



Risk factors for loneliness in patients with cancer: A systematic literature review and meta-analysis



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A B S T R A C T

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Objective: To systematically review the literature on the severity and risk factors for loneliness in adult cancer patients.

Methods: We systematically reviewed quantitative studies addressing loneliness in cancer patients. Exclusion criteria were absence of a validated loneliness questionnaire, and studies that focused on loneliness determined by specific circumstances, and not cancer in general (e.g. appearance concerns, cultural and language barriers, requiring palliative care). We searched PsycINFO, CINAHL, Embase, Cochrane Library, and Pubmed in compliance with the predefined in- and exclusion criteria. The search, quality appraisal, and data extraction were performed by two independent reviewers. Weighted mean scores were calculated by using random effects adjusted inverse variance weighting.

Results: We included 15 studies. In 13 studies the UCLA loneliness scale was used (range 20–80; higher scores indicate higher loneliness). The weighted mean loneliness score was 38.26 (95% CI: 35.51–41.00), which corresponds to moderate loneliness. Time since diagnosis was positively associated with degree of loneliness. Other cancer-related factors, such as cancer site, treatment type, or stage of disease were not associated with loneliness. The non-cancer related determinants of loneliness in cancer patients that emerged from our review were being unmarried (people who have never been married, are widowed or divorced), and lack of psychological or social support.

Conclusion: Our findings suggest that the level of loneliness rises with increasing time after cancer diagnosis. Furthermore, social functioning emerged as a consistent theme, for which it was shown that lack of social support was associated with increasing levels of loneliness.

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Introduction

With advances in early detection and cancer treatments, numbers of cancer survivors are rising (Maddams et al., 2009). Whereas cancer used to be a fatal disease, it is now developing towards a chronic or even curable disease (Hewitt et al., 2006; Pavlic et al., 2009). The growing group of cancer survivors mandates attention to quality of life and psychosocial consequences of cancer and its treatment (Stanton, 2012). Traditionally, the consequence of cancer and cancer treatment that is evaluated most often is survival. The consequences on quality of life, however, are less

clear. An important aspect of quality of life is loneliness. Loneliness is defined as “an unpleasant experience that occurs when a person's network of relationships is felt to be deficient in some important way” (Peplau and Perlman, 1982). Central to loneliness is that it is a subjective and negative experience (De Jong Gierveld et al., 2006).

It has been shown that loneliness, social isolation, and social support reflect related but distinct concepts (Tomaka et al., 2006). Whereas loneliness is a subjective and negative experience, social isolation is an objective situation and refers to the absence of relationships with other people (Dykstra, 2009). Hence, socially isolated persons are not necessarily lonely, and lonely persons are not necessarily socially isolated (De Jong Gierveld et al., 2006). Similarly, persons with adequate social support might still be lonely and vice versa. Whereas loneliness refers to the subjective experience of deficits in social relations, social support refers to the availability of interpersonal resources (Perlman and Peplau, 1984). Furthermore, social support includes several types of support ranging from

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emotional, to informational and instrumental support (Tomaka et al., 2006).

The consequences of loneliness are not to be taken lightly. As aptly put by Masi et al., “loneliness influences virtually every aspect of life” (Masi et al., 2011). Loneliness is a risk factor for numerous health disorders, ranging from elevated blood pressure and poorer sleep quality (Cacioppo et al., 2002) to diminished immunity (Pressman et al., 2005), abnormal ratios of circulating white blood cells (Cole, 2008), anxiety (Russell et al., 1980), and depression (Cacioppo et al., 2006). Furthermore, Penninx et al. found that during a 29-month follow-up and after controlling for age, gender, chronic diseases, alcohol use, smoking, self-rated health, and functional limitations, loneliness predicted all-cause mortality (Penninx et al., 1997). This finding was also supported by two studies that are more recent (Luo et al., 2012; Newall et al., 2012). The other way around is also true; health disorders are also risk factors for the onset of and continuation of loneliness (Penninx et al., 1999; Savikko et al., 2005).

From this point of view, it has been shown that loneliness is an important concern for patients with cancer (Wells and Kelly, 2008). Qualitative studies have shown that especially the period after the initial treatment is characterized by feelings of loneliness (Ekwall et al., 2007; Rosedale, 2009). Furthermore, two studies in cancer patients that aimed to refine the Distress Thermometer problem list included loneliness as an additional item because patients identified it as an important source of distress (Brennan et al., 2011; Tuinman et al., 2008).

Previous studies have shown that life stressors significantly predict loneliness (Cacioppo et al., 2010; Hensley et al., 2011). Hence, patients with cancer might be particularly vulnerable to becoming lonely.

Because loneliness is a negative experience, and it is associated with a large spectrum of negative consequences, it is important to gain insight in the occurrence of loneliness in patients with cancer. As a first step, we decided to systematically review the existing literature. To our knowledge, a systematic literature review on the severity and risk factors for loneliness in patients with cancer has not yet been published. The aim of this review is to gain insight in the severity and factors associated with loneliness in patients with cancer.

Methods

Information sources and search strategy

Pubmed, Embase, PsycINFO, Cochrane Library and CINAHL databases were searched for articles published before 24 September 2013. The search was based on combinations of database-specific subject headings. For Pubmed, Cochrane Library and CINAHL, these were ‘social isolation’ in combination with ‘neoplasms’. The term social isolation was used because social isolation and loneliness have often been used interchangeably (Dickens et al., 2011) and in MeSH terms loneliness is a subheading of social isolation. For Embase and PsycINFO we used ‘social isolation’ in combination with ‘neoplasms’, and ‘loneliness’ in combination with ‘neoplasms’ as separate search strategies because in these two databases loneliness was not a subheading of social isolation. Reference lists of included studies were hand searched and experts in the field were contacted to identify additional studies.

Eligibility criteria and study selection

The review included all original quantitative studies that considered loneliness reported by adult cancer patients (≥ 18 years), with or without a non-cancer control group. Studies were

only included if loneliness was measured with a validated scale. Studies using a single-item question, or directly enquiring about one's perceived level of loneliness, were excluded since the answers are likely to be biased as loneliness may be seen as a stigmatizing concept and provoke socially desirable answers (Victor et al., 2005). Studies in which loneliness might have been determined by specific circumstances and not cancer in general were excluded. These included studies that especially focused on loneliness related to appearance concerns (e.g. facial disfigurement, malodorous fungating wounds), cultural and language barriers (e.g. being an immigrant), and requiring palliative care. We excluded these studies because we believe that these circumstances might influence the severity of loneliness, and therefore, loneliness scores in these subgroups might not be representative of loneliness in cancer patients in general. Furthermore, we excluded studies that measured loneliness before cancer diagnosis as the causal pathway between loneliness and the development of cancer was beyond the scope of this review.

Appraisal

All abstracts were screened by two independent reviewers who were blind to each other's decisions. Citations were categorized into three groups: relevant, not relevant, and undetermined. Based on full texts of all relevant and undetermined citations, the quality of the remaining records was independently appraised by the same reviewers; this included compliance with the in- and exclusion criteria, and whether the quality of the text was comprehensible and coherent. In cases of disagreement, open discussion took place between the two reviewers and a decision was reached by consensus. Reasons for exclusion were recorded.

Data collection and analysis

Data from the articles included in the review were extracted into a standardized template by the two reviewers separately. Extracted data considered four domains; 1) study design and patient characteristics, 2) the scale used to assess loneliness, 3) the severity of loneliness and 4) risk factors for loneliness.

Patient characteristics included number of participants, mean age, age range, types of cancer, and time since diagnosis. Extracted data on the loneliness scale included the name and version of the scale that was used, number of items, scale on which the items were answered, range of the total score, direction of the scores, and Cronbach's alpha. For the severity of loneliness, mean scores with their standard deviations, and distribution were extracted. For randomized controlled trials, the baseline loneliness scores were extracted, as the intent of our review was observational. For observational longitudinal studies, all available loneliness scores were extracted. Risk factors for loneliness included subgroup mean loneliness scores, standard deviations, regression coefficients between loneliness and possible risk factors, statistical tests and corresponding *P* values. As possible risk factors, we considered cancer-related factors (time since cancer diagnosis, cancer type, treatment, and stage), demographic characteristics as described by Perlman and Peplau (age, marital status, gender, socioeconomic status) (Perlman and Peplau, 1984), and risk factors as described by de Jong Gierveld et al. (gender, marital and partner status, kin and nonkin relationships, size and composition of the network, relationships standards, personality characteristics, objective and subjective health) (De Jong Gierveld et al., 2006). For marital status we considered married versus unmarried persons. Some studies did not differentiate between persons who have never been married, who are widowed, or are divorced. Therefore, we defined the group of unmarried persons as persons who have never been

married, are currently widowed, or are divorced. Where data were unclear or missing, authors were contacted to provide more information. Areas of discrepancy were resolved in group discussions.

The heterogeneity of the study outcomes was tested using the Q statistic, which describes the percentage of variation across studies that is due to heterogeneity.

Because heterogeneity was high, we used random-effects rather than fixed-effect meta-analysis. Weighted mean scores were calculated for studies that used the same loneliness questionnaire (Avci and Kumcagiz, 2011; Coleman et al., 2005; Fogel et al., 2002; Friedman et al., 1989; Jaremka et al., 2013; Mosher et al., 2012; Pehlivan et al., 2011; Perry, 1990; Sahin and Tan, 2012; Samarel et al., 2002; Sevil et al., 2006; Yildirim and Kocabiyik, 2010). The study of Fukui et al. was not included in the meta-analyses as for this study a measure of precision was not available (Fukui et al., 2003).

We used inverse variance weighting as described by Lipsey and Wilson, using adjusted inverse variance weights that incorporate the random effects variance component (Lipsey and Wilson, 2001). Differences between weighted mean scores were statistically significant if there was no overlap in the 95% confidence intervals (95%

CI) around the mean scores. In one study that used the UCLA loneliness scale, a modified version of ten items instead of 20 items was used (personal communication) (Fogel et al., 2002). As such, the loneliness scores ranged between 10 and 40 instead of between 20 and 80. When included in the meta-analysis, results of this study were transformed to a scale from 20 to 80.

In order to test the robustness of the results three sensitivity analyses were performed. First, weighted means were recalculated excluding the study of Avci and Kumcagiz (2011) and Sahin and Tan (2012), as the mean loneliness score of this study was higher than that of all other studies. Furthermore, we separately calculated weighted mean loneliness scores for studies performed in the US, studies performed in Turkey, studies using the revised UCLA loneliness scale, and studies using the UCLA loneliness scale version 3.

Results

Results of the search

The final search identified 968 unique hits. Only 15 studies met the inclusion criteria for the review (see Fig. 1 and Table 1).

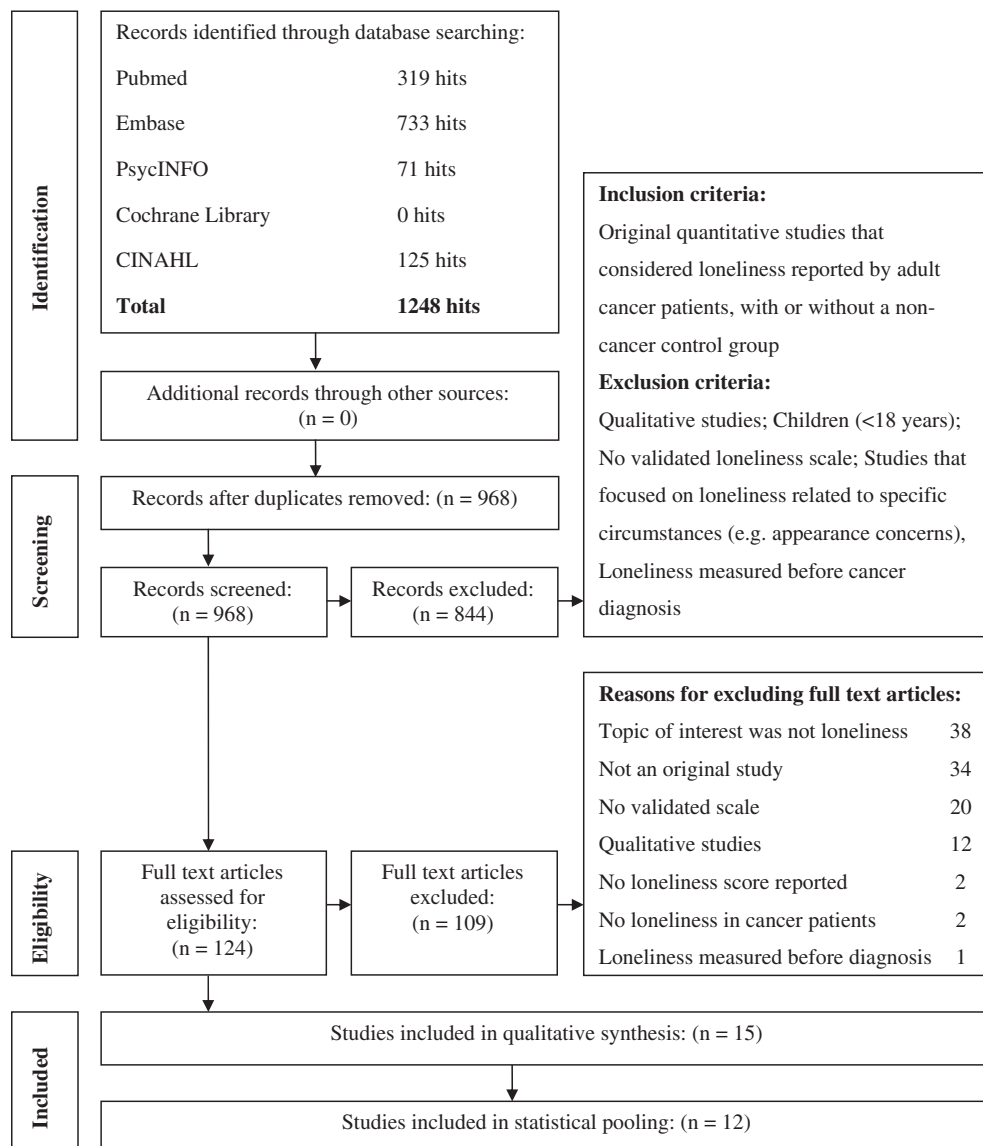


Fig. 1. Results of the search strategy and identification of studies included in this review.

Table 1
The frequency and risk factors for loneliness

Study Design and Patient Characteristics		Loneliness Questionnaire	Frequency of Loneliness	Risk Factors for Loneliness
Avci and Kumcagiz (2011)	Cross-sectional observational study 48 female breast cancer patients Age: Mean 50.1 (SE=11.4) Turkey Minimum 3 months after mastectomy No metastasis	Revised UCLA loneliness scale Turkish version (validity and reliability confirmed) 20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness Cronbach's alpha 0.85	Mean loneliness score 63.5 (SE=10.2)	Mean loneliness by education Primary School 60.3 (SD=10.4) NS ^a Secondary School 61.6 (SD=7.8) High school and up 67.0 (SD=9.9) Mean loneliness by employment Employed 61.9 (SD=10.2) NS ^b Unemployed 65.9 (SD=9.8) Mean loneliness by social assurance Yes 63.5 (SD=10.2) NS ^b No 63.3 (SD=11.9) Mean loneliness by postoperative marriage status Good 66.3 (SD=10.0) NS ^a Bad 62.7 (SD=10.4) Unknown 70.5 (SD=2.1)
Boer et al. (1998)	Cross-sectional observational study 480 non-hospitalized cancer patients (340 females, 140 males) aware of cancer diagnosis for 2.5 yrs Age: 18 - 80, mean 60.6 (SD=11.8) Type of cancer: 54 gynaecological, 54 breast, 39 lung, 55 stomach and intestine region, 78 prostate	De Jong Gierveld Loneliness Scale 11 items, 5-point Likert scale, scores were transformed to a 100-point scale, lower scores indicate greater loneliness	Mean loneliness score 75.3 (SD = 15.2)	Regression coefficient of loneliness ~ mental health aspects of quality of life Social functioning 0.211 ($P < .001$) Emotional limitations 0.142 ($P < .001$) Mental Health 0.283 ($P < .001$) Vitality 0.183 ($P < .001$)
Coleman et al. (2005)	Randomized controlled trial 106 female breast cancer patients US → experimental group (N=54, mean age 57) → control group (N=52, mean age 58) 2 - 4 weeks post-surgery (TNM stage 0, I, II, or III)	UCLA loneliness scale (version 3) 20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness Cronbach's alpha 0.92	Mean loneliness score → experimental group: 34 (SE=1) → control group: 34 (SE=1)	
Deckx et al. (2013)	Prospective observational study: measurement at baseline (T0) and six months later (T1) Belgium 712 patients: 273 younger cancer patients (50-69 yrs), 143 older cancer patients (≥70 yrs), 296 older controls (≥70 yrs) Cancer patients within three months after diagnosis Type of cancer: breast, prostate, lung, and gastrointestinal	De Jong Gierveld Loneliness Scale Dutch version (validity and reliability confirmed) Higher scores indicate greater loneliness Total loneliness: 11 items, range 0–11, cut-off ≥3	Total loneliness Younger patients 21% Older patients 27% Older controls 37%	T0 T1 21% 21% 26% 26% 33% 33% Older vs. younger patients ^c T0: $P = 0.17$ T1: $P = 0.40$ Older patients vs. controls ^c T0: $P < .05$ T1: $P = 0.27$ In the three groups, loneliness was significantly associated with lower health related quality of life ($P < .05$) ^d
Fogel et al. (2002)	Cross-sectional observational study 188 breast cancer patients US Age: ≤65 yrs, mean 51.46 (SD=8.35) Diagnosed within the past 3 yrs 78 Internet use for breast health issues 36 Internet for general use 74 No Internet use	UCLA Loneliness Scale (version 3) 10 items (personal communication), 4-point Likert scale, 10 - 40 Higher scores indicate greater loneliness Cronbach's alpha 0.89	Mean loneliness score → web use for breast issues: 17.85 (SD=4.57) → web use in general: 21.28 (SD=6.02) → no web use: 18.94 (SD=5.63)	
Friedman et al. (1989)	Cross-sectional observational study 60 cancer patients, age: 19 - 45 yrs Israel Type of cancer: breast (32%), thyroid (13%), testicular (12%), melanoma (10%), lymphoma (10%), ovarian (7%), other (16%) → 38 healthy controls → 27 cancer patients diagnosed ≤3 months → 33 cancer patients diagnosed 1-3 yrs before	Revised UCLA loneliness scale Hebrew version 20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness Cronbach's alpha 0.85	Mean loneliness score → healthy controls: 31.8 → diagnosed ≤3 months: 33.5 → diagnosed 1-3 yrs before: 35.4	→ Married 28 healthy controls: 32.32 (SD=5.61) 21 cancer patients diagnosed ≤3 months: 32.57 (SD=7.42) 28 cancer patients diagnosed ≥1-3 yrs: 33.71 (SD=10.62) → Unmarried 10 healthy controls: 30.40 (SD=7.19) 6 cancer patients diagnosed ≤3 months: 36.67 (SD=4.41) 5 cancer patients diagnosed ≥1-3 yrs: 44.80 (SD=8.04)
Fukui et al. (2003)	Randomized controlled trial 50 breast cancer patients Japan Age: ≤65 yrs, mean 53.5 (SD=7.1) 25 experimental group and 25 control group Surgery 4-18 months ago, no chemotherapy	Revised UCLA Loneliness scale Japanese version (validity and reliability confirmed) 20 items, 4-point Likert scale, 20 - 80 Higher scores indicate greater loneliness	Mean loneliness score → experimental group: 36.6 → control group: 32.8	

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Table 1
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	Study Design and Patient Characteristics	Loneliness Questionnaire	Frequency of Loneliness	Risk Factors for Loneliness
Jaremka et al. (2013)	Cross-sectional observational study 200 female breast cancer survivors (Stage 0 - IIIA)	UCLA Loneliness Scale (Version 3) 20 items, 4-point Likert scale, 20 – 80	Mean loneliness score 38.73 (SD=8.27)	Linear regression for loneliness by: Symptom cluster: pain depression fatigue $\beta=0.35, P < .001$ Pain $\beta=0.16, P = .023$ Depression $\beta=0.33, P < .001$ Fatigue $\beta=0.31, P < .001$
US	Completed treatment (except selective oestrogen receptor modulators/aromatase inhibitors) Age: 27 - 76 yrs, mean 51.58 (SD=9.24)	Higher scores indicate greater loneliness		
Mosher et al. (2012)	Cross-sectional observational study 195 cancer survivors (50% female)	UCLA Loneliness Scale (Version 3) 20 items, 4-point Likert scale, 20 - 80	Mean loneliness score 34.29 (SD=8.68)	Path analysis coefficients of loneliness ~ social constraints, emotional support, and distress
US	9-72 months after haematopoietic stem cell transplantation Age: 22 - 77 yrs, mean 54 (SD=12). Type of cancer: multiple myeloma (31%), lymphoma (32%), leukaemia (24%), other (13%)	Higher scores indicate greater loneliness Cronbach's alpha 0.92		Partner social constraints 0.27, $P < .05$ Family/friends social constraints 0.22, $P < .05$ Partner emotional support -0.14, $P < .05$ Family/friends emotional support -0.31, $P < .05$ Distress 0.45, $P < .05$
Pehlivan et al. (2011)	Cross-sectional observational study 188 cancer patients	Revised UCLA loneliness scale Turkish version (validity and reliability confirmed)	Mean loneliness score 35.8 (SE=0.8)	Mean loneliness by gender
Turkey	Age: ≥ 18 yrs, mean 44.6 (SE=1.1) Mean duration of disease: 17.2 months (SE=1.7) Diagnosed with cancer ≥ 2 months before interview Outpatients, currently in treatment in the hospital Type of cancer: 30 lung, 37 haematologic, 42 gastro-intestinal, 35 breast, 24 urologic, 20 dermatologic	20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness Cronbach's alpha 0.74		Female (N=91) 35.1 (SE=1.1) NS ^b Male (N=97) 36.4 (SE=1.1)
				Mean loneliness by education
				Illiterate (N=51) 35.6 (SE=1.4) NS ^b Primary school (N=79) 34.6 (SE=1.0) High school (N=41) 36.7 (SE=2.0) University (N=17) 39.6 (SE=3.5)
				Mean loneliness by marital status
				Married (N=150) 35.6 (SE= 0.9) NS ^b Single (N=38) 36.7 (SE= 1.8)
				Mean loneliness by cancer site
				Lung (N=30) 37.6 (SE= 2.2) NS ^b Hematologic (N=37) 36.3 (SE= 1.6) Gastro-intestinal (N=42) 36.2 (SE= 1.6) Breast (N=35) 33.2 (SE= 1.8) Urologic (N=24) 33.5 (SE= 2.1) Dermatologic (N=20) 38.7 (SE= 2.8)
				Mean loneliness by stage of disease
				Local (N=34) 30.2 (SE= 1.1) $P = .001^a$ Regional (N=78) 36.0 (SE= 1.3) Metastatic (N=76) 38.1 (SE= 1.3)
				Mean loneliness by treatment
				Chemotherapy (N=125) 6.3 (SE=1.0) NS ^a Radiotherapy (N=7) 8.0 (SE=4.7) Operation+ chemo+ radiotherapy (N=56) 4.3 (SE=1.3)
Perry (1990)	Cross-sectional observational study 41 cancer patients (20 female, 21 male)	Revised UCLA Loneliness scale 20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness	Mean loneliness score 36.4 (SD=11.7)	Mean loneliness by age
US	Age: ≥ 21 yrs, 29-80 yrs, mean 58.7, median 60 Cancer patients ≤ 100 days after receiving diagnosis Receiving chemotherapy or radiotherapy and/or were recovering from surgery The most common cancer sites (in descending order) were: lung, breast, colon, blood leukaemia), lymphatic system, liver, head and neck, oesophagus, and bladder	20-34 low degree of loneliness 35-49 moderate degree of loneliness 50-64 moderately high degree of loneliness 65-80 high degree of loneliness	Loneliness score distribution: Low: 21 (51.2%) Moderate: 15 (36.6%) Moderately high: 5 (12.2%) High: 0 (0%)	<49 37.7 $P < .05^c$ 50-59 41.8 between the most and least lonely 60-67 34.1 >70 31.7
				Mean loneliness by educational level (grade completed)
				6, 7, 8 38.2 NS ^c 9, 10, 11 37.3 between the most and least lonely 12 33.6 13-16 37.2
				Mean loneliness by sex
				Male 37.7 NS ^c Female 35.0
				Mean loneliness score by marital status
				Single 44.4 $P < .05^c$ Divorced 44.0 between single versus married Widowed 34.7 Married 33.0
Sahin and Tan (2012)	Cross-sectional observational study 60 cancer patients (85% men, 25% women), >4 months after diagnosis (1% <1 yr, 20% 1-3 yrs, 79% >4 yrs) Age: ≥ 18 yrs, mean 61.7 Most common cancer types were breast cancer (77%), and lymphoma	Revised UCLA loneliness scale Turkish version (validity and reliability confirmed) 20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness Cronbach's alpha 0.84	Mean loneliness score: 70.70 (SD=12.31)	Correlation loneliness ~ perceived social support $r = -0.32, P < .001$

Table 1
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Study Design and Patient Characteristics		Loneliness Questionnaire	Frequency of Loneliness	Risk Factors for Loneliness
Samarel et al. (2002)	Randomized controlled trial 125 breast cancer patients (TNM Stage 0, I, II, III)	UCLA Loneliness Scale (version 3)	Mean loneliness score (baseline)	
US	Age: 30–83 yrs, mean 53.8 (SD=10.8) 34 experimental group, 48 control group 1, 43 control group 2 Surgery for cancer ≤4 weeks prior to start of study	20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness Cronbach's alpha 0.93	Exp. group: 35.94 (SD=9.50) Group 1: 34.67 (SD=9.97) Group 2: 35.19 (SD=9.21)	
Sevil et al. (2006)	Cross-sectional observational study 94 hospitalized gynaecological cancer patients	Revised UCLA Loneliness scale Turkish version (validity and reliability confirmed)	Mean loneliness score 35.85 (SD=9.30)	Mean loneliness by income levels Less than expenditures 40.72 (SD = 11.09) $P = .03^f$ Equal to expenditures 34.93 (SD=8.62) Higher than expenditures 30.50 (SD=5.00)
Turkey	50–59 yrs: 36% ≥60 yrs: 37.4%	20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness 20–34 low degree of loneliness 35–49 moderate degree of loneliness 50–64 moderately high degree of loneliness 65–80 high degree of loneliness	Loneliness score distribution: Low: 44 (46.8%) Moderate: 42 (44.7%) Moderately high: 6 (6.4%) High: 2 (2.1%)	Mean loneliness by cancer treatment periods 0–12 months 35.5417 NS ^c 13 months and above 36.8336 Mean loneliness by any need for psychological support Yes 38.82 $P < .05^c$ No 32.47 Mean loneliness by any need for psychological support No need 32.47 (SD=7.50) $P = .001^f$ Slight need 31.33 (SD=5.71) Moderate need 39.86 (SD=10.22) Excessive need 39.75 (SD=8.27)
Yildirim and Kocabiyik (2010)	Cross-sectional observational study 144 cancer patients (92 female, 52 male)	Revised UCLA Loneliness scale Turkish version (validity & reliability confirmed)	Mean loneliness score 33.09 (SD=9.17)	Mean loneliness by gender Male 33.86 (SD= 9.73) NS ^c Female 32.65 (SD=8.86)
Turkey	Age: ≥18 yrs, 20 – 77 yrs, mean 51.76 (SD=12.14) Solid cancer: 55 breast, 50 gastrointestinal, 16 gynaecological, 10 lung, 13 others Undergoing treatment in the outpatient chemotherapy unit	20 items, 4-point Likert scale, 20 - 80, higher scores indicate greater loneliness 20–34 low degree of loneliness 35–49 moderate degree of loneliness 50–64 moderately high degree of loneliness	Loneliness score distribution: Low: 89 (61.8%) Moderate: 46 (31.9%) Moderately high: 9 (6.3%)	Mean loneliness by marital status Married 31.96 (SD= 8.06) $P < .01^f$ Single 36.91 (SD= 12.06) Widowed 38.75 (SD= 12.15) Mean loneliness by educational level Non-literate 38.16 (SD= 12.18) NS ^f Primary school 33.64 (SD= 8.05) Secondary school 33.00 (SD= 8.68) High school 32.48 (SD= 8.13) University 30.78 (SD= 10.46) Mean loneliness by living style With partner 31.58 (SD= 8.04) $P < .001^f$ Others 34.38 (SD= 8.05) Lonely 45.41 (SD= 11.65) Mean loneliness by income level Low 34.91 (SD= 9.59) NS ^f Moderate 32.26 (SD= 9.63) High 31.76 (SD= 8.46) Mean loneliness by cancer site Breast 31.62 (SD= 7.71) NS ^f Gastrointestinal 34.48 (SD= 9.33) Gynaecological 33.94 (SD= 10.62) Lung 34.10 (SD= 13.05) Others 32.15 (SD= 9.46) Mean loneliness by disease stage Metastatic disease 32.54 (SD= 9.36) NS ^c Loco-regional disease 33.38 (SD= 9.10) Mean loneliness by pain status With pain 33.44 (SD= 10.14) NS ^c Without pain 32.92 (SD= 8.71)

Abbreviations: US, United States; yrs, years.

^a Kruskal–Wallis test.^b Mann Whitney U.^c chi-square test.^d logistic regression.^e t-test.^f ANOVA.

In 13 of the selected studies the UCLA loneliness scale was used. The UCLA loneliness scale is a 20-item rating scale that measures the subjective experience of loneliness on a four-point Likert scale. The UCLA loneliness scale was originally developed and validated among college students. The first version consisted of 20 negatively worded items (Russell et al., 1978). Later, a revised version was developed, incorporating 10 positively worded items (Russell et al., 1980). This revised UCLA loneliness scale has high internal consistency (Cronbach's alpha 0.94) and discriminant validity was shown. The total score ranges from 20 to 80. Higher scores indicate higher loneliness. The most commonly used categorization is the following: 20–34 denotes a low degree of loneliness, 35–49 a moderate degree of loneliness, 50–64 a moderately high degree of loneliness, and 65–80 a high degree of loneliness. Three studies included in our review used this categorization (Perry, 1990; Sevil et al., 2006; Yildirim and Kocabiyik, 2010). This revised UCLA loneliness scale was used by all Turkish studies (Avci and Kumcagiz, 2011; Pehlivan et al., 2011; Sahin and Tan, 2012; Sevil et al., 2006; Yildirim and Kocabiyik, 2010), one American study (Perry, 1990), one Japanese study (Fukui et al., 2003), and one Israeli study (Friedman et al., 1989). Four of these studies reported a Cronbach's alpha and it ranged between 0.74 and 0.85 (Avci and Kumcagiz, 2011; Friedman et al., 1989; Pehlivan et al., 2011; Sahin and Tan, 2012). In 1996, a third version was developed, and this is now the most commonly used version of the UCLA loneliness scale (Russell, 1996). This third version is a simplified version of the revised UCLA loneliness scale, making it more suitable for other populations (e.g. elderly). Compared to the revised UCLA loneliness scale the content of one item was reversed, for all of the items the statement “how often do you feel ...” was added at the beginning of each question, and for three items the wording was simplified. Hence, the number of items, total score, and score range remained the same. The UCLA loneliness scale (version 3) has been shown to be reliable, both in terms of internal consistency (Cronbach's alpha ranging from 0.89 to 0.94) and test-retest reliability over a one-year period ($r = 0.73$). Convergent validity was shown by significant correlations with other measures of loneliness. The UCLA loneliness scale (version 3) was used in five American studies (Coleman et al., 2005; Fogel et al., 2002; Jaremka et al., 2013; Mosher et al., 2012; Samarel et al., 2002). Four of these studies reported a Cronbach's alpha and it ranged between 0.89 and 0.93 (Coleman et al., 2005; Fogel et al., 2002; Mosher et al., 2012; Samarel et al., 2002).

The Loneliness Scale of De Jong-Gierveld (De Jong Gierveld et al., 2006; De Jong-Gierveld and Kamphuis, 1985) was used in two studies (Boer et al., 1998; Deckx et al., 2013). This loneliness scale

was developed at the beginning of the 1980s. The Loneliness Scale of De Jong-Gierveld is an 11-item questionnaire, which was validated using data of unemployed, disabled, and employed men and women. The scale can be used as a unidimensional loneliness scale, but the items were developed with Weiss's (1973) distinction between social and emotional loneliness in mind. The scale consists of five positively and six negatively worded items, which correspond to social and emotional loneliness. Response categories for each item range from one to five: strongly disagree, disagree, not disagree/not agree, agree and strongly agree. The loneliness scale score is computed as the sum of all the dichotomized items, ranging from 0 (absence of loneliness) to 11 (extreme loneliness) for total loneliness, from 0 to 5 for social loneliness, and from 0 to 6 for emotional loneliness (De Jong-Gierveld and van Tilburg, 1999). The loneliness scale as a whole, and the subscales for emotional and social loneliness separately, have proved to be valid and reliable measurement instruments in various populations and across different administration modes (e.g. face-to-face interviews, telephone interviews, and self-administered mail questionnaires) (De Jong Gierveld et al., 2006; De Jong-Gierveld and Kamphuis, 1985).

Severity of loneliness

For the 12 studies that used the UCLA loneliness scale and were included in the meta-analysis, the weighted mean loneliness score was 38.26 (95% CI: 35.51–41.00). This corresponds to a moderate degree of loneliness, according to the commonly used categorization mentioned above (see Table 2). When divided into studies that used the revised UCLA loneliness scale and version 3 of the UCLA loneliness scale, mean scores were 41.15 (95% CI: 34.68–47.61) and 36.11 (95% CI: 34.56–37.66) respectively. This difference was not statistically significant. Three studies reported a loneliness score distribution (Perry, 1990; Sevil et al., 2006; Yildirim and Kocabiyik, 2010): 32–47% of patients with cancer reported moderate loneliness, and 6–12% reported moderately high loneliness. Only a minority of patients with cancer, ranging from 0 to 2%, reported high levels of loneliness.

Patients without cancer were only included in two studies (Deckx et al., 2013; Friedman et al., 1989). The study of Friedman et al. showed no differences between cancer and non-cancer patients ($P > .05$). In the study of our own research group, older cancer patients were less lonely than non-cancer patients at time of cancer diagnosis. Six months later the prevalence of loneliness was comparable in older cancer and non-cancer patients (Deckx et al., 2013).

Table 2

Weighted mean loneliness scores for studies that used the UCLA loneliness scale.

	Number of participants	Number of studies	Weighted mean	(95% CI)
Loneliness in (all) cancer patients ^a	1449	12	38.26	(35.51–41.00)
Loneliness according to time since diagnosis				
- ≤1 year after cancer diagnosis ^b	515	6	34.35	(33.60–35.17)
- >1 year after cancer diagnosis ^c	431	4	37.38	(35.38–39.38)
Loneliness according to marital status ^d				
- Married	316	3	33.48	(31.36–35.60)
- Unmarried ^e	76	3	37.82	(35.48–40.17)

Weighted by the inverse of the variance, adjusted for the random effects variance component; UCLA loneliness scale: 20 items, score range 20–80, higher scores indicate higher loneliness.

^a Weighted mean loneliness score in (all) cancer patients included the following studies: (Avci and Kumcagiz, 2011; Coleman et al., 2005; Fogel et al., 2002; Friedman et al., 1989; Jaremka et al., 2013; Mosher et al., 2012; Pehlivan et al., 2011; Perry, 1990; Sahin and Tan, 2012; Samarel et al., 2002; Sevil et al., 2006; Yildirim and Kocabiyik, 2010).

^b ≤1 year after cancer diagnosis included the following studies: (Coleman et al., 2005; Friedman et al., 1989; Perry, 1990; Samarel et al., 2002; Sevil et al., 2006; Yildirim and Kocabiyik, 2010).

^c ≥1 year after cancer diagnosis included the following studies: (Fogel et al., 2002; Friedman et al., 1989; Pehlivan et al., 2011; Sevil et al., 2006).

^d Loneliness according to marital status included the following studies for both married and unmarried patients: (Friedman et al., 1989; Pehlivan et al., 2011; Yildirim and Kocabiyik, 2010).

^e Unmarried: includes people who have never been married, widowed or divorced.

Factors associated with loneliness

With respect to cancer-related factors, two timeframes wherein loneliness was measured were identified: 1) loneliness measured within one year after cancer diagnosis, often during or shortly after initial treatment (Avcı and Kumcagiz, 2011; Coleman et al., 2005; Deckx et al., 2013; Friedman et al., 1989; Fukui et al., 2003; Perry, 1990; Samarel et al., 2002; Sevil et al., 2006; Yildirim and Kocabiyyik, 2010), and 2) loneliness measured among cancer survivors more than one year after cancer diagnosis (Boer et al., 1998; Fogel et al., 2002; Friedman et al., 1989; Pehlivan et al., 2011). The weighted mean loneliness score for studies conducted during or shortly after initial treatment was significantly lower compared to studies conducted more than one year after cancer diagnosis. The weighted mean loneliness score for studies performed within one year after cancer diagnosis was 34.35 (95% CI: 33.60–35.17); for studies that were conducted in cancer patients who had been diagnosed more than one year prior to the data collection, it was 37.38 (95% CI: 35.38–39.38) (see Table 2). One study looked at duration of cancer treatment period and showed a significant association with loneliness (Sevil et al., 2006).

Neither cancer site nor treatment type was associated with loneliness. A more advanced stage of disease was significantly associated with increased loneliness in only one study (Pehlivan et al., 2011). Another study that assessed stage of disease, found that mean loneliness scores were comparable for patients with loco-regional disease versus metastatic disease (Yildirim and Kocabiyyik, 2010).

Several studies focused on the association between subjective health and loneliness. However, the instruments used to measure subjective health varied highly across the different studies. One study focused on pain, fatigue and depression based on self-report measurements. This study showed a positive relation between loneliness and pain, fatigue, depression, and the combination of these (Jaremka et al., 2013). In contrast, the study of Yildirim and Kocabiyyik (2010) showed no association between loneliness and pain (Yildirim and Kocabiyyik, 2010). In the study of our own research group, we showed that loneliness was significantly associated with lower health related quality of life (Deckx et al., 2013). Similarly, another study showed that better functioning on different aspects of mental health related quality of life (social functioning, emotional limitations, mental health, and vitality) was associated with lower prevalence of loneliness (Boer et al., 1998). Others studies focused on the social aspects of functioning and showed a negative relation between loneliness and (perceived)

social support, social functioning, or emotional support (Boer et al., 1998; Mosher et al., 2012; Pehlivan et al., 2011; Sahin and Tan, 2012), and a positive relation between loneliness and social constraints (Mosher et al., 2012). Similarly, in another study it was shown that need for psychosocial support was associated with higher loneliness scores (Sevil et al., 2006). Hopelessness was reported in only one study and was associated with a higher degree of loneliness (Pehlivan et al., 2011).

In the studies included in this review, demographic factors such as gender, age, education, and employment were not consistently associated with loneliness. With respect to age, a significant difference in the degree of loneliness between cancer patients aged 50–59 years (the highest scoring group) and cancer patients aged 70 years and above (the lowest scoring group) was reported in one study ($P < .05$) (Perry, 1990). However, in another study, there was no difference in the proportion of loneliness in older versus younger cancer patients shortly after diagnosis (Deckx et al., 2013). In two studies, loneliness increased with decreasing income level (Sevil et al., 2006; Yildirim and Kocabiyyik, 2010). This difference, however, was only statistically significant in one study ($P = .03$) (Sevil et al., 2006). Marital status was the only sociodemographic factor that was consistently associated with loneliness. Two studies showed significantly higher loneliness scores among unmarried compared to married cancer patients (Perry, 1990; Yildirim and Kocabiyyik, 2010). The meta-analyses showed that weighted mean loneliness scores for unmarried patients were higher compared to married patients (37.82 and 33.48 respectively), but this was not statistically significant (see Table 2).

Sensitivity analyses

In order to test the robustness of the results three sensitivity analyses were performed (see Table 3). First, weighted mean loneliness was recalculated when excluding the study of Avcı and Kumcagiz (2011) and Sahin and Tan (2012), as the mean loneliness score of these studies was higher than that of all other studies. Weighted mean loneliness score decreased from 38.26 (95% CI: 35.51–41.00) to 35.78 (95% CI: 34.66–36.90), when these two studies were excluded. However, this difference was not statistically significant. Second, we separately calculated weighted mean loneliness scores for studies performed in the US and studies performed in Turkey. The mean loneliness score was 46.28 (95% CI: 35.30–57.27) for Turkish studies and 36.12 (95% CI: 34.66–37.58) for studies performed in the US. Although the mean loneliness

Table 3

Sensitivity analysis: weighted mean loneliness scores according to the version of the UCLA loneliness scale and excluding outliers.

	Number of participants	Number of studies	Weighted mean	(95% CI)
Loneliness in (all) cancer patients ^a	1449	12	38.26	(35.51–41.00)
Loneliness in (all) cancer patients excluding Avcı and Kumcagiz (2011) and Sahin and Tan (2012)	1341	10	35.78	(34.66–36.90)
Loneliness according to country				
- Turkey ^b	534	5	46.28	(35.30–57.27)
- United States ^c	855	6	36.12	(34.66–37.58)
Loneliness according to version of the UCLA loneliness scale				
- Revised UCLA loneliness scale ^d	635	7	41.15	(34.68–47.61)
- UCLA loneliness scale (version 3) ^e	814	5	36.11	(34.56–37.66)

Weighted by the inverse of the variance, adjusted for the random effects variance component; UCLA loneliness scale: 20 items, score range 20–80, higher scores indicate higher loneliness.

^a Weighted mean loneliness score in (all) cancer patients included the following studies: (Avcı and Kumcagiz, 2011; Coleman et al., 2005; Fogel et al., 2002; Friedman et al., 1989; Jaremka et al., 2013; Mosher et al., 2012; Pehlivan et al., 2011; Perry, 1990; Sahin and Tan, 2012; Samarel et al., 2002; Sevil et al., 2006; Yildirim and Kocabiyyik, 2010).

^b Turkish studies were the following: (Avcı and Kumcagiz, 2011; Pehlivan et al., 2011; Sahin and Tan, 2012; Sevil et al., 2006; Yildirim and Kocabiyyik, 2010).

^c American studies were the following: (Coleman et al., 2005; Fogel et al., 2002; Jaremka et al., 2013; Mosher et al., 2012; Perry, 1990; Samarel et al., 2002).

^d Studies that used the revised UCLA loneliness scale were the following: (Avcı and Kumcagiz, 2011; Fukui et al., 2003; Pehlivan et al., 2011; Perry, 1990; Sahin and Tan, 2012; Sevil et al., 2006; Yildirim and Kocabiyyik, 2010).

^e Studies that used the UCLA loneliness scale (version 3) were the following: (Coleman et al., 2005; Fogel et al., 2002; Jaremka et al., 2013; Mosher et al., 2012; Samarel et al., 2002).

score of Turkish studies was higher, this difference was not statistically significant. Third, we separately calculated weighted mean loneliness scores for studies using the revised UCLA loneliness scale and studies using the UCLA loneliness scale version 3. The weighted mean loneliness score was 41.15 (95% CI: 34.68–47.61) for studies that used the revised UCLA loneliness scale and 36.11 (95% CI: 34.56–37.66) for studies that used the UCLA loneliness scale version 3. This difference was not statistically significant.

Discussion

Based on a systematic and extensive review of the literature, we evaluated loneliness in cancer patients after identifying 15 studies that met our inclusion criteria. The weighted average of loneliness among patients with cancer was 38.26 (95% CI: 35.51–41.00). This corresponds to a moderate degree of loneliness, following to the commonly used categorization mentioned above. None of the cancer-related factors were clearly associated with increasing levels of loneliness. However, there is an indication that the level of loneliness rises with increasing time after cancer diagnosis. The reported risk factors that were not related to cancer varied widely across the studies. Social functioning emerged as a consistent theme, for which it was shown that lack of social support was associated with increasing levels of loneliness.

Severity and risk factors of loneliness

Without any doubt, a diagnosis of cancer is a stressful event, which is clearly associated with some increase in distress (Rokach, 2003). Previous studies in a general population have shown that life stressors significantly predict loneliness (Cacioppo et al., 2010; Hensley et al., 2011). Hence, patients with cancer might be especially vulnerable to becoming lonely and the risk factors for loneliness in cancer patients might be different compared to non-cancer patients. For example, Friedman et al. observed that approximately 50% of the cancer patients included in their study attributed their loneliness to cancer or cancer-related situations (Friedman et al., 1989). However, in this review, cancer-related factors such as cancer site, treatment type, or stage of disease were not clearly associated with loneliness. Furthermore, patients without cancer were only included in two studies. This makes it impossible to make firm conclusions about the influence of a diagnosis and treatment of cancer compared to a general population. In a study of our own research group, older cancer patients were less lonely than non-cancer patients at time of cancer diagnosis, while six months later the prevalence of loneliness was comparable in older cancer and non-cancer patients (Deckx et al., 2013). This might be explained by the sudden increased availability of social support, especially at time of cancer diagnosis and start of cancer treatment. As also shown in this review, social support and loneliness are negatively associated. In the long run, this effect of increased social support on loneliness might not endure. In this respect we showed that the weighted mean loneliness score for studies performed within one year after cancer diagnosis was significantly lower compared to studies with data collection more than one year after cancer diagnosis. The occurrence of loneliness after end of the primary cancer treatment has been described previously and has been defined as “survivor loneliness” (Rosedale, 2009).

The non-cancer related determinants of loneliness in cancer patients that emerged from our review were being unmarried (people who have never been married, are widowed or divorced), and lack of psychological or social support. Also in a general population, being unmarried, widowed or divorced has been identified as one of the main risk factors for becoming lonely (Perlman and Peplau, 1984). Besides marital status, other demographic risk

factors that were reported included age, gender, and socioeconomic status. There was no clear association between age and loneliness in cancer patients. However, for the majority of studies, the mean age was <60 years. As was shown by Dykstra, loneliness has a U-shaped distribution, with the highest levels of loneliness at the younger and the advanced ages (Dykstra, 2009). None of the included studies showed different levels of loneliness for female compared to male cancer patients. However, this was evaluated in three studies only. Socioeconomic status was significantly associated with loneliness in only one Turkish study; loneliness was more prevalent among lower income groups (Sevil et al., 2006). The same trend was shown in other studies, although the association was not statistically significant (Avci and Kumcagiz, 2011; Yildirim and Kocabiyik, 2010).

Social support and related concepts (emotional support, social functioning) were negatively associated with loneliness. In contrast to loneliness, the role of social support in cancer patients has been studied extensively. In this respect, especially the influence of social support and social network on cancer survival has been studied (Nausheen et al., 2009; Pinquart and Duberstein, 2010). It is more and more acknowledged that social support influences survival of cancer patients. However, there is great variety in extend and types of social support, including instrumental, informational, and emotional support. Several hypotheses have been developed explaining the association between social support and survival, e.g. instrumental support increases healthcare accessibility, emotional support decreases stress and might improve immune response. Kroenke et al. investigated the role of different types of social support in a large prospective cohort study. They concluded that the higher mortality among cancer patients was specifically related to lack of close relatives, friends or living children (Kroenke et al., 2006). Although social support and loneliness are different concepts, there is some overlap. With respect to loneliness, generally two types of loneliness are being distinguished: social and emotional loneliness. Social loneliness is linked to the subjective absence of a broader group of contacts, or social network such as friends, colleagues, and neighbours. Emotional loneliness is linked to the subjective absence of an intimate figure or a close emotional attachment such as a partner or a best friend (De Jong Gierveld et al., 2006; Weiss, 1973). Kroenke et al. showed that the higher mortality among cancer patients was specifically related to lack of close relatives (Kroenke et al., 2006). Although the focus of the study of Kroenke et al. was social support, there is some overlap between lack of close relatives and emotional loneliness. Hence, we believe that emotional loneliness should be considered as an important concern in cancer patients.

Interventions targeting loneliness in patients with cancer

Three studies reported on the effectiveness of an intervention targeting loneliness in cancer patients (Coleman et al., 2005; Fukui et al., 2003; Samarel et al., 2002). Two of these claimed that the intervention was effective in reducing the level loneliness in cancer patients (Fukui et al., 2003; Samarel et al., 2002), while one study was unable to show an effect (Coleman et al., 2005).

The study by Fukui et al. claimed that a six-week group intervention consisting of health education, coping skills training, stress management, and psychological support was effective in reducing the level of loneliness in Japanese patients with breast cancer (Fukui et al., 2003). However, the absolute difference was very small and not significantly different when evaluated with a *t*-test. In the experimental group mean loneliness score at baseline was 36.6, 33.9 at six weeks, and 33.7 at six months. In the control group mean loneliness score at baseline was 32.8, 32.7 at six weeks, and 33.9 at six months.

The study by Samarel et al. aimed to evaluate the effectiveness of 13 months of individual telephone support combined with in-person group support sessions and formal education sessions (experimental group) compared to 13 months of individual telephone support and formal education sessions (control group 1), and compared to a one-time mailed educational information (control group 2) (Samarel et al., 2002). Samarel et al. claimed that among US patients with breast cancer, 13 months of individual telephone and/or interpersonal group support combined with formal education sessions reduced loneliness levels. However, absolute differences were very small. Mean loneliness scores changed from 36 at baseline to 34 at the end of the intervention in the experimental group, from 35 to 33 in control group 1, and from 35 to 39 in control group 2.

The study of Coleman et al. aimed to find the most effective methods of providing social support in breast cancer patients by comparing the effectiveness of 13 months of telephone social support provided by oncology nurses combined with a mailed educational resource kit versus a mailed educational resource kit alone (Coleman et al., 2005). Neither the educational resource kit, nor telephone support in combination with the educational resource kit, was effective in reducing levels of loneliness. In the study of Coleman et al. the mean loneliness score was 34 at baseline and 34 at the end of the intervention in the experimental group. In the control group the mean loneliness score was 34 at baseline and 36 at the end of the study.

Although the conclusions of two studies were positive, we believe that these results must be interpreted with caution. First, in both studies the absolute mean difference in loneliness was small (<3 points difference measured on a scale from 20 to 80), both studies were conducted in breast cancer patients only, and the number of participants was relatively low (50 and 126 participants). Hence, the effectiveness of these interventions and the generalizability of these results are debatable. Second, from a thorough review of ten interventions addressing loneliness in a general population, we learnt that the majority of interventions did not reduce the level of loneliness, but more likely prevented an increase in loneliness in the experimental group (Fokkema and van Tilburg, 2007). Third, with respect to the content of the interventions, in both studies that claimed to reduce loneliness in cancer patients, (psycho)social support played an important role. This is consistent with previous reviews regarding strategies to reduce loneliness, which mainly discuss four primary strategies: enhancing social support, improving social skills, increasing opportunities for social interaction, and addressing maladaptive social cognition (Masi et al., 2011). However, a thorough quantitative meta-analysis of loneliness reduction interventions in the general population, showed that interventions addressing maladaptive social cognition were more successful than studies focussing on enhancing social support, improving social skills or increasing opportunities for social interaction (Masi et al., 2011).

Strengths and limitations

This is the first systematic literature review and meta-analysis to focus on loneliness in patients with cancer. Another strength is that the PRISMA statement was followed for reporting this systematic literature review and meta-analysis (see www.prisma-statement.org) (Moher et al., 2009). Furthermore, only studies that used a validated loneliness scale were included. Unfortunately, there are no separate validation studies in a population of cancer patients, neither for the UCLA loneliness scale, nor for the Loneliness Scale of De Jong-Gierveld. However, in 8 out of 13 studies that used the UCLA Loneliness Scale, a Cronbach's alpha was reported and all

were >0.70, which corresponds to a good internal consistency (Avci and Kumcagiz, 2011; Coleman et al., 2005; Fogel et al., 2002; Friedman et al., 1989; Mosher et al., 2012; Pehlivan et al., 2011; Sahin and Tan, 2012; Samarel et al., 2002). Furthermore, the UCLA loneliness scale and the Loneliness Scale of De Jong-Gierveld are the two most commonly used loneliness scales and they have been proven to be reliable in a wide variety of populations, including older persons in good health (Russell et al., 1980, 1978; Russell, 1996), older persons with varying self-reported health (De Jong Gierveld et al., 2006; De Jong-Gierveld and Kamphuis, 1985), disabled persons (De Jong Gierveld et al., 2006; De Jong-Gierveld and Kamphuis, 1985), and opiate dependent persons (Britton and Conner, 2007). Another asset of this study is that we performed three sensitivity analyses (see Table 3). These revealed that the results of the meta-analysis were robust when studies with outlying results were excluded, when weighted mean loneliness scores were calculated separately for Turkish and American studies, and for studies that used the Revised UCLA loneliness scale or version 3 of the UCLA loneliness scale.

Weighted mean loneliness score decreased when the two studies with outlying results were excluded. However, the absolute difference was very small, and the confidence intervals overlapped, indicating no significant difference (see Table 3). Furthermore, the two studies with outlying results were Turkish studies. When weighted mean loneliness scores were calculated for Turkish and American studies separately, the mean loneliness score for Turkish studies was higher and corresponded to moderately high loneliness. However, again, this difference was not statistically significant. Contact with authors of both Turkish studies with relatively high loneliness scores did not clarify the reason for these high loneliness scores. Cultural differences probably play a role. In a recent study by Fokkema et al. it was shown that older adults in southern and central European countries were generally lonelier than their peers in northern and western European countries (Fokkema et al., 2012).

This review is also subject to some limitations. One drawback is that we were unable to make a comparison regarding factors associated with loneliness in cancer patients versus non-cancer patients, as only two of the selected studies compared patients with and without cancer. Furthermore, it was also difficult to draw conclusions on factors associated with loneliness in cancer patients as a group, given the large variability of factors that were measured.

Consequences for clinical practice and directions for future research

Loneliness research has often focused on older persons and cancer primarily affects older people. Surprisingly, only one of the selected studies focused on older cancer patients. Hence, future studies should focus on risk factors for loneliness in older cancer patients, as the former might be particularly vulnerable to becoming lonely due to the combination of age and cancer. Efforts should be made to compare risk factors across different populations, in order to assess which effective interventions from one population can be extrapolated to another.

Conflict of interest

The authors have no funding or conflicts of interest to disclose.

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