Singlehood and partnerships in healthy people and childhood cancer survivors
Lehmann, Vicky

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Body Image in Cancer Survivors: A Systematic Review

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University Medical Center Groningen (UMCG)

The Church says: The body is a sin.
Science says: The body is a machine.
Advertising says: The body is a business.
The body says: I am a fiesta.

(Eduardo Galeano)
Abstract

**Purpose:** There is common consensus that cancer and its treatment can impair the body, but combined evidence of the previous literature in cancer survivors is missing. Therefore, we reviewed body image in cancer survivors and focused on case-control studies, in order to draw conclusions as to whether body image might be altered due to cancer. **Methods:** Medline, Cinahl, Embase, and PsycInfo were searched and after duplicate extraction, 1932 hits were retrieved and screened for eligibility. Included studies were rated on selection, measurement, and reporting bias. **Results:** Twenty-five studies were identified using 19 different scales to measure body image. Ten studies reported a more negative body image in survivors, nine found no differences, three reported mixed findings, and three reported a more positive body image in survivors. Potential bias was common and 16 studies had at least three sources of potential bias. Less biased studies (i.e. ≤ 2 sources of bias, n=9) hinted to weak differences between survivors and controls, favoring healthy controls. A planned meta-analysis could not be performed. **Conclusions:** This review was long overdue and indicates a somewhat more negative body image in cancer survivors than healthy controls. However, numerous problems potentially biasing study results have been detected and firm conclusions cannot be drawn. Instead we recommend future studies to recruit larger samples, match samples, and pay attention to how body image is conceptualized and measured in order to draw reliable conclusions as to whether body image is impaired in cancer survivors.

**Keywords:** systematic review, body image, cancer survivors, case-control studies
Body Image in Cancer Survivors

Introduction

A vast amount of psycho-oncological research focusses on the impact of cancer and its drastic treatment regimens on appearance and physical functioning, which in turn may cause a negative body image. There is no doubt that surgery can alter appearance permanently, for example due to scarring or amputations. Accordingly, many studies have examined the impact of irreversible body alterations by comparing for example survivors treated with breast-sparing surgery versus mastectomy [1], or by focusing on the impact of double mastectomy [2], bladder removal [3], or disfigurement after head and neck cancer [4]. Other studies also focused on the impact of more temporary changes in body image due to physical alterations caused by chemotherapy or radiotherapy (e.g., hair loss, skin burns, or significant weight fluctuations [5-7]). Even if treatment caused only temporary bodily changes or had no visible effects, body image may still be affected, because patients no longer feel in control of their body and see it as a threat to their health and functioning, or source of discomfort [8-10]. It is therefore expected that all types of cancer and all types of treatment may have an impact on body image, but we do not know whether this is the case, and whether an impaired body image is temporary or fades over the years of survivorship.

A major problem in body image research is the lack of a clear definition of body image, perhaps because it has been studied by many different psychological traditions. Still, there seems to be consensus that body image is a multidimensional construct, and generally, it is referred to as people’s evaluation of their body, including perceptions and feelings about it, not only based on appearance, but also based on functioning, and physical competence [11]. Previous research has been plentiful and Thompson and colleagues [12] identified 16 terms that either referred to body image or a sub-dimension of body image (e.g., body image disturbance, body esteem, body concern, body satisfaction, appearance evaluation, weight satisfaction, or body schema). It seems most problematic that all these terms are often used as synonyms for body image. Contributing to this overall confusion is the fact that more than 50 different instruments exist to measure body image or a related dimension [13]. Hence, the conceptualization and measurement of body image appear to be complicated in the general field of body image research [13], and the same is true for psycho-oncological research [14].

Since body image is an important issue in psycho-oncological research, aggregated evidence is needed as to whether body image is impaired in cancer survivors. Therefore, the
current systematic review focuses on psycho-oncological studies in cancer survivors that have investigated body image or one of its dimensions. Only case-control studies will be included comparing cancer survivors with healthy controls, in order to estimate the extent to which body image might be impaired in survivors. This is of clinical importance, since body image problems have been found to be related to lower quality of life, in both cancer and healthy samples (e.g., [14-17]). Therefore, efforts to improve body image in survivors could also improve quality of life.

This review includes several steps. First, we want to shed light onto how body image is conceptualized and measured in case-controls studies among cancer survivors. Second, and in accordance with the PRISMA guidelines [18], we will rate the included studies on potential selection, measurement, and reporting bias. Third, we will perform a systematic literature review and, if possible, conduct meta-analyses. Thereby, our bias rating will be taken into account. Furthermore, gender and the length of survival (in order to check whether body image problems may fade over time) will be considered. Women were found to be more dissatisfied with their bodies, overestimate their body size, or feel more ashamed about their bodies than men, although body issues in men seem to be on the rise in the last years (see [19] for an overview). Therefore, gender differences may also be apparent in cancer survivors.

Method

Search strategy

In March 2013, the databases Medline, Cinahl, Embase, and PsycInfo were searched for studies including the key terms body image and neoplasms (incl. their mesh terms, e.g., body image disturbances, appearance, cancer). In addition, the search was extended to studies with the terms body image, and cancer or oncology in title and abstract. Studies published before 1980 and labeled with certain publication types (i.e. focus groups, reviews, and case-reports) were excluded from the search.
Eligibility

Determining eligibility of the identified studies followed a two-stepped procedure. First, based on title and abstract, studies were included if they investigated cancer survivors, reported on body image, and were written in English. Second, and based on full-text, we selected studies that included a healthy comparison group or norm scores. In addition, it was checked whether the survivor sample was indeed disease-free and off treatment at the time of study. If this was not clear in the manuscript, the corresponding author was contacted by email.

Critical appraisal and analyses

After establishing eligibility, data from the studies were extracted including demographic and clinical data of the survivor and control sample, the conceptualization of body image, the used questionnaires to measure body image, and the descriptive statistics of the body image measure (means and standard deviations). In case of incomplete outcome reporting (i.e. not reporting mean scores, standard deviations, and/or number of participants for each (sub-)group), the corresponding authors were contacted by email three times and asked to provide this information.

In order to estimate potential bias within each study, we critically appraised them regarding potential selection, measurement, and reporting bias (see the results section for more details). Subsequently, studies reporting complete descriptive statistics were intended to be included in a meta-analysis (with the mean difference in body image scores between survivors and controls as primary outcome measure). In addition, we intended to perform sub-meta-analyses, based on our bias rating, gender, and length of survival.

Results

The initial search yielded 1932 hits after duplicate extraction, which were screened by the first author for potential full-text review. Twenty-five percent of these references were double-screened by the last author for inter-rater reliability, finding a concordance of 86%. Eight hundred and forty-nine studies were identified as potentially including cancer survivors and measuring body image, and after full text assessment 25 case-control studies were identified and included in this review (see flow chart in Figure 1 and Table 1).
<table>
<thead>
<tr>
<th>first author</th>
<th>age</th>
<th>cancer type</th>
<th>survival since</th>
<th>sample specifics</th>
<th>BI instrument</th>
<th>controls</th>
<th>authors reported:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahn [20]</td>
<td>47</td>
<td>breast</td>
<td>[s] great range</td>
<td>(15-143m)</td>
<td>EORTC-</td>
<td>general population</td>
<td>no difference</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[d] short-term</td>
<td>(&lt;2y)</td>
<td>BR-23 [21]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[l] great range</td>
<td>(1-10y)</td>
<td>DSFI [23]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>lesbian, bisexual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Survivors: lower sexual attractiveness</td>
</tr>
<tr>
<td>Boehmer [24]</td>
<td>52</td>
<td>breast</td>
<td>[d] short-term</td>
<td>(4.5y ± 2.3)</td>
<td>matched by age, sex, SES</td>
<td>Survivors: certain change in body image to a greater extent</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>lesion, bisexual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bukovic [26]</td>
<td>-</td>
<td>breast</td>
<td>[t] great range</td>
<td>(1-10y)</td>
<td>self-developed</td>
<td>women matched by relationship status, age</td>
<td>Survivors: answered the questions more often negatively</td>
</tr>
<tr>
<td>Calaminus [27]</td>
<td>8-17</td>
<td>leukemia, mixed</td>
<td>[t] short-term</td>
<td>(1-5y)</td>
<td>self-developed</td>
<td>unmatched female</td>
<td>Survivors: better body image</td>
</tr>
<tr>
<td></td>
<td></td>
<td>solid tumor, leukemia</td>
<td>[d] great range</td>
<td>(1-10y)</td>
<td>self-developed</td>
<td>matched by age, age, SES</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>mixed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calaminus [28]</td>
<td>12</td>
<td>mixed</td>
<td>[d] great range</td>
<td>(1-10y)</td>
<td>self-developed</td>
<td>matched by gender</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>breast</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohen [29]</td>
<td>51</td>
<td>breast</td>
<td>[d] great range</td>
<td>(1-17y)</td>
<td>Arabic and married</td>
<td>women matched by age, education, marriage</td>
<td></td>
</tr>
<tr>
<td>Falk Dahl [31]</td>
<td>55</td>
<td>breast</td>
<td>[t] short-term</td>
<td>(3-5y)</td>
<td>BIS-5 [32]</td>
<td>women matched by age, SES</td>
<td>Survivors: more often self-conscious and dissatisfied when dressed</td>
</tr>
<tr>
<td>Katre [33]</td>
<td>66</td>
<td>oral, oropharyngeal</td>
<td>[s] great range</td>
<td>(1-14y)</td>
<td>DAS24 [34]</td>
<td>women matched by age, age, SES</td>
<td>no difference</td>
</tr>
<tr>
<td>Kriss [35]</td>
<td>51</td>
<td>breast</td>
<td>[t] short-term</td>
<td>(m=12m)</td>
<td>BIS [36]</td>
<td>unmatched, but similar</td>
<td>Survivors: more disfavor of the amputated breast</td>
</tr>
<tr>
<td>Lee [37]</td>
<td>56</td>
<td>gastric adenocarcinoma</td>
<td>[t] long-term</td>
<td>(5y follow-up)</td>
<td>EORTC-STO-22 [38]</td>
<td>matched by age, age, race</td>
<td>Survivors: poorer body image</td>
</tr>
<tr>
<td>Madan-Swain [40]</td>
<td>16</td>
<td>leukemia, mixed</td>
<td>[t] long-term</td>
<td>(5.5-13y)</td>
<td>MAPI [41]</td>
<td>matched by age, age, race</td>
<td>Survivors: body comfort more problematic, unresolved, and major concern</td>
</tr>
</tbody>
</table>

Table 1: Overview of the 25 studies included in this review
<table>
<thead>
<tr>
<th>Author</th>
<th>Age (range)</th>
<th>Cancer Type</th>
<th>Staging/Duration</th>
<th>Measurement</th>
<th>Matching Criteria</th>
<th>Survivor Group Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maggiolini</td>
<td>12-20</td>
<td>leukemia</td>
<td>[d] great range (off [t] &gt; 2y) excl. BMT</td>
<td>OSIQ [43]</td>
<td>matched by age, gender, SES</td>
<td>survivors: better self-image</td>
</tr>
<tr>
<td>Moadel</td>
<td>36</td>
<td>Hodgkin's disease, mixed</td>
<td>[t] great range (8m – 16y)</td>
<td>non gynecological in relationship; amenorrheic; had HRT</td>
<td>DSFI [23]</td>
<td>matched by age, gender, SES</td>
</tr>
<tr>
<td>Molassiotis</td>
<td>35</td>
<td>leukemia, lymphoma 1: short-term (7-97m)</td>
<td>1: only BMT</td>
<td>self-developed</td>
<td>unmatched students</td>
<td>both survivor groups: greater dysfunction</td>
</tr>
<tr>
<td>Mumma</td>
<td>33/25</td>
<td>leukemia</td>
<td>[t] great range (64m ±38) aged 15-40 at diagnosis</td>
<td>DSFI [23]</td>
<td>norm scores</td>
<td>survivors: poorer body image</td>
</tr>
<tr>
<td>Park</td>
<td>25-87</td>
<td>cervical cancer</td>
<td>[t] great range (&lt;5y to &gt;15y) EORTC-CX-24 [48]</td>
<td>composite of 6 validated measures</td>
<td>Polivy's BIS [51, 52]</td>
<td>matched by age, gender, ethnicity</td>
</tr>
<tr>
<td>Pendley</td>
<td>11-21</td>
<td>lymphoma, mixed</td>
<td>[t] short-term (17m ±8.7) no physical disabilities</td>
<td>EORTC-CX-24 [48]</td>
<td>matched by age, gender, ethnicity</td>
<td>unmatched, but similar</td>
</tr>
<tr>
<td>Penman</td>
<td>30-69</td>
<td>breast</td>
<td>[s] great range (0-15m)</td>
<td>female, diagnosed prior 1986</td>
<td>OSIQ [43]</td>
<td>matched by gender, age</td>
</tr>
<tr>
<td>Puukko</td>
<td>17 (&gt;14)</td>
<td>leukemia</td>
<td>[t] long-term (6.8y ±3.1)</td>
<td>Polivy's BIS [51, 52]</td>
<td>unmatched women</td>
<td>survivors: less negative feelings about body parts</td>
</tr>
<tr>
<td>Reaby</td>
<td>50/63</td>
<td>breast</td>
<td>[s] short-term (m=3.2y)</td>
<td>Polivy's BIS [51, 52]</td>
<td>unmatched women</td>
<td>survivors: more positive Appearance Evaluation; less positive Appearance Orientation</td>
</tr>
<tr>
<td>Sabiston</td>
<td>57</td>
<td>breast</td>
<td>[t] great range (several months - 27y) (attending dragon boating celebration)</td>
<td>MBSRQ [56]</td>
<td>unmatched women</td>
<td>survivors: higher body dissatisfaction</td>
</tr>
<tr>
<td>Sertoz</td>
<td>41</td>
<td>breast</td>
<td>[t] short-term (m=3y) mastectomy menstruating</td>
<td>Body Cathexis Scale [58]</td>
<td>matched by age</td>
<td>survivors: poorer body image</td>
</tr>
<tr>
<td>Trninic</td>
<td>65/60</td>
<td>colorectal cancer</td>
<td>[s] short-term (1-2y)</td>
<td>EORTC-CR-38 [60]</td>
<td>unmatched, but similar</td>
<td>survivors: poorer body image</td>
</tr>
</tbody>
</table>

[s] = surgery; [d] = diagnosis; [t] = treatment; * reported for chemotherapy / bone marrow transplant; † reported for reconstruction/ breast prosthesis; ‡ reported for colostomy/ without colostomy
HRT = hormone replacement therapy
BMT = bone marrow transplant
Figure 1: Flow chart of in- and excluded studies

Conceptualization of Body Image

Almost all studies \((n=22)\) referred to the concept included in their research as body image, or more specifically to one sub-dimension: body image dissatisfaction \((n=1 [50])\), body image disturbances \((n=1 [40])\), and concerns about appearance \((n=1 [33])\). Only a minority of these studies defined the concept of body image in their introduction \((n=5 [29, 31, 54, 55, 57])\). They described it as the individual’s attitude to his or her physical appearance, health, functioning and sexuality [29], or as a subjective picture of an individual’s own physical appearance established by self-observation and by noting the reactions of others, including an attitude of satisfaction or dissatisfaction with one’s body [31]. Two studies more thoroughly defined body image as a multidimensional concept referring to perceptions of body appearance, thoughts, and beliefs regarding body shape.
and appearance, attitudes reflecting how individuals feel about their body size and shape, and behaviors that embody actions related to appearance [55], as well as feelings, perceptions, and attitudes towards one’s physical self, appearance, overall wholeness, and functionality [57]. Another study also simply put it as the picture of her or his body that a person carries in her or his mind [54].

Nine studies indicated their conceptualization of body image by describing their used body image questionnaire in the method section [26-28, 35, 39, 44, 46, 49, 50]. The rest of the studies only referenced previous research about body image (n=4 [24, 33, 45, 53]) or did not define or introduce it at all (n=7 [20, 22, 37, 40, 42, 47, 59]).

**Measurement of Body Image**

It was striking that the 25 studies used 19 different scales to measure body image. The Body Image Subtest of the Derogatis Sexual Functioning Inventory [23], which assesses perceptions of one’s body and attractiveness, was most frequently used (n=3 [22, 44, 46]). Two other studies [31, 39] used the 5-item version of Hopwood’s Body Image Scale [32] predominantly addressing self-consciousness and body dissatisfaction. Another two studies [50, 54] used Polivy’s Body Image Scale [51] covering people’s satisfaction with different body parts, weight, and height (see also Table 1 for all included measures). Overall, these scales have a strong focus on feelings toward one’s physical appearance, and the satisfaction with it.

In addition, four studies [20, 37, 47, 59] used the questionnaires developed by the European Organisation for Research and Treatment Center (EORTC). These include a body image subscale that is also appearance-focused, but these questionnaires were specifically developed for usage in different cancer samples. As a consequence, at least one item relates to as a result of your disease or treatment and it is unclear how healthy controls would respond to such items. We contacted the respective authors of these studies in order to clarify how they formulated these items. Only one replied [59] acknowledging that items had been kept in their original format.

The validity of some measures has to be questioned as well, since they were self-developed for the specific study [26-28, 45]. In addition, other studies referred to the concept measured in their study as body image while using scales for sub-dimensions, such as body esteem [24], body satisfaction [27, 54, 57], or they used a scale entitled to measure
body comfort while referring to it as body image disturbance without further explanation [40].

Nevertheless, all studies seem to have measured body image or a related sub-dimension while putting an emphasis on appearance, overall warranting the inclusion of all studies into this review (see also Table 1).

**Potential Bias**

In order to assess potential bias introduced in each study, we critically appraised them (see Table 2). First, potential *selection bias* was evaluated based on recruitment, response rate, sample size, and the control group. We appraised it as good practice if survivors were approached consecutively (within the boundaries of the in- and exclusion criteria), response rate exceeded 50%, sample size of the survivor and control group was at least 50 each, and if controls were matched in terms of socio-demographic aspects. Eleven studies selected survivors in any kind of way, applied convenience sampling, or did not report their recruitment strategy and were considered as potentially introducing bias [22, 24, 27, 31, 35, 45, 49, 50, 54, 55, 59]. Response rate was assessed as biased in 8 studies (*n*=2 below 50%, [40, 47], *n*=6 not reported [26, 27, 29, 37, 49, 57]). Sample sizes differed largely ranging from 16 - 1933 cancer survivors and 12 studies reported on (sub-)samples with less than 50 survivors [22, 27, 28, 35, 40, 44, 45, 49, 53, 54, 57, 59]. About half of all studies (*n*=13) were potentially biased due to using unmatched control groups [20, 22, 26, 28, 35, 44-47, 50, 54, 55, 59].

Second, *measurement bias* was defined as using body image scales with reliability scores below .6 (not reported in any study) or as not reporting reliability scores (*n*=17 [20, 22, 24, 26, 28, 33, 35, 37, 40, 42, 44, 46, 50, 53, 54, 57, 59]). Moreover, four studies [26-28, 45] used self-developed (i.e. non-validated) scales to assess body image potentially introducing measurement bias into their studies.

Third, *reporting bias* was, according to our rating, introduced by studies that did not provide complete descriptive scores (*n*=7 [20, 27, 28, 33, 46, 47, 50]), or studies that categorized their data (*n*=3 [26, 31, 40]).

In total, we rated each study on six potential sources of bias and we appraised a study as considerably biased if we identified at least three sources of potential bias. Accordingly, the majority of included studies (*n*=16) had to be considered as such.
Table 2: Bias rating of the 25 studies (sorted by their total number of potential bias)

<table>
<thead>
<tr>
<th>1st author</th>
<th>recruitment</th>
<th>response rate</th>
<th>sample size</th>
<th>unmatched controls</th>
<th>measurement bias</th>
<th>reporting bias</th>
<th>bias score</th>
<th>favoring controls</th>
<th>no difference</th>
<th>favoring survivors</th>
<th>effect sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liavaag</td>
<td></td>
<td></td>
<td></td>
<td>n</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>d=.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maggiolini</td>
<td>[42]</td>
<td>n</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>d=.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohen</td>
<td>[29]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>d=.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boehmer</td>
<td>[24]</td>
<td>x</td>
<td>n (s)</td>
<td></td>
<td>2</td>
<td>+</td>
<td>0^</td>
<td>d=.54/ .16/.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lee</td>
<td>[37]</td>
<td>n</td>
<td></td>
<td></td>
<td>2</td>
<td>+</td>
<td>0^</td>
<td>d=.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sabiston</td>
<td>[55]</td>
<td>x</td>
<td>x (s)</td>
<td></td>
<td>2</td>
<td>+</td>
<td>0^</td>
<td>d=.14/.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puukko</td>
<td>[53]</td>
<td>x</td>
<td>n</td>
<td></td>
<td>2</td>
<td>0</td>
<td>0^</td>
<td>d=.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Katre</td>
<td>[33]</td>
<td>n</td>
<td>x</td>
<td></td>
<td>2</td>
<td>0</td>
<td>0^</td>
<td>d=.06/.09/.31/ .29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Falk Dahl</td>
<td>[31]</td>
<td>x</td>
<td>x</td>
<td></td>
<td>2</td>
<td>+</td>
<td>0^</td>
<td>OR=2.7/ 2.6/ 1.6/ 2.3 /1.4</td>
<td>d=.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sertoz</td>
<td>[57]</td>
<td>n</td>
<td>x</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0^</td>
<td>d=.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moadel</td>
<td>[44]</td>
<td>x</td>
<td>x n</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0^</td>
<td>d=.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendley</td>
<td>[49]</td>
<td>n</td>
<td>n x</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0^</td>
<td>d=1.29/ .80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mumma</td>
<td>[46]</td>
<td>x</td>
<td>n x</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0^</td>
<td>d=.19/ 1.29/ 1.92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Park</td>
<td>[47]</td>
<td>x</td>
<td>x x</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0^</td>
<td>d=1.83/ .06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ahn</td>
<td>[20]</td>
<td>x</td>
<td>n x</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0^</td>
<td>d=1.83/ .53</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Trninic</td>
<td>[59]</td>
<td>x</td>
<td>x x n (s)</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0^</td>
<td>d=1.29/ .80</td>
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</tr>
<tr>
<td>Kriss</td>
<td>[35]</td>
<td>x</td>
<td>x x n (s)</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0^</td>
<td>d=1.19/ 1.29/ 1.92</td>
<td></td>
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<tr>
<td>Mollasiotis</td>
<td>[45]</td>
<td>n</td>
<td>x x m (s)</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0^</td>
<td>d=1.83/ 1.05</td>
<td></td>
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<tr>
<td>Reaby</td>
<td>[54]</td>
<td>x</td>
<td>x x n (s)</td>
<td></td>
<td>4</td>
<td>+</td>
<td>0^</td>
<td>d=1.83/ 1.53</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Blackmore</td>
<td>[22]</td>
<td>x</td>
<td>x x n</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0^</td>
<td>d=1.0</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Bukovic</td>
<td>[26]</td>
<td>n</td>
<td>x m^*</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0^</td>
<td>OR=2.05</td>
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<tr>
<td>Madan-Swain</td>
<td>[40]</td>
<td>x</td>
<td>x n x</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0^</td>
<td>Δ=.15</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Penman</td>
<td>[50]</td>
<td>x</td>
<td>x n x</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calaminus</td>
<td>[28]</td>
<td>x</td>
<td>x m^*</td>
<td></td>
<td>4</td>
<td>+</td>
<td>0^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calaminus</td>
<td>[27]</td>
<td>n</td>
<td>n x m</td>
<td></td>
<td>5</td>
<td>0</td>
<td>0^</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

# studies 11 8 12 13 17/4 10 10 9 3

n = not reported; studies received an ‘x’ for potential bias in:

recruitment: selected or convenience sample (‘*’ = recruitment of one subgroup not reported); response rate: <50%; b no response rate due to convenience; sample size: <51; unmatched controls: controls were not intentionally matched; measurement: reliability of scales <.6; m=self-developed measure; reporting: reported no or incomplete means and/or standard deviations (s = reported descriptive statistics for subscales or subgroups); compared subgroups without providing n per group; studies reported mixed findings; note that we had to calculate odds ratios (OR) and Cliff’s Delta as measures of effect due to dichotomized and categorical results. Cliff’s Δ of .1 should be considered weak as scores above .44 are comparable to d=.8 [61]

Statistical Meta-analyses

Due to reporting bias, 10 studies (40%) automatically excluded themselves from our planned meta-analyses. In addition, the high number of studies with considerable bias (n=16/25 and n=8/15 for a statistical meta-analysis) questioned the quality and reliability of their results, and leading us to doubt whether meta-analyses should be performed.

Aggregating results from potentially biased studies into one meta-analysis probably leads to
a highly heterogeneous and biased outcome. Therefore, we refrained from performing statistical meta-analyses.

**Systematic Review**

Based on what the studies reported, 10 (40%) found a more negative body image in survivors compared to controls [26, 27, 35, 37, 40, 45-47, 57, 59]. Another nine studies (36%) reported no significant differences [20, 22, 29, 33, 39, 44, 49, 50, 53], and three found both (12%; due to reporting results of several subscales [24, 55], or separate items [31]). Finally, three studies (12%) reported a more positive body image in survivors than controls ([28, 42, 54]; see Table 1).

In order to estimate the relevance of each study’s finding, we calculated effect sizes and reviewed the studies’ findings in combination with the identified level of potential bias. Studies with a small number of potential bias (i.e. ≤2 sources, n=9) showed very weak to moderate effect sizes, $d=.01$ - .54. These studies reported no differences between survivors and controls (n=4) or mixed findings (n=3). The studies reporting no differences included female survivors of leukemia [53], ovarian [39], and breast cancer [29], as well as a mixed gender sample of oral cancer survivors [33]. The studies reporting mixed findings included female breast cancer survivors only [24, 31, 55]. In addition, one study among mixed gender survivors of gastric cancer [37] reported a weak difference ($d=.29$) favoring healthy controls, while the other [42] reported a moderate difference ($d=.53$) favoring survivors. The latter, however, included young leukemia cancer survivors (aged 12-20) and excluded those that had received a bone marrow transplant, which is the treatment modality with the highest physical impact [62]. In that sense, their result probably only applies to this specific, better functioning, group of young survivors.

Among studies with a higher level of bias (i.e. ≥3 sources, n=16), we calculated effect sizes ranging from $d=.03$ – 1.92. Most interestingly, we found strong effects ($d \geq .8$) exclusively in five of these more biased studies (of which four reported a worse [35, 45, 57, 59] and one reported a more positive [54] body image in cancer survivors), which have to be regarded as less convincing (see also Table 2).

Overall, the results indicate a more negative body image in survivors than controls, while less biased studies indicate that these differences are small. Studies reporting several aspects/ sub-dimensions of body image may actually indicate which aspects could be bothersome for cancer survivors: Survivors were found to report more negative scores than
controls regarding appearance evaluation [55], sexual attractiveness [24], self-consciousness [31], and feelings towards the body [35] while weight concerns, physical condition [24], body dissatisfaction or avoiding people because of one’s appearance [31] did not differ.

**Subgroups**

**Gender.** Numerous studies (n=14) included exclusively female samples (another nine studies examined mixed gender samples, and two included men only). These studies included female survivors of breast (n=10 [20, 24, 26, 29, 31, 35, 50, 54, 55, 57]), cervical (n=1 [47]), ovarian (n=1 [39]), leukemia (n=1 [53]), and mixed cancer diagnoses (n=1 [44]). Almost half of them (n=6 [20, 29, 39, 44, 50, 53]) reported no significant differences between female survivors and controls, but bias was common.

Three out of six less biased studies [29, 39, 53] reported no differences between female survivors and controls where we found effects sizes of d=.05 - .20 accordingly. Two studies [24, 31] reported mixed findings (i.e. no differences and worse body image aspects in survivors) with effects up to .54. The sixth study [55] reported significant differences on two subscales, once more positive scores in survivors (on appearance evaluation) and once in controls (on appearance orientation); but effect sizes were weak with d=.14 and .15 accordingly.

The other eight studies examining female survivors were considerably biased [20, 26, 35, 44, 47, 50, 54, 57]. Four of them favored healthy controls [26, 35, 47, 57] where we found strong effects (i.e. d=.77 - 1.92), while three reported no differences [20, 44, 50] of which we could calculate effect sizes for only one study (d=.25 [44]). Finally, one study [54] reported a more positive body image in female breast cancer survivors, but had four sources of potential.

Exclusively male samples were included in only two studies [22, 45] of which one reported no differences between survivors and controls [22] while the other reported a more negative body image in male survivors [45]. However, we identified four sources of potential bias in each of these two studies.

To conclude, it was indicated in less biased studies that female cancer survivors are comparable to healthy controls. However, conclusions about body image in male survivors cannot be drawn. Support for no gender differences comes from two mixed gender studies that actually compared male and female survivors to healthy controls separately. They found both sexes to report similar results and hence their comparison to healthy controls
was similar: The less biased study reported no differences [33] while the more biased study [46] reported poorer body image in male and female survivors compared to norm scores

**Varying Survival Time.** As outlined in the introduction, body image problems may be more common shortly after treatment and may change in the course of prolonged survival. We grouped studies according to whether they included short-term survivors (i.e. less than 5 years of survival), long-term survivors (i.e. at least 5 years of survival), or a sample of survivors with varying ranges of survival (i.e. including both short- and long-term).

Studies including short-term survivors (n=10) were predominantly studies with a high number of potential bias (n=8). Most of them (n=5 [27, 35, 45, 57, 59]) reported a worse body image in survivors with effects sizes ranging from $d=0.77 - 1.92$ accordingly. Only two less biased studies included short-term survivors reporting mixed findings indicating self-consciousness and dissatisfaction [31] as well as sexual attractiveness [24] to be more negative in survivors than controls (as mentioned before). Conclusions about whether body image might be impaired in the short-term after cancer diagnosis cannot be drawn as too many studies had too many sources of bias.

Fifteen studies included longer term survivors (i.e. n=3 long-term, n=12 varying ranges of survival) and considerable bias was identified in eight of these studies [20, 26, 28, 40, 44, 46, 47, 50]. Their potentially biased findings most often indicated a worse body image in cancer survivors [26, 40, 46, 47] or no differences [20, 44, 50]. More importantly, the majority of the less biased studies (n=4 out of 7, [29, 33, 39, 53]) indicated no body image differences between survivors and healthy controls with effects sizes up to $d=0.20$. Therefore, the results more convincingly hint to no differences between longer term survivors and controls.

**Discussion**

This is the first systematic review summarizing the psycho-oncological literature regarding body image in cancer survivors compared to healthy controls. Twenty-five studies could be included in which we identified problems regarding the conceptualization and measurement of body image, as well as potential selection, measurement, and reporting bias. We found indications that the body image of cancer survivors seems somewhat less favorable than that of healthy controls, but differences are small. Clearly, more high quality
studies are needed before reliable conclusions can be drawn and several aspects should be considered regarding future studies and regarding this review.

**Conceptualization and Measurement.** Almost half of the included studies did not elaborate on how they defined body image. An explanation might be that numerous studies did not use body image as their main outcome, but rather as a secondary or explanatory variable. This, however, gives us some confidence that publication bias is low in that sense that null-findings are not very likely to be underreported. Nevertheless, the variety of scales that were used to measure body image is worrisome, especially the usage of self-developed scales of which reliability and validity has to be questioned. The development of new scales seems redundant given the variety of measures that already exist. The majority of scales used in the 25 studies seemed to emphasize feelings and perceptions of one’s appearance, the satisfaction with it, as well as self-rated attractiveness. Therefore, psycho-oncological research in cancer survivors seems to focus on appearance when it comes to body image. We appraise this as a good approach. Cancer survivors might be left with functional impairments which can be visible or not (e.g., reduced physical fitness, amputations, stomas, etc.), and therefore, they may objectively have a worse physical functioning than healthy people, but that does not imply that they also feel negative about their physical appearance. Hence, a research focus on appearance and the overall satisfaction with one’s body is an important asset next to assessing functional impairments due to cancer in cancer survivors.

**Bias.** The majority of studies \((n=16)\) had at least three sources of potential bias. We frequently observed the usage of pre-selected and small samples, unmatched controls, and not reporting response rates. All of these aspects (potentially contributing to selection bias) restrict conclusions as to whether body image is impaired in cancer survivors. In addition, the studies used various measurement instruments and barely indicated reliability scores, again putting the reliability of study findings into question. Furthermore, the reporting of study findings was too often incomplete.

**A Failed Meta-Analysis and Systematic Review.** Due to considerable potential bias detected in the included studies, a meta-analysis would have been highly biased as well. Therefore, we would like to make this a case of a ‘failed meta-analysis’ [63], meaning that the available data (i.e. the included studies) did not permit aggregation into a meta-analysis. Instead, we focused on our systematic review.
In order to make this review stronger, we calculated effect sizes for each study (if possible) and focused on these results in combination with the amount of potential bias detected in each study. We found weak to strong effects more often indicating that cancer survivors reported a more negative body image than controls. However, studies indicating strong effects ($d \geq 0.8$) and hence clinically relevant differences between survivors and controls were considerably biased. Therefore more convincing evidence, found in less biased studies, points to only small differences between survivors and controls, favoring healthy controls.

Nevertheless, survivor samples were sometimes highly specific due to employed inclusion and exclusion criteria (e.g., excluding certain treatment types or people with disabilities, including pre-menopausal women, etc., see Table 1). This potentially increased heterogeneity across studies and limited the generalizability of all findings.

**Subgroups.** It appeared that female survivors did not differ from healthy female controls. Hence, the potential vulnerability of women in developing body image problems after cancer was not convincingly demonstrated in the included studies. Length of survival, on the other hand, could be an important factor. We found indications that survivors who were longer after diagnosis were most likely comparable to healthy controls, while findings about short-term survivors were not indicating clear directions.

**Conclusions.** Studies in survivors of various cancer types and varying times of survival point to a small negative impact of cancer on body image, an impact that is not very likely to persist long-term. However, our review was hampered by numerous aspects as indicated throughout this discussion: The conceptualization of body image was often unclear in the included studies, measurement varied (but emphasized appearance), various sources of bias were detected, heterogeneity was high, female samples were overrepresented, and outcome reporting was often incomplete. In addition, there were aspects we could not systematically include in this review (due to the limited number of studies). For example, the potential impact of different cancer types, treatment types, or the presence of physical late effects.
Nevertheless, this review was long overdue, pointing out problems in studies examining cancer survivors’ body image in comparison to healthy controls. Future studies should carefully consider the following points in order to draw reliable conclusions as to whether body image might be impaired in (specific groups of) cancer survivors:

» clarify the conceptualization of body image
» use validated instruments to measure body image; and only slightly adapt them to your purposes if necessary
» it is recommended to use Hopwood’s Body Image Scale [32] or the body image subtest of the Derogatis Sexual Functioning Inventory [23]
» match survivors and controls (at least) on age and gender
» aim for larger samples, also allowing subgroup comparisons (i.e. based on cancer-relevant aspects such as cancer type or treatment)
» report complete descriptive statistics
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