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Featured Article

Featured Article: Depressive Symptoms in Parents of Children With Chronic Health Conditions: A Meta-Analysis

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Abstract

Objective Caring for children with chronic health conditions is associated with stressors that may impair mental health. The goal of our meta-analysis was to analyze depressive symptoms among parents who care for a child or adolescent with chronic physical disease and/or sensory disability and/or physical disability compared with parents of healthy children or test norms. **Methods** A systematic search through electronic databases identified 460 relevant studies that were included in a random-effects meta-analysis. **Results** Parents of children with chronic conditions showed small to moderate elevations of depressive symptoms compared with parents of healthy/nondisabled children and test norms ($g = .46$ *SD* units). Twelve studies using structured clinical interviews provided a weighted mean depression rate of 20.9%. The highest elevations were found among parents of young people with neuromuscular disorders, cancer, and cerebral palsy. Elevations of depressive symptoms were greater in cases with shorter durations of the chronic condition, in mothers compared with fathers, and in parents from economically less developed countries rather than developed countries. **Conclusions** Parents of children with chronic conditions, particularly parents of children with neuromuscular disorders, cancer, and cerebral palsy, should be screened for depression and receive psychosocial services aimed at reducing these symptoms, if needed.

Key words: chronic disease; depression; fathers; mothers; parents.

The term *chronic health condition* covers medically diagnosed diseases and chronic disabilities (Lawn & Schoo, 2010). The present meta-analysis assessed the levels of depressive symptoms and the prevalence of clinical depression among parents of children and adolescents with chronic physical diseases and/or physical/sensory disabilities. In addition, we assessed whether levels of depressive symptoms vary by characteristics of the chronic health condition (e.g., duration), the child (e.g., age), and the parents (e.g., gender), as well as study quality. It is important to understand the extent of depressive symptoms among parents of children with chronic conditions because parental depressive symptoms have been found to be correlated to negative parenting practices (Celano, Bakeman, Gaytan, Smith, Koci, & Henderson, 2008), poor adherence (Eckshtain, Ellis, Kolmodin, & Naar-King, 2010), and an increase in their children's symptoms over time (Otsuki, Eakin, Arceneaux, Rand, Butz, & Riekert, 2010). Knowledge on these questions is also important for identifying parents who should be screened for depression.

Providing care for a child with a chronic health condition may lead to depressive symptoms among mothers and fathers. First, having a child diagnosed with a chronic condition is associated with losses, such as the loss of the healthy/nondisabled child parents thought they had, the loss of confidence in

their own parental ability to protect their child from danger, the loss of freedom because of disease- or disability-related restrictions, and the loss of previous sources of positive feelings because of reduced time spent with friends or partaking in hobbies (Lowes & Lyne, 2000). A loss of perceived control is a main risk factor for depressive symptoms and disorders (Abramson, Metalsky, & Alloy, 1989; Carpentier, Mullins, Chaney, & Wagner, 2006). Second, elevated caregiving demands may result in chronic stress and emotional as well as physical exhaustion which could, again, lead to parental depression (Lawoko & Soares, 2006). Third, in some cases, depression may result from feelings of guilt, for example, if the chronic condition resulted from parental behaviors (e.g., in the case of mother-to-child transmission of HIV; Lazarus, Struthers, & Violari, 2009). Finally, when parents face their child's life-threatening condition (where existing treatments may fail) or life-limiting conditions (when the disease cannot be cured and patients will die of the disease; Fraser et al., 2012), a negative mood could also be an aspect of anticipatory grief reactions (Lowes & Lyne, 2000; Olshansky, 1962; Rando, 2000).

Until now, only one meta-analysis has been published on depressive symptoms among parents of children with a chronic health condition. Easter, Sharpe, and Hunt (2015) found a small to moderate elevation of depressive symptoms among caregivers of children with asthma compared with caregivers of healthy children ($d = .44$ *SD* units). Narrative reviews indicated that up to 50% of parents of children with congenital heart defects or epilepsy report clinically relevant levels of depression and/or anxiety (Ferro & Speechley, 2009; Woolf-King, Anger, Arnold, Weiss, & Teitel, 2017). Elevated levels of general psychological distress has also been found in meta-analyses on parents of children with cancer ($d = .30$–$.35$; Pai, Greenley, Lewandowski, Drotar, Youngstrom, & Peterson, 2007) and spina bifida ($d = .54$–$.76$; Vermaes, Janssens, Bosman, & Gerris, 2005). However, the results of these reviews are difficult to compare because of the use of different outcome variables (depression vs. heterogeneous indicators of psychological distress). In addition, most reviews reported considerable variability of the effect sizes (Pai et al., 2007; Vermaes et al., 2005; Woolf-King et al., 2017). Information on the source of heterogeneity is needed for identifying parents who are at the highest risk for depressive symptoms. These points were addressed in the present meta-analysis.

Research Questions

Absolute levels of depressive symptoms cannot be aggregated across studies if different measures were used. Therefore, depression scores of the individual studies must be standardized before aggregation (Lipsey & Wilson, 2001). This is achieved when computing the difference between depressive symptoms in parents of a child with a chronic health condition and members of a control group (who have been assessed with the same depression scale but who do not have a child with a chronic condition), and dividing the difference by the pooled *SD*. The standardized score indicates elevations of depressive symptoms in parents of a child with a chronic condition that can be attributed to the condition. Thus, the present meta-analysis analyzed elevations of depressive symptoms in parents of children with a chronic condition when compared with parents of healthy children and test norms. The first research question asked whether parents of children and adolescents with a chronic condition show higher levels of depressive symptoms and a higher rate of clinical depression than parents of healthy/nondisabled children or test norms.

The second question asked whether elevations of parental depressive symptoms vary by study characteristics. The selection of moderator variables was mainly based on family stress models. These models indicate that the amount of psychological distress of family members depends on the amount of stressors and the availability of coping resources (Frishman et al., 2017). With regard to stressors, the strongest elevations of parental depressive symptoms were expected among cases of life-threatening and life-limiting conditions, such as cancer, cystic fibrosis, HIV infection/AIDS, and progressive neuromuscular disorders (Fraser et al., 2012) because depressive symptoms often result from losses (Lowes & Lyne, 2000) and anticipatory grief (Rando, 2000). In addition, mothers of young people with chronic conditions were expected to show stronger elevations of depressive symptoms than fathers because of being, on average, more involved in the childcare (Pinquart, 2018), showing stronger emotional responses to stressors than men as well as less effective ways of coping with stressors (Hyde, Mezulis, & Abramson, 2008). Furthermore, stronger elevations of parental depressive symptoms were expected when caring for younger children (because of higher caregiver demands; Naar-King et al., 2009) and in the case of shorter duration of the chronic condition (because of having less time to adapt; Murray et al., 2008).

With regard to resources, married parents of children with chronic health conditions were expected to show weaker elevations of depressive symptoms than unmarried parents because married parents tend to share caregiving responsibilities and because being married increases the availability of emotional support (Frishman et al., 2017; Mullins et al., 2011). In addition, we expected weaker elevations of depressive symptoms in parents from developed countries with advanced economies (International Monetary Fund

[IMF], 2018) because of better access to high-quality medical treatments (World Health Organization, 2018) and psychosocial services for the affected families (Telfer, 2009; Witbooi, 2013).

Because moderator effects of the study quality are a central topic of high-quality meta-analyses (Higgins & Green, 2009; Lipsey & Wilson, 2001), we also tested whether effect sizes vary by study quality and publication status.

Methods

Sample

When searching through electronic databases (PSYCINFO, MEDLINE, Google Scholar, CINAHL, PSYNDEX [an electronic data base of psychological literature from German-speaking countries]), we used the following search terms: (mothers or fathers or parents) AND (illness OR disease OR disability OR chronic condition) and depress*. In addition, we checked the references sections of the identified papers for additional studies.

Given the very large numbers of chronic physical diseases (World Health Organization, 1992), we could not include the complete list of these diseases in our search terms. Therefore, we used the broader search terms *illness* OR *disease* OR *disability* OR *chronic condition*, and decided for each identified condition whether it fulfills the criteria of a chronic disease by Thompson and Gustafson (1996): A chronic disease is associated with functional impairment, persists for >3 months in a year, and/or necessitates a period of continuous hospitalization for >1 month. We had learned from electronic searches for previous meta-analyses that the use of the search terms *chronic disease* and *chronic illness* does not identify larger numbers of relevant studies because this phrase is not used in many studies on cancer, asthma, and other chronic diseases. Therefore, we did not use the phrase *chronic illness* or *chronic disease* in our search.

Criteria for inclusion of studies in the present meta-analysis were:

a. they assessed depressive symptoms or depressive disorders in parents who have a child with a chronic physical disease or sensory disability or physical disability;
b. as we were interested in psychological consequences of caring for a child with a chronic condition, depression had to be assessed *after* the onset of the chronic condition;
c. the studies provided sufficient information for a comparison of levels of parental depression with established normative data or a similar group of families with healthy/nondisabled children from the same county;
d. the mean age of children at being diagnosed was <18 years—the legal age of majority in most countries (http://www.youthpolicy.org/factsheets/); and
e. the studies were published or presented before April, 2018.

The literature search was completed on March 29, 2018.

Unpublished studies (e.g., dissertations and master theses) were identified as part of the systematic search with the electronic data bases PSYCINFO, CINAHL, Google Scholar, and PSYNDEX, as well as cross-referencing, and were included if they met the criteria listed above. We identified 1,634 papers. After screening and assessing for eligibility, we were able to include 460 studies in the meta-analysis. A flow chart of the search for studies is provided in Figure 1, and the studies included are listed in Appendix A1 and A2 (see Supplementary Online Material).

If between-group differences were provided for several subgroups within the same publication (e.g., for different chronic conditions), we entered them separately in our analysis instead of entering the global association. If more than one depression scale was applied in the same sample, the effect sizes were averaged. Data from intervention studies were only used if pretest scores were provided and participants had *not* been selected based on elevated depression scores or elevated psychological symptoms in general.

Information from the IMF (2018) was used for coding countries as developed (countries with advanced economy) or developing (emerging market and developing economies). Study quality was assessed by the sum of four criteria from the Modified Quality Index that has been previously used in pediatric psychology (Ferro & Speechley, 2009): (a) external validity (whether the parents were representative of the entire population from which they were recruited; 1 = yes, 0 = no), (b) internal validity (use of valid and reliable depression measures; 1 = yes, 0 = no), (c) whether parents of children with and without chronic conditions did not differ in third variables or whether the analysis adequately adjusted for confounding effects of third variables (1 = yes, 0 = no), and (d) sufficient statistical power (for detecting the mean effect size from the meta-analysis by Easter et al., 2015; 1 = yes, 0 = no).

Coding

After assessing studies for eligibility, all studies were coded by the author, and a random sample of 120 studies was also coded by a psychologist with experience in meta-analyses. Differences between the two coders were resolved by discussion. We coded the number of parents of individuals with pediatric chronic conditions (intraclass correlation coefficient [ICC] = 1.0), number of persons in the control group (ICC = 0.91), mean parental age at assessment (ICC = 0.96), percentage of mothers (ICC = 0.93), percentage of married parents (ICC = 0.97), mean age of the child

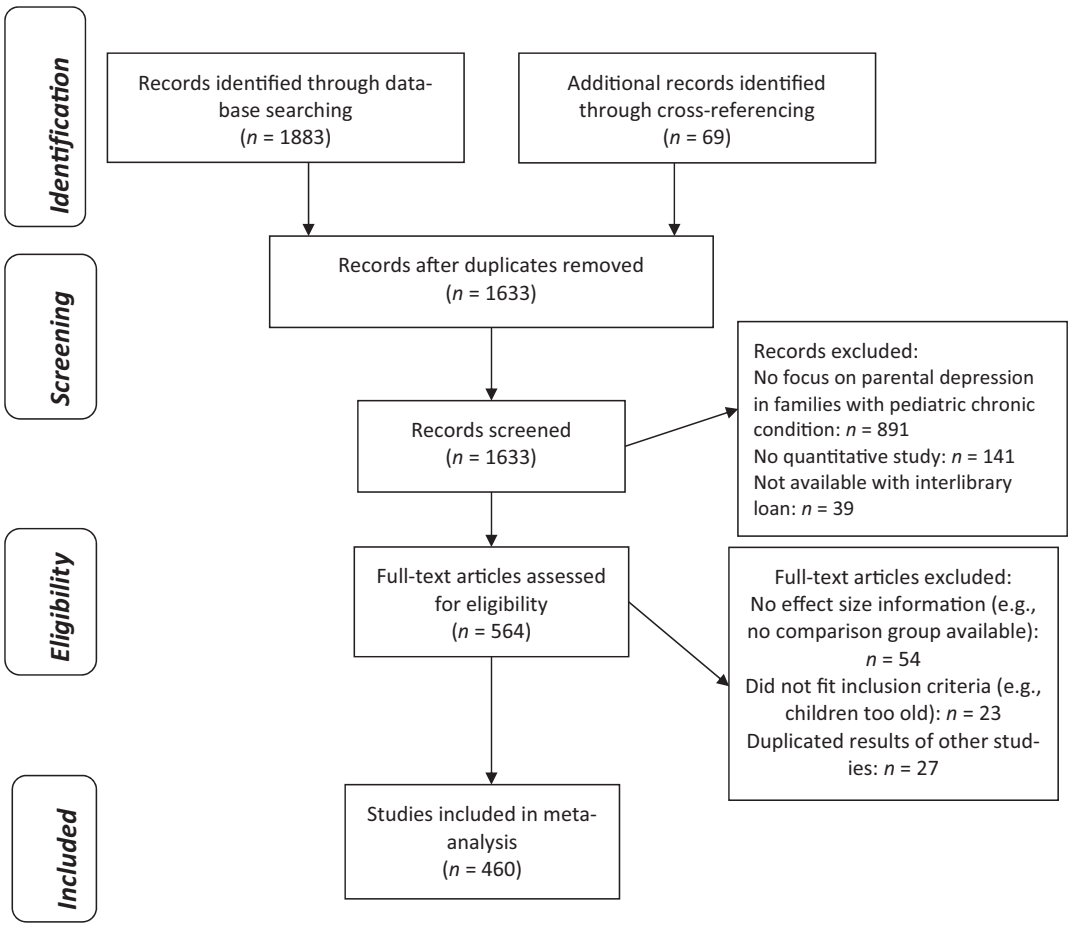

Figure 1. PRISMA flow diagram.

(ICC = 0.98), time since diagnosis (ICC = 0.93), type of chronic condition (inter-rater agreement 100%), whether all young people have a progressive disease (e.g., AIDS, cystic fibrosis, neuromuscular disorders; 2 = yes, 1 = no; ICC = 0.90), representativeness of the sample (1 = yes, 0 = no/not reported; ICC = 0.92), comparison group (1 = parents of healthy/nondisabled children from same recruitment area, 0 = test norms/other reference groups; ICC = 1.0), equivalence of patient and control group (1 = yes, 0 = not tested/no; inter-rater agreement 94%), available support for the validity and reliability of the depression measure (1 = yes, 0 = limited/no; ICC = 0.94), method for assessing depressive symptoms (inter-rater agreement 98%), publication status (2 = published, 1 = unpublished, ICC = 1.0), standardized size of between-group differences in depressive symptoms (ICC = 0.94), and percentage of parents meeting the criteria of a depressive disorder based on structured clinical interviews (ICC = 1.0). The sample sizes were used to determine whether the study had a sufficient test power for identifying moderate effect sizes (1 = yes, 0 = no). A review protocol can be accessed from the author.

Statistical Integration of the Findings

Calculations for the meta-analysis were performed in seven steps with *Comprehensive Meta-Analysis* (Borenstein, Higgins, Hedges, & Rothstein, 2005) using random-effects models and the method of moments.

1. For comparisons of parents of children with and without a chronic condition, we computed effect sizes *d* as the difference in parental depression between the sample with a chronic condition and the control sample divided by the pooled *SD*. If the authors only provided test scores for parents of children with a chronic condition, we used the norms from the test manuals or from national comparative samples (with similar age and gender distributions) for comparison. Outliers that were >2 *SD* from the mean of the effect sizes were recoded to the value at 2 *SD*, based on Lipsey and Wilson (2001).
2. The effect sizes *d* were transformed to Hedges' *g* to correct for bias because of overestimation of the population effect size in small samples.
3. Weighted mean effect sizes and 95% confidence intervals [CIs] were computed. The significance of the mean was tested with *Z*-tests by dividing the weighted mean effect size by the standard error of the mean. To interpret the practical significance of the results, we used Cohen's

criteria (Cohen, 1992): Effect sizes of $g = .20$ are interpreted as small, $g = .50$ as medium, and $g = .8$ as large.
4. Homogeneity of effect sizes was computed by use of the Q statistic.
5. To test the influence of categorical moderator variables, we used an analogue of an analysis of variance. A significant Q score indicates heterogeneity of the effect sizes between the compared conditions. If more than two chronic conditions were compared, differences between individual conditions were interpreted as significant if the 95% CIs of effect sizes do not overlap (Lipsey & Wilson, 2001). For analyzing effects of continuous moderator variables, we used a weighted regression analysis (meta-regression).
6. Egger's test and the trim-and-fill algorithm by Duval and Tweedie (2000) were used to check whether the results may have been influenced by a publication bias.
7. For computing the weighted mean prevalence of clinical depression, prevalence rates from the individual studies were weighted by their sample size.

Results

The 460 studies provided data on 58,290 parents of children with chronic conditions. About 78.4% of the parents were mothers, 81.3% were married, and the parents had a mean age of 37.78 years ($SD = 3.64$). The children had a mean age of 8.88 years ($SD = 3.14$) and 46.7% of them were girls. The children most often had cancer ($N = 10,987$), asthma ($N = 6,763$), cystic fibrosis ($N = 6,132$), epilepsy ($N = 4,411$), diabetes ($N = 4,459$; predominantly type I diabetes), heart disease ($N = 3,772$), and cerebral palsy ($N = 2,526$). Their health condition had been diagnosed, on average, 3.82 years before the assessment of parental depression ($SD = 2.99$). Only 21 studies provided longitudinal data. The included studies have been published between 1959 and 2018, with 51.2% of the studies being published after 2007. Parental depression was assessed with versions of the Beck Depression Inventory (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; 151 studies), the Center for Epidemiological Studies Depression Scale (Radloff, 1977; 72 studies), the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983; 60 studies), versions of the Symptom Checklist by Derogatis (e.g., SCL-90R; Derogatis, 1977; 58 studies), structured clinical interviews (14 studies), and related instruments (105 studies, see Supplementary Appendix 2).

Overall Elevations of Depressive Symptoms and Rates of Clinical Depression

With regard to the first research question, we found, on average, small to moderate elevations of depressive symptoms among families with a child with a chronic condition when compared against parents of healthy children or test norms ($g = .46$ SD units; Table I). This effect size indicated that 5.0% of the interindividual variability of depressive symptoms could be explained by having a child with a chronic condition. The effect size was heterogeneous, thus indicating the need to search for moderator variables.

Twelve studies reported prevalence rates of depressive disorders based on structured clinical interviews (targeting parents of children with asthma, severe burns, cancer, cleft lip and palate, chronic pain, cystic fibrosis, epilepsy, inflammatory bowel disease, and liver disease). These studies provide a weighted mean prevalence rate of depressive disorders of 20.9%. For comparing rates of clinical depression in these parents with prevalence rates in the general population, we weighted the global prevalence rates of mood disorders in men (4.0%) and women (7.3%; Steel et al., 2014) with the percentages of mothers and fathers of children with a chronic health condition who had been assessed for clinical depression. This comparison indicates that the prevalence rate of clinical depression in these parents was 2.98 times higher than the rate in the general population.

Moderator Effects of Study Characteristics

Condition-specific analyses were computed if at least four effect sizes were available for an individual condition. With regard to the second research question, we found that depressive symptoms varied between chronic conditions (Table II). Moderate elevations were found in parents of children with neuromuscular disorders (e.g., Duchenne muscular dystrophy; $g = .75$), cancer ($g = .63$), cerebral palsy ($g = .60$), inherited hematological diseases, such as thalassemia major and sickle cell disease ($g = .60$), chronic pain (e.g., migraine; $g = .51$), and spina bifida ($g = .50$). Small elevations of depressive symptoms were found in in parents of children with asthma ($g = .46$), kidney/liver/renal diseases ($g = .44$), epilepsy ($g = .43$), cystic fibrosis ($g = .43$), metabolic diseases (such as phenylketonuria, $g = .41$), gastroenterological diseases ($g = .40$), cardiovascular diseases ($g = .35$), sensory impairment ($g = .35$), obesity ($g = .33$), skin diseases (e.g., eczema, $g = .32$), and diabetes ($g = .23$). Furthermore, there were very small, yet statistically significant elevations of depressive symptoms if the child had arthritis/rheumatism ($g = .19$). In contrast, no significant elevations of depressive symptoms were found in parents of children with food allergies, cleft lip and palate, or HIV infection/AIDS. The largest effect size indicates that 12.3% of the interindividual variability in depressive symptoms could be explained by having a child with a neuromuscular disorder.

The nonoverlap of the 95% CIs indicates that elevations of parental depressive symptoms were greater in the cases of cancer than in the cases of arthritis, cleft lip and palate, diabetes, and cardiovascular diseases.

Table I. *Influence of Categorical Moderator Variables on Between-Group Differences in Depressive Symptoms*

Group	*K*	*g*	95% CI		*Z*	*Q*
Total group	724	.46	(.42)	(.49)	25.11***	789.90*
Chronic condition						65.80***
Arthritis/rheumatism	34	.19	(.02)	(.36)	2.23*	22.38
Asthma	48	.46	(.33)	(.59)	6.83***	56.33
Cancer	171	.63	(.55)	(.70)	16.30***	223.58**
Chronic pain (e.g., migraine)	9	.51	(.20)	(.82)	3.26**	5.43
Cerebral palsy	41	.60	(.45)	(.75)	7.87***	37.68
Cleft lip and/or palate	10	.10	(−.20)	(.40)	.67	18.10*
Cystic fibrosis	38	.43	(.27)	(.58)	5.21***	14.44
Diabetes[a]	68	.23	(.12)	(.35)	3.87***	46.83
Epilepsy	38	.43	(.29)	(.58)	5.74***	34.79
Food allergies	5	.28	(−.15)	(.71)	1.26	1.86
Cardiovascular diseases	37	.35	(.19)	(.51)	4.30***	52.50*
HIV infection/AIDS	7	.17	(−.19)	(.53)	.92	7.48
Gastroenterological diseases	9	.40	(.07)	(.72)	2.42*	8.25
Kidney/liver/renal disease	14	.44	(.18)	(.71)	3.27**	20.32
Inherited hematological diseases (e.g., sickle cell disease and thalassemia major)	23	.60	(.40)	(.80)	5.93***	29.52
Metabolic diseases	7	.41	(.04)	(.78)	2.15*	5.24
Neuromuscular disorders	6	.75	(.34)	(1.16)	3.60***	4.41
Obesity	11	.33	(.05)	(.61)	2.34*	4.53
Sensory impairment	15	.35	(.10)	(.59)	2.76**	6.25
Skin diseases (e.g., eczema)	25	.32	(.09)	(.55)	2.77**	14.13
Spina bifida	9	.50	(.19)	(.81)	3.15**	10.88
Other/mixed diseases	103	.51	(.42)	(.61)	10.44***	92.33
Country					81.52***	
Economically developed countries (e.g., the United States)	558	.37	(.33)	(.41)	17.77***	442.86
Less economically developed countries	166	.76	(.68)	(.83)	20.14***	276.53***
Study quality						4.21
Low (0–1)	87	.52	(.41)	(.63)	9.07***	67.98
Moderate (2)	317	.41	(.35)	(.47)	13.63***	281.25
High (3–4)	319	.48	(.43)	(.54)	17.72***	373.07*
Publication status						.37
Published	676	.46	(.42)	(.49)	23.02***	674.44
Unpublished	48	.50	(.36)	(.65)	6.81***	48.67

Notes. k = number of effect sizes, g = weighted effect size (positive scores indicate higher depression scores in parents of children with a chronic condition); Z = test for significance. 95% *CI* = lower and upper limits of 95% confidence interval; Q = test for homogeneity of effect sizes.

[a]About 77% of these studies included only patients with type 1 diabetes.

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

Table II. *Influences of Continuous Moderator Variables on Between-Group Differences in Depressive Symptoms*

Predictor	*k*	*β*	*B*	95% CI		*Z*
Illness duration[a]	444	−.14	−.024	(−.040)	(−.008)	−2.93**
Child age at assessment	614	−.06	−.001	(−.019)	(.003)	−1.38
Parental gender (% mothers)	685	.12	.002	(.001)	(.003)	3.04**
% married	341	.09	.003	(−.001)	(.007)	1.61

Notes. *β*/*B* = standardized/unstandardized regression coefficient, 95% CI = 95% confidence interval of *B*.

[a]Studies on progressive conditions (HIV infection/AIDS, cystic fibrosis, muscular dystrophy, sickle cell disease) were excluded from the analysis.

**$p < .01$.

Effect sizes were heterogeneous in 3 of 21 chronic conditions (cancer, cleft lip and palate, and cardiovascular diseases). Additional analyses showed that heterogeneity of effect sizes in parents of children with cancer, cardiovascular diseases, and cleft lip and palate could be explained by differences in duration of the chronic condition: comparisons of parents of children with duration of the chronic condition above versus below the median indicate significantly stronger elevations of depressive symptoms in the case of shorter duration, cancer: $g = .58$ versus $g = .36$, $Q(1) = 4.40$, $p < .05$; cleft lip: $g = .42$ versus $g = -.41$, $Q(1) = 4.41$,

$p < .05$. There was a similar trend among the parents of children with cardiovascular diseases, $g = .44$ versus $g = .22$, $Q(1) = 2.88$, $p < .10$, although the difference was only marginally significant. Because longer duration of cancer is often associated with the successful completion of therapy, we also compared levels of depression in parents of completers and parents of children who were still in active treatment. Depression levels varied between both groups, $Q(1) = 5.05$, $p < .02$, with parents of completers reporting lower levels of depressive symptoms ($g = .41$, based on 36 samples) than parents of children who were in active treatment ($g = .66$, based on 76 samples). All effect sizes in the subgroups with shorter versus longer duration of the condition and active treatment versus completion were homogeneous.

When testing the moderator effect of the duration of the chronic condition, we excluded studies on progressive conditions, such as HIV infection/AIDS, cystic fibrosis, and muscular dystrophy. In the remaining studies, we found that a longer duration of the condition was associated with smaller elevations of parental depressive symptoms (Table II). We did not have enough studies on moderator effect of the duration of progressive conditions, as the duration was often not reported in these studies.

Between-group differences in parental depressive symptoms did not vary by the child's age. However, there were greater between-group differences if the sample included larger percentages of mothers. In contrast, between-group differences did not vary by marital status (Table II).

The meta-analysis also identified a moderator effect of county of residence (Table I). Between-group differences in depressive symptoms were greater if the families lived in an economically less developed country ($g = .76$) rather than in a developed country, such as the United States or in Western Europe ($g = .37$). In contrast to studies from developed countries, effect sizes varied across studies in the less developed countries.

The sum measure of study quality did not moderate the size of the observed between-group differences. Follow-up analyses (not shown) also did not find moderator effects of the individual criteria of study quality. Effects sizes of published and unpublished studies did also not differ significantly. Egger's test did not indicate funnel plot asymmetry, $t(723) = .28$, and the trim-and-fill analysis did not find evidence for a possible overestimation of the effect size because of publication bias.

Discussion

The present study reports the results of the first meta-analysis on depressive symptoms among parents of children with a broad range of chronic health conditions. Depressive symptoms were elevated by 0.46 *SD* units when compared with parents of healthy/nondisabled children and test norms. Twelve studies with structured clinical interviews provided a weighted mean depression rate of 20.9%—a rate that was 2.98 times higher than the rate in the general population (Steel et al., 2014). The largest elevations of depressive symptoms were observed in parents of children with neuromuscular disorders and cancer. In addition, we found greater elevations of parental depression if the child's condition has lasted for a shorter period at the time of the assessment, in mothers compared with fathers, and in parents from less economically developed countries rather than developed countries. The present results assist with identifying parents with the greatest need for depressive symptoms screenings.

When comparing the results of the present meta-analysis with the results of a previous meta-analysis on depressive symptoms in children and adolescents with chronic conditions (Pinquart, M. & Shen, Y. 2011), we find greater elevations of symptoms in the parents than in the children. This difference may indicate that parents are more depressed because they are more aware of the negative consequences of the health condition of the child than the child is (Aldridge, Shimmon, Miller, Fraser, & Wright, 2017), that parents experience more stressors than their children (because of high involvement in illness management; Naar-King et al., 2009), or that children tend to underreport their depressive symptoms or show repressive coping and avoid thoughts about threatening or distressing aspects of their health condition (Phipps & Srivastava, 1997).

Condition-specific elevations of depressive symptoms were similar to those reported by Easter et al. (2015) and Vermaes et al. (2005), although Pai et al. (2007) reported lower elevations of psychological distress in parents of children with cancer compared with the present meta-analysis. This difference may have been based on the use of different outcome measures (psychological distress in general vs. depressive symptoms in particular) or on the fact that Pai et al. (2007) included only studies from western, developed countries where elevations of depressive symptoms were lower than in the other countries.

We only found partial support for the suggestion that parental depressive symptoms would be highest if their child has a life-threatening or life-limiting condition, such as cystic fibrosis, HIV infection/AIDS, or progressive neuromuscular disorders. While parents of children with neuromuscular disorders and cancer showed moderate elevations of depressive symptoms, between-group differences were small in the case of cystic fibrosis, and even statistically nonsignificant in the case of HIV infection/AIDS. As most HIV-infected

children had not yet developed AIDS, some sources of depressed mood (such as expecting to lose the child in the near future) were probably not yet present. Although cystic fibrosis is a life-limiting condition, survival rates have increased. While in 1985, patients were expected to live, on average, to the age of 25 years, the expected mean survival was 47.7 years for children born in 2016 (Cystic Fibrosis Foundation, 2017). Increased length of survival reduced one source of depressive symptoms in parents of children and adolescents with cystic fibrosis (Lowes & Lyne, 2000).

The present results indicate that the fact whether a disease is life-threatening or life-limiting may be less relevant for predicting parental depressive symptoms than other characteristics, such as expected length of survival, seeing the child suffering, or high caregiving demands (Lawoko & Soares, 2006). In addition, parental perceptions of life-threat often differ from the actual life-threat (with many parents being overly optimistic), and parental subjective perceptions of life-threat may be more relevant for parental mental health than the related objective life-threat (Mack, Cook, Wolfe, Grier, Cleary, & Weeks, 2007).

The highest between-group differences in depressive symptoms were found in parents of children with neuromuscular disorders, such as Duchenne muscular atrophy—a lethal disease that is characterized by progressive muscle degeneration and weakness, with death often occurring before the age of 20 years (Bothwell, Dooley, Gordon, MacAuley, Camfield, & MacSween, 2002). Depressive feelings in these parents may result from lack of control over the course of disease, chronic stress because of caregiving demands, perceptions of social isolation, and the near death of their child (Bothwell et al., 2002). The data on families with children with cleft lip and palate showed that some chronic conditions of children do not, on average, lead to elevated parental depressive symptoms. Treatment of cleft lip and palate is usually completed in early childhood, and the condition does no longer affect the daily life of most parents in the long run (Feragen et al., 2017).

The moderation effect of the duration of chronic conditions suggests that, in the case of nonprogressive diseases, caregiving demands decline over time and parents increasingly adapt to the chronic condition of their child which leads to lower levels of depressive symptoms. Lower between-group differences in depressive symptoms in the case of longer durations of the chronic condition may also be because of the fact that some chronic conditions tend to become less severe over time (e.g., asthma; Ko, Song, & Clark, 2014), or that young patients increasingly take responsibility for their own disease management (Naar-King et al., 2009). If the latter plays an important role for parental depression, we should also find lower between-group differences among parents with older children. However, this was not the case in the present meta-analysis.

The greater elevations of depressive symptoms observed in samples with higher percentages of women could be based on the higher involvement of mothers in the care of their ill children, mothers' stronger emotional responses to the disease of their children (Hyde et al., 2008), or gender differences in coping with stressors, such as using a ruminative coping style (Hyde et al., 2008). We did not find a moderator effect of parental marital status; this may have been based on the fact that fewer studies were available for testing a moderator effect as compared with the other moderator analyses, or on the restricted variance of this moderator variable, as no separate data were available for unmarried parents. The observed higher elevations of parental depression in less economically developed countries can be explained by the lower access to high-quality health care for the ill children (Telfer, 2009), as well as lower availability of high-quality support services for parents of children with chronic diseases (Witbooi, 2013). Finally, the lack of moderator effects of the aspects of the study quality and publication status indicates that our results were robust with regard to these criteria.

Limitations

Some limitations specific to the present study have to be mentioned. First, only a few studies were available for some chronic conditions, such as allergies and HIV infection/AIDS, and we were also not able to compute effect sizes for some chronic conditions, such as chronic fatigue syndrome. Second, as only 2.6% of the included studies provided rates of clinical depression, the pooled rates are less robust than the pooled estimates of elevated depressive symptoms. Third, fathers were underrepresented in most included studies. Fourth, as most data reflect a concurrent relationship between the child's chronic condition and parental depression, our data do not allow for testing causal relationships. Although there are good arguments for the suggestion that a child's chronic condition leads to greater parental depressive symptoms, parental depression can also have an effect on the course of a child's condition, for example when depression interferes with effective disease management (Eckshtain et al., 2010; Otsuki et al., 2010). When compared with matched controls, Enns et al. (2016) found elevated rates of parental depressive disorders in the 2 years before their child was burned, which may indicate that depressed parents did less to prevent the burn injury. Fifth, we could not test for moderator effects of severity and prognosis of the chronic condition, or

parental psychological vulnerability (e.g., as indicated by psychological symptoms before the onset of the chronic condition of the child), because studies usually did not provide separate results for groups with different levels of these variables. Finally, we only assessed one domain of psychological symptoms. Anxiety and other symptoms have to be addressed in future meta-analyses.

Conclusions

Despite these limitations, several conclusions can be drawn from the present meta-analysis. From the research perspective, more studies are needed on parental depression pertaining to chronic pediatric conditions that were seldom addressed in the present meta-analysis, such as chronic fatigue syndrome. As concurrent associations do not inform us about the causal direction of associations, we recommend more longitudinal research on predictors of change in depressive symptoms of parents with children with chronic conditions. More research is also recommended on the prevalence of clinical depression and on the processes that cause elevated levels of depressive symptoms and clinical depression in parents of children with a chronic condition, such as related losses, emotional or physical exhaustion, or feelings of guilt. As only a minority of the parents develops clinical depression, we also recommend more research on factors that protect the parents from becoming depressed.

With regard to the policy perspective, our data indicate that efforts are particularly needed for families from less economically developed countries, such as improving medical care of the child and supporting their parents. With regard to conclusions for clinicians, the highest observed rates of parental depressive symptoms within families with a child with neuromuscular disorders, cancer, cerebral palsy, and inherited hematological diseases indicate that these parents should be, in particular, screened for depressive symptoms and receive psychosocial services aimed at reducing these symptoms, if needed. As available theoretical explanations for parental depressive symptoms refer to loss of control (Carpentier et al., 2006), exhaustion by care demands (Lawoko & Soares, 2006), and feelings of guilt (Lazarus et al., 2009), interventions should increase parental control (e.g., through an active role in treatment decision-making), reduce overtaxing caregiving demands (e.g., by use of informal or formal support), and lower feelings of guilt (e.g., by realistically evaluating the possible parental contribution to the child's condition). A meta-analysis by Eccleston, Fisher, Law, Bartlett, and Palermo (2015) found support for positive effects of problem-solving therapy on the mental health of parents of children with chronic physical conditions. In this kind of intervention, specific problem-solving skills are taught in sequential steps such as defining the problem, generating alternative solutions, making decisions, and verifying/implementing solutions. Although average effect sizes on mental health were small, we must be aware that many participating parents probably did not fulfill the criteria of psychological disorders at the start of the intervention, thus leaving less room for improvement. Nonetheless, more intervention research is needed on clinically depressed parents of children with chronic conditions.

Supplementary Data

Supplementary data can be found at: https://academic.oup.com/jpepsy.

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References

Abramson, L. Y., Metalsky, G. I., & Alloy, L. B. (1989). Hopelessness depression: A theory-based subtype of depression. *Psychological Review*, *96*, 358–372.

Aldridge, J., Shimmon, K., Miller, M., Fraser, L. K., & Wright, B. (2017). 'I can't tell my child they are dying.' Helping parents have conversations with their child. *Archives of Diseases in Childhood*, *102*, 182–187.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives for General Psychiatry*, *4*, 561–571.

Bothwell, J. E., Dooley, J. M., Gordon, K. E., MacAuley, A., Camfield, P., & MacSween, J. (2002). Duchenne muscular dystrophy—Parental perceptions. *Clinical Pediatrics*, *41*, 105–109.

Borenstein, M., Higgins, L., Hedges, J., & Rothstein, H. (2005). *Comprehensive meta-analysis, Version 2*. Englewood, NJ: Biostat.

Carpentier, M. Y., Mullins, L. L., Chaney, J. M., & Wagner, J. L. (2006). The relationship of illness uncertainty and attributional style to long-term psychological distress in parents of children with type 1 diabetes mellitus. *Children's Health Care*, *35*, 141–154.

Celano, M., Bakeman, R., Gaytan, O., Smith, C. O., Koci, A., & Henderson, S. S. (2008). Caregiver depressive symptoms and observed family interaction in low-income children with persistent asthma. *Family Process*, *47*, 7–20.

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155–159.

Cystic Fibrosis Foundation (2017). Patients registry annual data report 2016. Retrieved from https://www.cff.org/Research/Researcher-Resources/Patient-Registry/2016-Patient-Registry-Annual-Data-Report.pdf. Retrieved August 15, 2018.

Derogatis, L. R. (1977). *SCL-90R revised version manual*. Baltimore, MA: Author.

Duval, S., & Tweedie, R. (2000). Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*, *56*, 455-463.

Easter, G., Sharpe, L., & Hunt, C. J. (2015). Systematic review and meta-analysis of anxious and depressive symptoms in caregivers of children with asthma. *Journal of Pediatric Psychology*, *40*, 623–632.

Eccleston, C., Fisher, E., Law, E., Bartlett, J., & Palermo, T. M. (2015). Psychological interventions for parents of children and adolescents with chronic illness. *Cochrane Database of Systematic Reviews*, *8*, CD009660. doi: 10.1002/14651858.CD009660.pub

Eckshtain, D., Ellis, D. A., Kolmodin, K., & Naar-King, S. (2010). The effects of parental depression and parenting practices on depressive symptoms and metabolic control in urban youth with insulin dependent diabetes. *Journal of Pediatric Psychology*, *35*, 426–435.

Enns, J., Gawaziuk, J. P., Khan, S., Chateau, D., Bolton, J. M., Sareen, J. ... Logsetty, S. (2016). Mental and physical health outcomes in parents of children with burn injuries as compared with matched controls. *Journal of Burn Care Research*, *37*, e18–e26.

Feragen, K. B., Rumsey, N., Heliövaara, A., Boysen, B. M., Johannessen, E. C., Havstam, C. ... Semb, G. (2017). Parental report of social and emotional experiences related to their 5 year old's cleft diagnosis. *Journal of Plastic Surgery and Hand Surgery*, *51*, 73–80.

Ferro, M. A., & Speechley, K. N. (2009). Depressive symptoms among mothers of children with epilepsy: A review of prevalence, associated factors, and impact on children. *Epilepsia*, *50*, 2344–2354. doi: 10.1111/j.1528-1167.2009.02276.x

Fraser, L. K., Miller, M., Hain, R., Norman, P., Aldridge, J., McKinney, P. A., & Parslow, R. C. (2012). Rising national prevalence of life-limiting conditions in children in England. *Pediatrics*, *129*, e923–e929.

Frishman, N., Conway, K. C., Andrews, J., Oleson, J., Mathews, K., Ciafaloni, E. ... Romitti, P. (2017). Perceived quality of life among caregivers of children with a childhood-onset dystrophinopathy: A double ABCX model of caregiver stressors and perceived resources. *Health and Quality of Life Outcomes*, *15*, 33.

Higgins, P. P., & Green, S. (2009). Cochrane Handbook for Systematic Reviews of Interventions, Version 5.02. Retrieved from http://handbook.cochrane.org/v5.0.2/. Retrieved May 23, 2017.

Hyde, J.S., Mezulis, A. H., & Abramson, L. Y. (2008). The ABCs of depression: Integrating affective, biological, and cognitive models to explain the emergence of the gender difference in depression. *Psychological Review*, *115*, 291–313.

International Monetary Fund (2018). World Economic Outlook, April 2018. Retrieved from http://www.imf.org/external/pubs/ft/weo/2009/02/weodata/groups.htm. Retrieved April 4, 2018.

Ko, Y. A., Song, P. X., & Clark, N. M. (2014). Declines with age in childhood asthma symptoms and health care use. An adjustment for evaluations. *Annals of the American Thoracic Society*, *11*, 54–62.

Lazarus, R., Struthers, H., & Violari, A. (2009). Hopes, fears, knowledge and misunderstandings: Responses of HIV-positive mothers to early knowledge of the status of their baby. *AIDS Care*, *21*, 329–334.

Lawn, S., & Schoo, A. (2010). Supporting self-management of chronic health conditions: Common approaches. *Patient Education and Counseling*, *80*, 205–211.

Lawoko, S., & Soares, J. J. F. (2006). Psychosocial morbidity among parents of children with congenital heart disease: A prospective longitudinal study. *Heart and Lung*, *35*, 301-314.

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Thousand Oaks, CA: Sage.

Lowes, L., & Lyne, P. (2000). Chronic sorrow in parents of children with newly diagnosed diabetes: A review of the literature and discussion of the implications for nursing practice. *Journal of Advanced Nursing*, *32*, 41–48.

Mack, J. W., Cook, E. F., Wolfe, J., Grier, H. E., Cleary, P. D., & Weeks, J. C. (2007). Understanding of prognosis among parents of children with cancer: Parental optimism and the parent-physician interaction. *Journal of Clinical Oncology*, *25*, 1357–1362.

Mullins, L. L., Wolfe-Christensen, C., Chaney, J. M., Elkin, T. D., Wiener, L., Hullmann, S. E. ... Junghans, A. (2011). The relationship between single-parent status and parenting capacities in mothers of youth with chronic health conditions: The mediating role of income. *Journal of Pediatric Psychology*, *36*, 249–257.

Murray, L., Hentges, F., Hill, J., Karpf, J., Mistry, B., Kreutz, M. ... Goodacre, T.; Cleft Lip and Palate Study Team. (2008). The effect of cleft lip and palate, and the timing of lip repair on mother–infant interactions and infant development. *Journal of Child Psychology and Psychiatry*, *49*, 115–123.

Naar-King, S., Montepiedra, G., Nichols, S., Farley, J., Garvie, P. A., Kammerer, B. ... Storm, D. (2009). Allocation of family responsibility for illness management in pediatric HIV. *Journal of Pediatric Psychology*, *34*, 187–194.

Olshansky, S. (1962). Chronic sorrow: A response to having a mentally defective child. *Social Casework*, *43*, 190–193.

Otsuki, M., Eakin, M. N., Arceneaux, L. L., Rand, C. S., Butz, A. M., & Riekert, K. A. (2010). Prospective relationship between maternal depressive symptoms and asthma morbidity among inner-city African American children. *Journal of Pediatric Psychology*, *35*, 758–767.

Pai, A. L. H., Greenley, R. N., Lewandowski, A., Drotar, D., Youngstrom, E., & Peterson, C. C. (2007). A meta-analytic review of the influence of pediatric cancer on parent and family functioning. *Journal of Family Psychology*, *21*, 407–415.

Phipps, S., & Srivastava, D. K. (1997). Repressive adaptation in children with cancer. *Health Psychology*, *16*, 521–528.

Pinquart, M. (2018). Parenting stress in caregivers of children with chronic physical condition – A meta-analysis. *Stress and Health*, *34*, 194–207.

Pinquart, M., & Shen, Y. (2011). Depressive symptoms in children and adolescents with chronic physical illness: An updated meta-analysis. *Journal of Pediatric Psychology*, *36*, 375–384.

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, *1*, 385–401.

Rando, T. (2000). *Clinical dimensions of anticipatory mourning: Theory and practice in working with the dying, their loved ones and their caregivers*. Champaign, IL: Research Press.

Steel, Z., Marnane, C., Iranpour, C., Chey, T., Jackson, J. W., Patel, V., & Silove, D. (2014). The global prevalence of common mental disorders: A systematic review and meta-analysis 1980–2013. *International Journal of Epidemiology*, *43*, 476–493.

Telfer, P. (2009). Update on survival in thalassemia major. *Hemoglobin*, *33*, S76–S80.

Thompson, R. J., & Gustafson, K. E. (1996). *Adaptation to chronic childhood illness*. Washington, DC: American Psychological Association.

Vermaes, I. P. R., Janssens, J. M. A. M., Bosman, A. M. T., & Gerris, J. R. M. (2005). Parents' psychological adjustment in families of children with spina bifida: A meta-analysis. *BMC Pediatrics*, *5*, 32.

Witbooi, L. G. (2013). *The role of psychosocial counselling in the lives of parents of children with neurodevelopmental disabilities treated at Tygerberg Academic Hospital*. Unpublished master thesis, University of Stellenbosch.

Woolf-King, S. E., Anger, A., Arnold, E. A., Weiss, S. J., & Teitel, D. (2017). Mental health among parents of children with critical congenital heart defects: A systematic review. *Journal of the American Heart Association*, *6*, e004862.

World Health Organization (1992). *International statistical classification of diseases and related health problems, 10th revision (ICD-10)*. Geneva: World Health Organization.

World Health Organization (2018). Global health expenditure data base. Retrieved from http://apps.who.int/nha/database/Select/Indicators/en. Retrieved April 4, 2018.

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, *67*, 361–370.