and chronic condition groups is presented in Figure 2. Analyses based on the 43 studies yielded a significant, but very small difference in standardized means of 0.14 (*SE* = 0.07, *p* = .048, and 95% CI [0.00, 0.29]). Three of the standardized means could be considered as outliers as they were more than two standard deviations above the mean. Two of these outliers came from the same study and reflected the loneliness mean for the control and chronic condition group. The third outlier came from a study with only a chronic condition group. Analyzing the data without these three outliers again yielded a significant but very small effect of 0.17 (*SE* = 0.06, *p* = .018, and 95% CI [0.03, 0.30]).

Furthermore, we examined whether the effect of having a chronic condition on loneliness differed across studies. We did not find evidence that the difference between control and chronic condition groups varies over studies (the variance estimate is 0.00, $\chi^2(1) = 0.0$, $p = 1$). We found, however, clear differences between studies in the overall level of loneliness (0.14, $\chi^2(1) = 267.0$, $p < .001$). Also within studies, we found variation in average loneliness scores between the chronic condition groups (0.04, $\chi^2(1) = 4.0$, $p = .046$). These variances are relatively large, if compared to the sampling variance of the observed means (the sampling variance depends largely on the study size, with the median sampling variance equal to 0.02).

Moderators of the Link Between Chronic Physical Conditions and Loneliness

Each moderator was tested in a separate model, for which the results are presented in Table 1. For all variables, except for type of condition, a main effect was also included in the model. However, in order to save space and facilitate interpretation, only the results regarding the moderation effects are presented. None of the moderator effects were significant, except

for recruitment procedure. Especially participants recruited from patient organizations, such as local and national organizations, sport teams, camps, and conferences, were found to be more lonely than their control peers.

To examine publication bias, we also added the number of participants as a moderator to the model. A negative coefficient, meaning that studies with smaller samples have larger effect sizes, would indicate the presence of publication bias. We did not find an indication for publication bias, as sample size did not moderate the effect of having a chronic condition ($F(1, 8.4) = 0.92$, $p = .365$). In addition, we calculated the failsafe number: we added studies with equal means in both conditions until the effect of condition was not statistically significant at the .05 level anymore. We found that if there are at least 21 studies with null effects that were not included in our meta-analysis, we do not have enough evidence anymore to conclude that the condition has an effect on loneliness. Hence, although 21 is not a small number, we cannot rule out the possibility that the effect we found is due to publication bias.

Discussion

The present meta-analysis examined loneliness in children and adolescents with chronic physical conditions as compared to control peers. We found a very small effect, suggesting that children and adolescents with chronic conditions are, on average, somewhat lonelier than their peers without such conditions. This increased risk for feelings of loneliness might have resulted from a reduced amount of peer-related social activities due to, for example, school absenteeism, reduced energy levels, physical restrictions, illness-related responsibilities, or experiences of stigmatization and victimization (Boekaerts & Roder, 1999; Emerson et al., 2016; Martinez et al., 2011; Pinquart & Teubert, 2012; Pittet et al., 2010). However, future research is necessary to unravel the underlying mechanisms that may explain this increased risk for feelings of loneliness.

Despite such small differences in loneliness in comparison to control samples, recognizing feelings of loneliness is important when treating children and adolescents with chronic physical conditions, as these feelings may have detrimental effects not only on their mental, but also on their physical well-being. Longitudinal studies that focused on children and adolescents from the general population found that loneliness was associated over time with a higher frequency of visits to the doctor, lower self-reported general health, and higher sleep dysfunction, while controlling for earlier reported health problems (Harris, Qualter, & Robinson, 2013; Qualter et al., 2013). Longitudinal research focusing on adolescents with a chronic condition (i.e., congenital heart disease) further showed that patients who scored high on loneliness experienced more cardiac symptoms, and had more difficulties in communicating with clinicians and in accepting their physical appearance (Vanhalst et al., 2013).

Moderators of the Link Between Chronic Physical Conditions and Loneliness

In addition to examining the overall effect of having a chronic condition, we examined several study and sample characteristics that may moderate this effect. Our results suggested that the link between chronic conditions and loneliness does not vary according to the geographical representation within the sample, whether the condition and control group were sampled from the same classroom, the publication year or the study, the country the study was conducted in, the loneliness instrument used, and the gender and age of the participants. However, the effect of having a chronic condition on loneliness scores did vary according to the recruitment procedure employed. The strongest effect of having a chronic condition on loneliness was found for studies that recruited children and adolescents from patient organizations. Such a procedure likely results in a select sample, as joining these patient organizations (e.g., local and national organizations, sport teams, camps, and conferences) is voluntary. It could be that members of these organizations are more concerned with their

chronic condition or encounter more obstacles in daily life. Another potential explanation is that children and adolescents who feel lonely are more inclined to join such organizations to find companions. It would be interesting for future research to examine whether joining these organizations helps in alleviating feelings of loneliness over time.

We also examined the moderating effect of type of condition, and expected that the effect of having a chronic condition on loneliness scores was especially strong for children and adolescents with a neurological condition or with hearing or visual problems. This moderation effect was statistically not significant. However, this may be explained by the limited number of studies that were found, which has a negative impact on the accuracy of the estimates and on the statistical power. The findings on the estimated mean effect sizes per category of condition showed a statistically significant elevation of loneliness only for children and adolescents with hearing or visual problems. Having hearing or visual problems has a profound impact on one's ability to communicate with others, which might disrupt interpersonal relationship (Cacioppo et al., 2015; Wallhagen et al., 2001).

Suggestions for Future Research

First, children and adolescents with a specific chronic condition are not a homogeneous group and show considerable variations in daily functioning (e.g., Meijer, Sinnema, Bijstra, Mellenbergh, & Wolters, 2000; Sattoe, Hilberink, Van Staa, & Bal, 2014; Sawyer, Drew, Yeo, & Britto, 2007). Focusing on a categorization based on body systems or types of chronic conditions might therefore not be very helpful when examining psychological and social variables (Perrin et al., 1993; Stein & Jessop, 1989). Hence, alternative categorizations based on dimensions of these chronic conditions that cut across diagnostic boundaries have been proposed in the literature.

An example of such an alternative categorization has been proposed by Perrin et al. (1993). Their model includes 13 continuous variables that can be scored for each child or

adolescent individually. Examples of these variables include the duration of the condition (ranging from brief to lengthy), limitation of age-appropriate activities (ranging from no limitations to unable to conduct), and visibility (ranging from not visible to highly visible). For example, when a child with a particular condition does not experience limitations in age-appropriate activities, this child might not feel lonely, whereas a child with the same condition who experiences many limitations in these activities, is more likely to feel lonely. However, these illness-related variables have been rarely examined in the context of loneliness. The few studies that have been conducted showed that loneliness was not associated with either duration of the condition or with objective ratings of illness severity (Brown, Connelly, Rittle, & Clouse, 2006; Noll, Reiter-Purtill, Moore, et al., 2007; Schorr, 2006; Vannatta et al., 2008). Regarding illness visibility, research found higher loneliness scores in children and adolescents who reported higher illness visibility (Curtin & Siegel, 2003). Future research could examine whether children and adolescents whose condition is more visible, are more likely to being stigmatized and bullied, increasing the risk for loneliness. Examining illness-related variables is not only relevant for researchers interested in loneliness, but also represents a promising approach when examining other psychological and social variables, such as depressive symptoms and peer group functioning (e.g., De Ridder, Geenen, Kuijer, & Van Middendorp, 2008; Meijer et al., 2000; Newacheck & Taylor, 1992; Stein & Jessop, 1989). Unfortunately, in the present meta-analysis, we were not able to adopt this alternative categorization, as insufficient information was provided on illness-related variables in the included studies.

A second avenue for future research is to examine the moderating role of having a chronic condition with respect to risk factors for loneliness. Previous research, for instance, has found that adolescents with chronic conditions were more likely to be victims of bullying than their peers without such conditions (Pittet et al., 2010). Being victimized, in turn,

increased the risk for internalizing difficulties such as depressive symptoms, especially among adolescents with chronic conditions. Similarly, risk factors for loneliness (such as victimization) may be especially harmful for children and adolescents with chronic physical conditions.

Third, it would be interesting for future research to examine whether having a chronic condition plays a different role regarding different types of loneliness. Two types that are often distinguished in the loneliness literature are intimate and relational loneliness (Cacioppo et al., 2015). Intimate loneliness is the feeling of lacking a close, intimate attachment to another person (e.g., a best friend), whereas relational loneliness is the feeling of lacking a network of social relationships (e.g., a peer group). It could, for example, be that children and adolescents with chronic physical conditions experience problems in their peer group, which might result in feelings of relational loneliness. However, they may still have a close relationship with a best friend, and, therefore, do not experience intimate loneliness.

Fourth, reviewing the literature on loneliness in children and adolescents with chronic physical conditions led us to formulate several other suggestions for future research. As a research community, we should aim to base our conclusions on a set of studies that is representative of the global population of children and adolescents with chronic conditions. For example, 69% of the studies included in the present meta-analysis were conducted in the US. Hence, even though we have a good estimate for US samples, this might not be the case for other countries. Furthermore, the majority of studies did not report on the socioeconomic and ethnic status of the participants. We would like to urge researchers to include information on these demographic characteristics of their sample in their research reports. Finally, as individuals with a specific chronic condition constitute a very heterogeneous group, it is important for future research to include more information on illness-related variables, such as

disease severity and treatment intensity, even when a categorization based on diagnoses is used.

Limitations

One limitation of the present meta-analysis, that is, the limited power regarding the moderation analyses, has already been discussed above. These power issues would have been even more pronounced, when we would have focused only on studies that included a control group (as is usually done in traditional meta-analysis). Therefore, we proposed the alternative mean-based approach, which allowed us to include all relevant studies even when these studies did not include a control sample. However, such an approach could lead to biased results if children and adolescents with chronic physical conditions differ on third variables from their peers without such conditions. As the mean effect size based on this approach was similar to the effect size on controlled studies, we do not have evidence for this kind of bias.

Conclusion

The present meta-analysis found that children and adolescents with chronic physical conditions are somewhat lonelier than their control peers. Especially children and adolescents with visual or hearing problems seem to be a vulnerable group. However, as individuals with a chronic condition constitute a very heterogeneous group, even within specific conditions, focusing on diagnoses might not be very helpful when examining psychological and social variables. An alternative categorization has been proposed that aims to classify children and adolescents based on illness-related variables rather than conditions. We hope that future research using this categorization may yield additional information on loneliness in children and adolescents with chronic physical conditions. In the meantime, caretakers and health care providers should be aware of and pay attention to the risk of loneliness in this group of children and adolescents.

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Table 1

Separate Regression Analyses for the Moderators Predicting Standardized Means of Loneliness

Moderator	Effect of condition	(SE)	$F_{interaction}$ (df)	*p*
Three categories of conditions			2.52 (2, 7.99)	.142
Neurological conditions	0.23	(0.16)		
Hearing or visual impairments	0.43*	(0.14)		
Other conditions	0.10	(0.06)		
Nine categories of conditions			1.53 (8, 25.0)	.195
Hearing or visual impairments	0.43***	(0.11)		
Hematologic conditions	0.12	(0.15)		
Cancer	-0.10	(0.17)		
Neurological conditions	0.22	(0.16)		
Endocrine diseases	-0.05	(0.13)		
Heart conditions	0.24	(0.16)		
Asthma and allergies	0.08	(0.23)		
Other conditions	0.21	(0.12)		
Mixed samples	0.11	(0.19)		
Geographical representation			2.81 (2, 30.4)	.076
1 city	0.16	(0.09)		
>1 city, 1 area	-0.01	(0.08)		
>1 area	0.30**	(0.11)		
Recruitment procedure			7.80 (2, 18.3)	**.004**
Schools	0.25*	(0.10)		
Clinical registers	0.07	(0.05)		
Patient organizations	0.91***	(0.21)		
Control group			0.16 (1, 40)	.694
Community sample	0.17	(0.09)		
Healthy peers	0.13	(0.08)		
Same classroom			0.72 (1, 40)	.403
No	0.19*	(0.08)		
Yes	0.10	(0.08)		

Publication year	0.01	(0.01)	0.89	(1, 58.2)	.350
Country			0.66	(2, 60)	.523
US	0.15	(0.08)			
Western non-US countries	0.32*	(0.15)			
Non-Western countries	0.12	(0.13)			
Loneliness questionnaire			1.19	(1, 62.0)	.279
CLS	0.20**	(0.07)			
UCLA	0.09	(0.09)			
Proportion male	0.55	(0.32)	3.07	(1, 39.3)	.087
Mean age	-0.02	(0.03)	0.85	(1, 30.5)	.365

Note. The models testing the interaction effects of Type of Condition could not be estimated. These models were therefore simplified by omitting the random effect of type of condition. For the three continuous variables, the column "Effect of condition" represents the moderator effect. CLS = Children's Loneliness Scale; UCLA = UCLA Loneliness Scale.

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

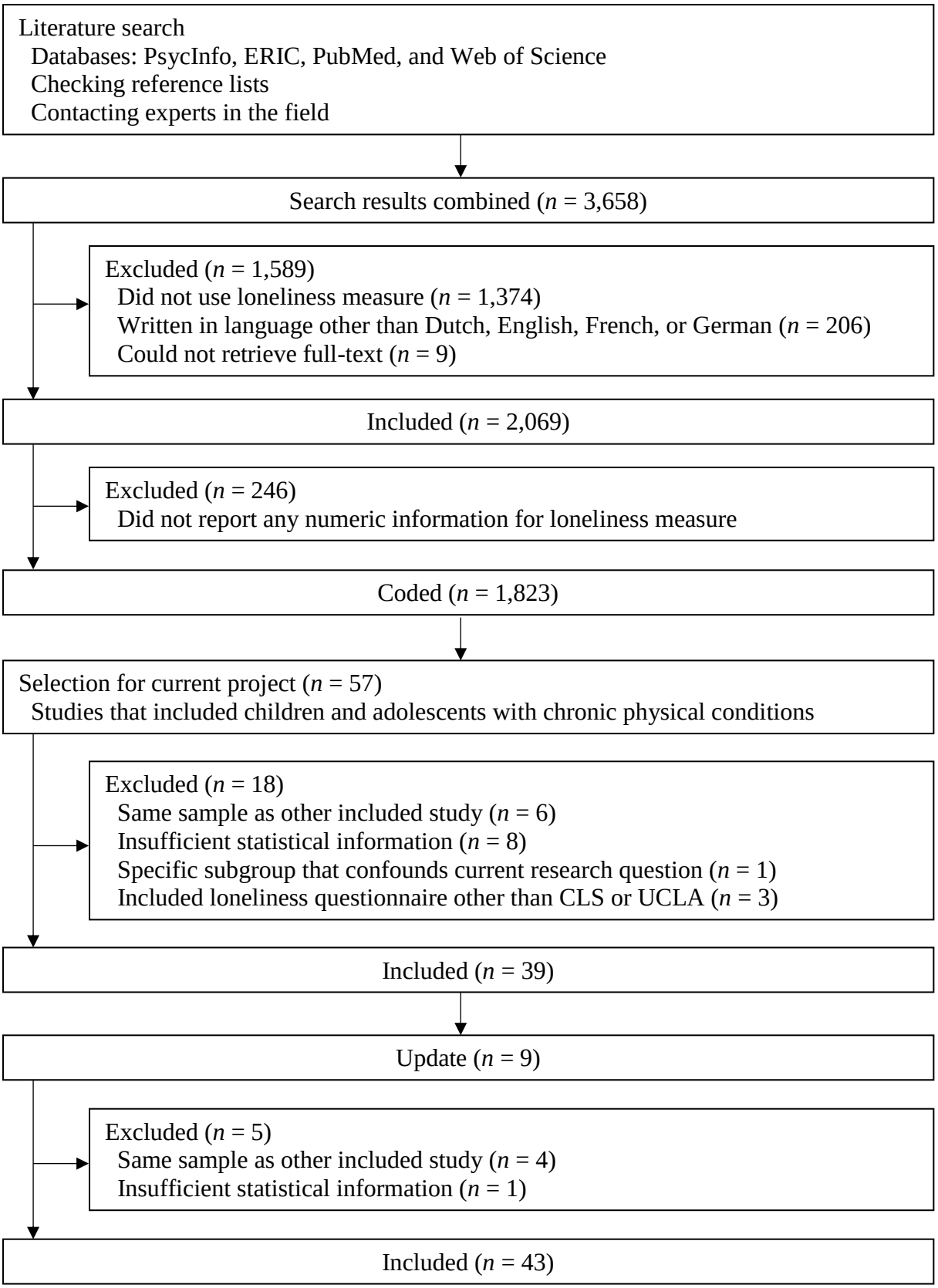

Figure 1. PRISMA flow chart.

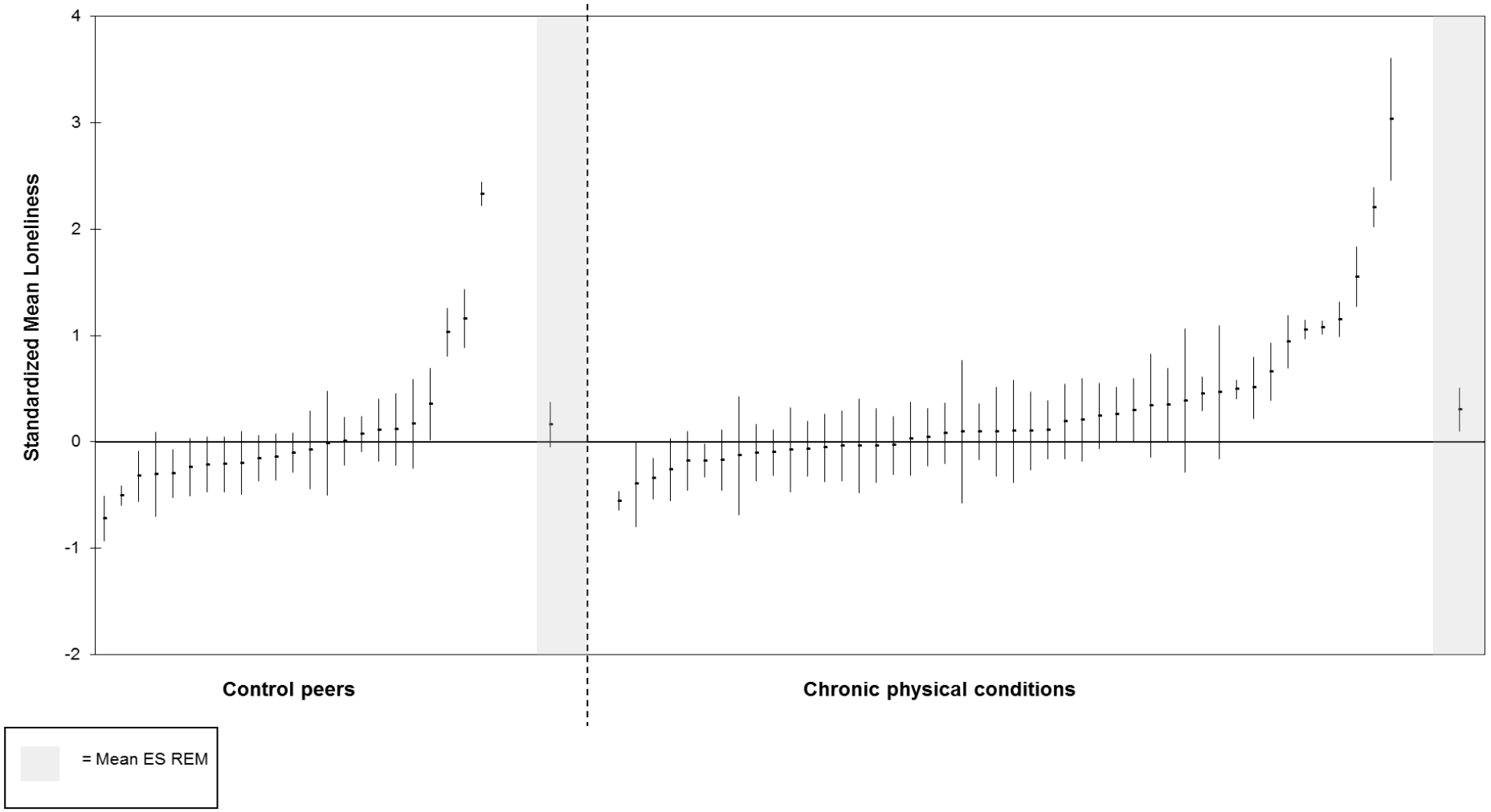

Figure 2. Sorted caterpillar plot of the standardized loneliness means for children and adolescents with chronic physical conditions and control peers, with 95% confidence intervals.