ORIGINAL RESEARCH ARTICLE

General population normative scores for interpreting the BODY-Q

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Summary

The BODY-Q is a patient-reported outcome measure used to assess outcomes in patients undergoing weight loss and/or body contouring surgery (BC) following massive weight loss. Normative values for the BODY-Q are needed to improve data interpretation and enable comparison. Thus, the aim of this study was to determine normative values for the BODY-Q. Participants were recruited internationally through two crowdsourcing platforms. The participants were invited to complete the BODY-Q scales through an URL link provided within the crowdsourcing platforms. General linear analyses were performed to compare normative means between countries and continents adjusted for relevant covariates. Normative reference values were stratified by age, body mass index (BMI), and gender. The BODY-Q was completed by 4051 (2052 North American and 1999 European) participants. The mean age was 36 years (±14.7 SD) and ranged from 17 to 76 years, the mean BMI was 26.4 (±6.7 SD) kg/m^2, and the sample consisted of 1996 (49.3%) females and 2023

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(49.9%) males. Younger age and higher BMI were negatively associated with all BODY-Q scales ($p < .001$). This study provides normative values for the BODY-Q scales to aid in the interpretation of BODY-Q scores in research and clinical practise. These values enable us to understand the impact of weight loss and BC on patients' lives.

KEYWORDS
bariatric surgery, body contouring, general population norms, normative scores, patient-reported outcome measure, patient-reported outcomes, quality of life, weight loss surgery

What is already known about this subject

- The BODY-Q is the psychometrically strongest, reliable, and responsive patient-reported outcome measure for use in weight loss and/or body contouring surgery.
- There is a lack of available general population norms for the BODY-Q as a reference point of patient's level of satisfaction with appearance, health-related quality of life (HRQL), and eating-related concerns.

What this study adds

- International general population normative scores generated from 4051 (2052 North American and 1999 European) participants for the following BODY-Q domains: appearance, HRQL, and eating-related concerns.
- First population norms of the BODY-Q scales to provide clinically relevant reference points for the interpretation of the BODY-Q.
- Normative scores enable us to understand the impact of weight loss and body contouring surgery following massive weight loss for research, future clinical care, and healthcare policy.

1 | INTRODUCTION

Since 1975, obesity has tripled with over 650 million people worldwide living with obesity.[1] Weight loss interventions, including lifestyle, medical, and surgical treatments, all aim to achieve long-term weight loss and remission of obesity-related co-morbidities.[2,3] However, massive weight loss often leads to people having varying amounts of excess skin, where subsequent body contouring surgery (BC) is needed.[4–6] To facilitate evidence-based and patient-centred care, understanding the impact of different weight loss treatments and subsequent BC on patients' lives is pivotal to optimising outcomes.[7]

Patient-reported outcome measures (PROM) are questionnaires used to measure health outcomes from the patient's perspective. To accurately measure patient-reported outcomes (PRO) validated, reliable and responsive condition-specific PROMs are needed.[8] Over the past decade, a vast array of PROMs have been used in weight loss and BC, many of which do not possess strong evidence of reliability and validity for the patient population.[9–12] The BODY-Q, introduced in 2016 is a rigorously developed and psychometrically validated PROM that measures outcomes of patients who undergo weight loss and/or BC.[4,13–15] The BODY-Q was developed following internationally recommended guidelines for PROM development and used a modern psychometric approach to measure concepts that matter most to patients. The conceptual framework covers four domains: appearance, health-related quality of life (HRQL), experience of health care, and eating-related concerns.[12,14,16] The four domains are organised into independently functioning scales (Figure 1), allowing the researchers and clinicians to administer the scale(s) that is most relevant to their practise or research question and reducing overall burden on patients.[17] The BODY-Q has been shown to be responsive to change and subsequently, can be used to measure change over the entire weight loss trajectory, i.e., from obesity to weight loss with or without BC.[14,18,19]

Since its development, the BODY-Q has been increasingly used worldwide.[4–6,20–24] Recent systematic reviews based on the Consensus-based Standards for the selection of health Measurement Instruments (COSMIN) methodology recommended the BODY-Q as the psychometrically strongest PROM for use in weight loss, particularly in bariatric surgery (BaS) and BC.[12,13] However, a current limitation of the BODY-Q is the lack of available general population norms as a reference point of the levels of satisfaction with appearance, eating-related concerns, and HRQL. Although the BODY-Q has been used to demonstrate the efficacy of weight loss therapy and BC,[4,22] it is not yet known how published preoperative and postoperative scores compare to population norms. Scores from the general population would enable a better understanding of HRQL of obesity and change through the weight loss trajectory.
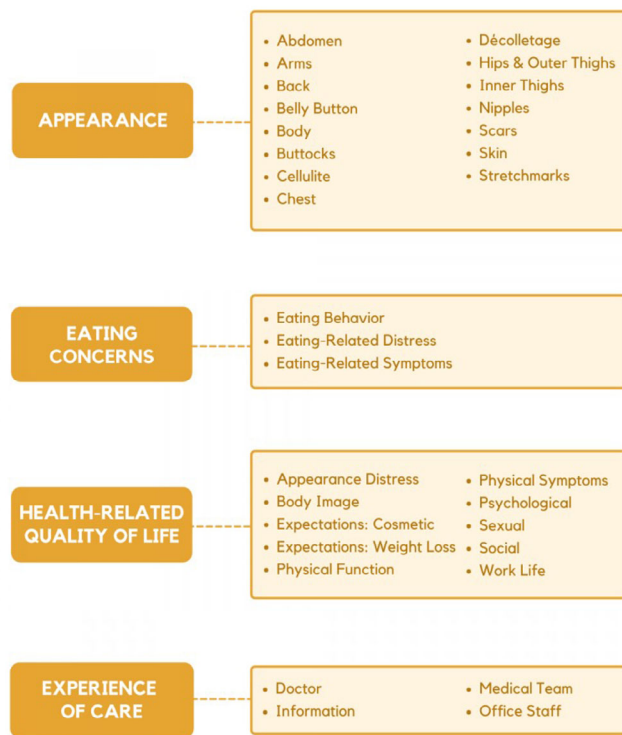
FIGURE 1 BODY-Q Framework[17]

The primary aim of this study was to determine BODY-Q scores for the general population as reference values for comparative purposes in research and clinical use. The secondary aim was to compare normative scores for North America and Europe, and to investigate associations between BODY-Q scores and age, gender, and body mass index (BMI).

2 | MATERIALS AND METHODS

We conducted an international study to collect BODY-Q scores from the general population in a total of 12 countries in North America and Europe. The European sample was approved by the Danish data protection agency. In Denmark, ethical approval is not required for survey-based studies. The North American study sample was approved by the institutional review board (Mass General Brigham [MGB] Institutional Review Board [IRB], United States [US]). All data and informed consent were obtained electronically in accordance with the Danish data protection agency and the MGB IRB.

2.1 | Recruitment of participants

Participants (18 years and older) were recruited through the crowdsourcing platforms in September 2020 for Prolific Academic

(www.prolific.co)[25] and February 2021 for Amazon Mechanical Turk (MTurk) (www.MTurk.com).[26] Through an URL link provided within Prolific and MTurk, participants were invited to read a study information letter and if interested in the study to complete the BODY-Q in their own language on an electronic survey platform, the REDCap survey platform. Participants were compensated per their institutional policies and a minimum of 6.50 USD per hour for completing the surveys. The following countries were included in North America and Europe: Belgium, Canada, Denmark, England, Finland, France, Germany, Italy, Netherlands, Poland, Sweden, and United States.

2.2 | Demographic variables

The following demographic variables were collected: age, gender, weight, height, ethnicity (White or other), marital status, educational level, and employment status. Data were collected on weather participants had undergone prior weight loss treatments including diet, behaviour, lifestyle-management changes, weight loss medications, endoscopic procedure, and BaS and/or prior BC procedure. Participants were also asked if they had any of the following co-morbidities including diabetes, hypertension, hyperlipidemia, obstructive sleep apnea, osteoarthritic disease, cardiovascular disease, and reflux disease.

2.3 | The BODY-Q

The BODY-Q was originally developed in English and field-tested in the United States, Canada, and the United Kingdom. The development involved a literature review, qualitative and cognitive interviews with patients, and expert input.[14,16,18,27–29] Currently, the scales have been translated into 19 languages for use in the following countries: Arabic Speaking Countries (Modern Standard), Belgium, Brazil, China (*China, Hong Kong, Taiwan*), Denmark, Finland, France, Germany, Greece, Italy, Japan, Netherlands, Norway, Poland, Russia, Spain, and Sweden. All translations followed recommended guidelines from the International Society for Pharmacoeconomics and Outcomes Research and/or the World Health Organization.[17,30–34]

The BODY-Q scales that measure appearance, HRQL, and eating-related concerns domain, were used to determine normative scores from the general population. For the appearance domain, 12 scales were included: body, abdomen, arms, back, buttocks, hips and outer thighs, inner thighs, chest, nipples, stretch marks, excess skin, and cellulite. For the HRQL domain, seven scales were included: psychological, physical, social, sexual, body image, work, and appearance distress. All three scales from the eating-related concerns domain were included: eating symptoms (e.g., vomiting, reflux, dumping), eating-related distress (e.g., feeling ashamed or out of control after eating), and eating behaviour (e.g., stop eating before feeling full, avoiding unhealthy snacks) scales.[14,16,27,29]

Each scale has between four and 10 items. Items are scored on a Likert scale from 1 (e.g., very dissatisfied) to 4 (e.g., very satisfied). The

summed raw scores in a scale are transformed to scores between 0 and 100 using Rasch converted scoring tables. For all but one scale (exeption appearance distress) higher scores indicate a better outcome. Items with missing data can be scored by applying the mean of the completed items as long as at least half of the items are completed.[15,18,19,35]

2.4 | Statistical analysis

Statistical analyses were performed using IBM SPSS Version 27.0 statistical software (IBM Corp.) and figures were made in GraphPad Prism 8.0 (Graphpad Software).

Descriptive statistics including mean, standard deviation (SD), and 95% confidence interval (95% CI) were computed for continuous variables, while proportions were computed for categorical variables. Continuous and categorical non dichotomous variables were transformed into dichotomous variables. We created following age groups: 17–29, 30–39, 40–49, 50–59, >60 years, and BMI was grouped: <18.5, 18.50–24.9, 25–29.9, 30–34.9, 35–39.9, >40. Depending on the distribution of data and normality assumptions, the Rasch converted mean scores of all scales for each country were compared using a general linear model. The model was adjusted for relevant covariates: age, gender, BMI, ethnicity, educational level, employment, marital status, comorbidities, and weight loss treatment. The Bonferroni test was applied to account for multiple testing. For each country and continent, the means, standard error (SE), 95% CI, minimum and maximum scores, and *p* values were computed. For the total scores of all normative participants, means, SD, 95% CI, and *p* values were computed. In addition to the normative values for each scale, the mean scores were stratified according to age and BMI groups by gender after adjusting for the following covariates: comorbidities, educational level, employment, ethnicity, marital status, and weight loss treatment. These reference scores were summarised as means for use as reference standards.

3 | RESULTS

3.1 | Demographics

A total of 4051 (2052 North American and 1999 European) participants completed the study survey. The mean age of participants was 36 years (±14.7 SD) and ranged from 17 to 76 years. The mean BMI was 26.4 (±6.7 SD) kg/m^2. In the sample 1996 (49.3%) participants identified as female, 2023 (49.9%) identified as male, and 32 (0.8%) identified as another gender. The full demographic data are presented in Table 1.

3.2 | Total and continent-specific normative scores

Table 2 summarises the normative mean scores of participants separately for North Americans and Europeans. There were statistically significant differences between North America and Europe for nine of

12 appearance scales: arms (*p* < .001), back (*p* < .001), buttocks (*p* = .004), thighs (*p* = .008), skin (*p* = .015), chest (*p* = .004), nipples (*p* < .001), and stretch marks (*p* < .001). In all nine scales, the European participants scored higher than North American participants. For the HRQL scales, European participants scored significantly higher on social (*p* = .026), sexual (*p* = .018), body image (*p* = .017), and work life (*p* < .001), while North American participants scored significantly higher on appearance distress (*p* < .001). In the eating-related concerns domain, European participants scored higher on eating-related distress (*p* < .001) compared to North American participants. There were no differences in scores for eating-related symptoms and eating behaviour between the two continents.

Figure 2 (appearance scales) and Figure 3 (HRQL and eating concerns scales) show the mean scores for each continent as well as the mean scores of the combined sample. Table A1 shows the country specific scores of all scales.

3.3 | Factors associated with the BODY-Q scales

In all appearance and HRQL scales, younger age (*p* < .001), higher BMI (*p* < .001), and country of residence (*p* < .001) were negatively associated with BODY-Q scores. In addition, lower scores for scales measuring body, abdomen, back, inner thighs, hips and outer thighs, arms, buttocks, chest, stretch marks, and body image were associated with an attempt to lose weight (*p* < .001), female gender (*p* < .001), and comorbidities (*p* < .001). In addition, higher scores on psychological and sexual scales were associated with marital and employment status (*p* < .001), while physical scores were negatively associated with comorbidities (*p* < .001) and lower educational level (*p* < .001). Lower scores indicating higher appearance distress were associated with all confounders including younger age (*p* < .001), higher BMI (*p* < .001), female gender (*p* < .001), attempt of weight loss in the past (*p* < .001), marital status (*p* < .001), comorbidities (*p* < .001), employment status (*p* < .001), educational level (*p* < .001), and country (*p* < .001).

In the eating-related concerns scales younger age (*p* < .001), higher BMI (*p* < .005), and comorbidities as dichotomized variable (*p* < .001) were adversely associated to all three scales. Eating-related distress and eating-related symptoms were also associated with attempt of weight loss in the past (*p* < .001), female gender (*p* < .001), and ethnicity (*p* = .02).

3.4 | Normative scores stratified by age and BMI

The mean normative scores for each scale stratified by age, gender and BMI are shown in Table 3. Table 3 serves as a reference and overview of normative BODY-Q scores for each age- and BMI group adjusted for country, ethnicity, educational level, employment status, marital status, comorbidities, and weight loss treatment, and shows the normative values by gender for the different age and BMI groups. The chest scale is applicable to people who identify as male or transmale.

TABLE 1 Demographics

Characteristics	Total (4051)	North America (2052)	Europe (1999)	USA (1980)	Canada (72)	Denmark (159)	Netherlands (208)	Sweden (209)	England (207)	Poland (210)	Italy (204)	Belgium (178)	France (213)	Finland (206)	Germany (205)
Gender n (%)															
Female	1996 (49.3)	1191 (58.0)	805 (40.3)	1143 (57.7)	48 (66.7)	43 (27.0)	84 (40.4)	61 (29.2)	159 (76.8)	60 (28.6)	99 (48.5)	53 (29.8)	90 (42.3)	79 (38.3)	77 (37.6)
Male	2023 (49.9)	849 (41.4)	1174 (58.7)	825 (41.7)	24 (33.3)	115 (72.3)	124 (59.6)	147 (70.3)	48 (23.2)	147 (70)	102 (50.0)	123 (69.1)	122 (57.3)	120 (58.3)	126 (61.2)
Other	32 (0.8)	12 (0.6)	20 (1.0)	12 (0.6)	0 (0)	1 (0.6)	0 (0)	1 (0.5)	0 (0)	3 (1.4)	3 (1.5)	2 (1.1)	1 (0.5)	7 (3.4)	2 (1.0)
Age															
Mean (SD)	36.03 (14.36)	43.08 (14.65)	28.79 (9.72)	42.61 (14.64)	55.81 (7.20)	28.07 (8.60)	27.13 (9.67)	29.35 (8.68)	35.92 (13.58)	23.6 (6.79)	26.94 (8.26)	28.39 (7.82)	29.59 (9.82)	28.86 (8.20)	29.84 (9.23)
Minimum; maximum	17; 76	18; 76	17; 74	18; 76	28; 73	18; 66	18; 74	17; 61	18; 74	17.0; 61.0	18; 61	18; 58	18; 71	17; 58	17; 65
Age group															
17–29	1773 (43.7)	507 (24.7)	1266 (63.3)	506 (25.6)	1 (1.4)	100 (62.9)	155 (47.5)	123 (58.9)	77 (37.2)	177 (84.3)	153 (75.0)	117 (65.7)	129 (16.6)	123 (59.7)	112 (54.6)
30–39	870 (21.5)	384 (18.7)	486 (24.3)	384 (19.4)	0 (0)	46 (28.9)	30 (14.4)	60 (28.7)	65 (31.4)	25 (11.9)	33 (16.2)	47 (26.4)	55 (25.8)	60 (29.1)	65 (31.7)
40–49	508 (12.5)	360 (17.5)	148 (7.4)	347 (17.5)	13 (18.1)	8 (5.0)	13 (6.3)	16 (7.7)	29 (14.0)	6 (2.9)	11 (5.4)	10 (5.6)	18 (8.5)	18 (8.7)	19 (9.3)
50–59	581 (14.3)	516 (25.1)	65 (3.3)	477 (24.1)	39 (54.2)	3 (1.9)	6 (2.9)	9 (4.3)	18 (8.7)	1 (0.5)	6 (2.9)	4 (2.2)	7 (3.3)	5 (2.4)	6 (2.9)
60–69	319 (7.9)	285 (13.9)	34 (1.7)	266 (13.4)	19 (26.4)	2 (0.3)	4 (1.9)	1 (0.5)	18 (8.7)	1 (0.5)	1 (0.5)	0 (0)	4 (1.9)	0 (0)	3 (1.5)
BMI															
Mean (SD)	26.37 (6.67)	28.14 (7.43)	24.55 (5.19)	28.08 (7.44)	29.56 (7.25)	24.84 (5.16)	24.30 (4.93)	25.33 (5.68)	26.19 (6.13)	23.7 (4.57)	23.33 (4.22)	24.26 (5.17)	23.38 (4.66)	25.15 (5.18)	25.11 (5.30)
Minimum; maximum	15.40; 72.70	16.16; 72.70	15.40; 54.07	16.16; 72.70	19.14; 57.04	15.77; 44.66	15.71; 47.66	15.79; 49.48	16.05; 54.07	15.96; 44.73	16.42; 40.79	15.40; 45.33	15.85; 40.64	16.40; 44.71	17.44; 47.45
BMI groups															
<18.5	194 (4.8)	61 (3.0)	133 (6.7)	61 (3.1)	0 (0)	9 (5.7)	14 (6.3)	8 (3.8)	14 (6.8)	19 (9.0)	13 (6.4)	13 (7.3)	28 (13.1)	9 (4.4)	7 (3.4)
18.5–25	1913 (47.2)	766 (37.3)	1047 (75.4)	744 (37.6)	22 (30.6)	91 (57.2)	127 (16.1)	111 (53.0)	91 (4.4)	133 (36.3)	136 (66.7)	101 (56.7)	124 (58.2)	113 (55.1)	120 (58.5)
25–30	1039 (25.6)	588 (28.6)	451 (22.6)	564 (28.5)	24 (33.3)	33 (20.8)	39 (18.8)	61 (29.2)	55 (26.6)	38 (18.1)	39 (19.1)	41 (23.0)	40 (18.8)	55 (26.8)	50 (24.4)
30–35	494 (12.2)	328 (16.0)	166 (8.3)	313 (15.8)	15 (20.8)	16 (10.1)	22 (10.6)	14 (6.7)	27 (13.7)	14 (6.7)	11 (5.4)	14 (7.9)	14 (6.6)	17 (8.3)	17 (8.3)
35–40	224 (5.5)	153 (7.5)	71 (3.6)	151 (7.6)	2 (2.8)	8 (5.0)	6 (2.9)	8 (3.8)	16 (7.7)	5 (2.4)	4 (2.0)	5 (2.8)	5 (2.3)	7 (3.4)	7 (3.4)
>40	187 (4.6)	157 (7.6)	30 (1.5)	148 (7.5)	9 (12.5)	2 (1.3)	1 (0.5)	7 (3.3)	4 (1.9)	1 (0.5)	1 (0.5)	4 (2.2)	2 (0.9)	4 (2.0)	4 (2.0)
Comorbidities n (%)															
Diabetes	199 (4.9)	152 (7.4)	47 (2.3)	143 (7.2)	9 (12.5)	5 (3.1)	0 (0)	9 (4.3)	4 (1.9)	13 (6.2)	1 (0.5)	2 (1.1)	3 (1.4)	5 (2.4)	5 (2.4)
Hypertension	466 (11.5)	395 (19.2)	71 (3.5)	370 (18.7)	25 (34.7)	4 (2.5)	3 (1.4)	7 (3.3)	10 (4.8)	12 (5.7)	4 (2.0)	9 (5.0)	7 (3.3)	6 (2.9)	9 (4.4)
Hyperlipidemia	264 (6.5)	225 (11.0)	39 (1.9)	212 (10.7)	13 (18.1)	1 (0.6)	5 (2.4)	2 (1.0)	4 (1.9)	3 (1.4)	3 (1.5)	5 (2.8)	9 (4.2)	4 (1.9)	3 (1.5)
Obstructive sleep apnea	184 (4.5)	156 (7.6)	28 (1.4)	148 (7.5)	8 (11.1)	2 (1.3)	3 (1.4)	2 (1.0)	2 (1.0)	3 (1.4)	2 (1.0)	5 (2.8)	3 (1.4)	3 (1.5)	3 (1.5)
Osteoarthritic disease	259 (6.4)	227 (11.1)	32 (1.6)	211 (10.7)	16 (22.2)	0 (0)	7 (3.4)	2 (1.0)	10 (4.8)	2 (0.9)	2 (1.0)	1 (0.6)	2 (0.9)	1 (0.5)	5 (2.4)

(Continues)

TABLE 1 (Continued)

Characteristics	Total (4051)	North America (2052)	Europe (1999)	USA (1980)	Canada (72)	Denmark (159)	Netherlands (208)	Sweden (209)	England (207)	Poland (210)	Italy (204)	Belgium (178)	France (213)	Finland (206)	Germany (205)
Cardiovascular disease	64 (1.6)	44 (2.1)	20 (1.0)	44 (2.2)	0 (0)	2 (1.3)	1 (0.5)	2 (1.0)	3 (1.4)	5 (2.4)	1 (0.5)	1 (0.6)	1 (0.5)	1 (0.5)	3 (1.5)
Reflux disease	473 (11.7)	307 (15.0)	166 (8.3)	290 (14.6)	17 (23.6)	14 (8.8)	20 (9.6)	17 (8.1)	18 (8.6)	8 (3.8)	19 (9.3)	27 (15.1)	16 (7.5)	14 (6.8)	13 (6.3)
No medical condition	2881 (71)	1220 (59.5)	1161 (82.9)	1194 (63.0)	26 (36.1)	135 (84.9)	169 (81.3)	177 (84.7)	171 (81.8)	175 (82.9)	173 (84.9)	137 (76.5)	172 (80.8)	179 (86.9)	173 (84.0)
Educational level n (%)															
Attending high school	114 (2.8)	10 (0.5)	104 (5.2)	10 (0.5)	8 (11.1)	15 (9.4)	2 (1.0)	11 (5.3)	9 (4.3)	30 (14.3)	8 (3.9)	2 (1.1)	8 (3.8)	12 (5.8)	7 (3.4)
High school diploma	684 (16.9)	232 (11.3)	452 (22.6)	224 (11.3)	17 (23.6)	73 (45.9)	49 (23.6)	64 (30.6)	22 (10.6)	43 (20.5)	85 (41.7)	31 (17.4)	21 (9.9)	30 (14.6)	34 (16.5)
Some college-, trade-, or university degree	972 (24.0)	567 (27.6)	405 (20.3)	550 (27.8)	35 (48.6)	12 (7.5)	54 (26.0)	16 (7.7)	60 (29.1)	78 (37.1)	20 (9.8)	25 (14.0)	29 (13.6)	57 (27.7)	54 (26.2)
Completed college, trade or university	1330 (32.8)	845 (41.2)	485 (24.3)	810 (40.9)	2 (2.8)	24 (15.1)	56 (26.9)	53 (25.4)	84 (40.6)	25 (11.9)	42 (20.6)	46 (25.8)	66 (31.0)	42 (20.4)	47 (22.8)
Some master or doctoral degree	315 (7.8)	95 (4.6)	220 (11.0)	93 (4.7)	9 (12.5)	25 (15.7)	15 (7.2)	60 (28.7)	11 (5.3)	10 (4.8)	12 (5.9)	14 (7.9)	35 (16.4)	16 (7.8)	22 (10.7)
Completed masters or doctoral degree	596 (14.7)	299 (14.6)	297 (14.9)	219 (14.6)	1 (1.4)	10 (6.3)	31 (14.9)	5 (2.4)	21 (10.1)	23 (11.0)	31 (15.2)	58 (32.6)	54 (25.4)	24 (11.7)	40 (19.4)
Other	40 (1.0)	4 (0.2)	36 (1.8)	3 (0.2)	0 (0)	0 (0)	1 (0.4)	0 (0)	0 (0)	1 (0.4)	6 (2.9)	2 (1.1)	0 (0)	25 (12.1)	1 (0.5)
Employment n (%)															
Full time >35 h per week	1541 (38.0)	879 (42.8)	662 (33.0)	856 (43.2)	23 (31.9)	50 (31.4)	58 (27.9)	75 (35.9)	64 (30.6)	59 (28.0)	46 (22.5)	81 (45.3)	94 (44.1)	64 (31.1)	71 (34.5)
Part time <35 h per week	576 (14.2)	291 (14.2)	285 (14.2)	278 (14.0)	13 (18.1)	26 (16.4)	55 (26.4)	27 (12.9)	44 (21.1)	17 (8.1)	20 (9.8)	18 (10.1)	21 (9.9)	33 (16.0)	24 (11.7)
Unemployed (currently looking for work)	325 (8.0)	137 (6.7)	188 (9.4)	131 (6.6)	6 (8.3)	14 (8.8)	17 (8.2)	28 (13.4)	20 (9.6)	24 (11.4)	23 (11.3)	14 (7.8)	9 (4.2)	22 (10.7)	17 (8.3)
Unemployed (currently not looking for work)	116 (2.9)	51 (2.5)	65 (3.2)	49 (2.5)	2 (2.8)	3 (1.9)	7 (3.4)	9 (4.3)	10 (4.8)	12 (5.7)	1 (0.5)	2 (1.1)	9 (4.2)	6 (2.9)	6 (2.9)
Self-employed	425 (10.5)	292 (14.2)	133 (6.6)	286 (14.4)	6 (8.3)	5 (3.1)	19 (9.1)	11 (5.3)	13 (6.2)	12 (5.7)	15 (7.4)	6 (3.4)	18 (8.5)	16 (7.8)	18 (8.7)
Volunteer	50 (1.2)	26 (1.3)	24 (1.2)	26 (1.3)	0 (0)	2 (1.3)	5 (2.4)	3 (1.4)	0 (0)	4 (1.9)	4 (2.0)	1 (0.6)	3 (1.4)	2 (1.0)	0 (0)
Student	880 (21.7)	158 (7.7)	722 (36.0)	158 (8.0)	0 (0)	63 (39.6)	94 (45.2)	68 (32.5)	26 (12.4)	100 (47.4)	106 (52.0)	57 (31.8)	55 (25.8)	78 (37.9)	75 (36.4)
Retired	202 (5.0)	176 (8.6)	26 (1.3)	160 (8.1)	16 (22.2)	3 (1.9)	2 (1.0)	0 (0)	15 (7.2)	1 (0.5)	0 (0)	0 (0)	2 (0.9)	1 (0.5)	2 (1.0)

TABLE 1 (Continued)

Characteristics	Total (4051)	North America (2052)	USA (1980)	Canada (72)	Europe (1999)	Denmark (159)	Netherlands (208)	Sweden (209)	England (207)	Poland (210)	Italy (204)	Belgium (178)	France (213)	Finland (206)	Germany (205)
Unable to work	126 (3.1)	88 (4.3)	84 (4.2)	4 (5.6)	38 (1.9)	4 (2.5)	3 (1.4)	9 (4.3)	8 (3.8)	0 (0)	0 (0)	2 (1.1)	3 (1.4)	5 (2.4)	4 (1.9)
Caring for home or family	195 (4.8)	135 (6.6)	130 (6.6)	5 (6.9)	60 (3.0)	4 (2.5)	2 (1.0)	5 (2.4)	18 (8.6)	3 (1.4)	5 (2.5)	3 (1.7)	4 (1.9)	7 (3.4)	9 (4.4)
Others	23 (0.6)	9 (0.4)	7 (0.4)	2 (2.8)	14 (0.7)	2 (1.3)	0 (0)	2 (1.0)	0 (0)	3 (1.4)	2 (1.0)	1 (0.6)	1 (0.5)	2 (1.0)	1 (0.5)
Race n (%)															
White	3560 (87.9)	1716 (83.6)	1651 (83.4)	56 (90.3)	1844 (92.2)	145 (91.2)	180 (86.5)	192 (91.9)	178 (86.4)	209 (99.5)	185 (90.7)	165 (92.2)	194 (91.1)	197 (95.6)	198 (96.1)
Other	336 (8.3)	336 (16.4)	329 (16.6)	7 (9.7)	155 (7.8)	14 (8.8)	28 (13.5)	17 (8.1)	28 (14.6)	1 (0.4)	19 (9.3)	13 (7.3)	19 (8.9)	9 (4.4)	7 (3.4)
Marital status n (%)															
Married	1138 (28.1)	825 (40.2)	792 (40.0)	33 (45.8)	313 (15.7)	27 (17.0)	29 (13.8)	37 (17.7)	63 (30.6)	63 (30.5)	20 (9.8)	27 (15.1)	30 (14.1)	32 (15.5)	30 (14.6)
Living common law	548 (13.5)	142 (6.9)	135 (6.8)	7 (9.7)	406 (20.3)	55 (34.6)	40 (19.2)	16 (7.7)	37 (18.0)	37 (17.9)	23 (11.3)	38 (21.2)	47 (22.1)	52 (25.2)	18 (8.7)
Widowed	48 (1.2)	44 (2.1)	40 (2.0)	4 (5.6)	4 (0.2)	0 (0)	5 (2.4)	0 (0)	2 (0.9)	2 (0.9)	1 (0.5)	0 (0)	0 (0)	1 (0.5)	0 (0)
Separated	52 (1.3)	32 (1.6)	28 (1.4)	4 (5.6)	20 (1.0)	0 (0)	1 (0.4)	4 (1.9)	3 (1.4)	3 (1.5)	1 (0.5)	1 (0.6)	3 (1.4)	2 (1.0)	0 (0)
Divorced	262 (6.5)	233 (11.4)	222 (11.2)	11 (15.3)	29 (1.5)	2 (1.3)	1 (0.4)	4 (1.9)	10 (4.9)	10 (4.8)	0 (0)	4 (2.2)	3 (1.4)	4 (1.9)	0 (0)
Single	2003 (49.4)	776 (37.8)	763 (38.5)	13 (18.1)	1227 (61.4)	75 (47.2)	133 (63.8)	148 (70.8)	91 (44.2)	92 (44.4)	159 (77.9)	108 (60.3)	130 (61.0)	115 (55.8)	157 (76.2)
Weight loss treatment n (%)															
None	783 (22.4)	197 (13.2)	191 (13.3)	6 (10.3)	586 (29.3)	41 (25.8)	67 (32.2)	57 (27.3)	37 (17.9)	66 (31.4)	70 (34.3)	65 (31.5)	47 (34.7)	62 (40.1)	56 (27.3)
Tried to lose weight myself	2236 (64.1)	1017 (68.3)	979 (68.4)	48 (65.5)	1219 (61.0)	113 (71.1)	132 (63.5)	128 (61.2)	140 (67.6)	124 (59.0)	98 (48.0)	101 (65.7)	120 (65.3)	132 (62.1)	131 (63.9)
Weight loss program	371 (10.6)	200 (13.4)	194 (13.5)	6 (10.3)	171 (8.6)	4 (2.5)	6 (2.9)	20 (9.6)	27 (13.0)	17 (8.1)	35 (17.2)	19 (10.7)	16 (7.5)	9 (4.4)	18 (8.8)
Weight loss medication	68 (1.9)	54 (3.6)	51 (3.6)	3 (5.2)	14 (0.7)	0 (0)	1 (0.5)	3 (1.4)	3 (1.4)	2 (1.0)	1 (0.5)	0 (0)	3 (1.4)	1 (0.5)	0 (0)
Endoscopic procedure	2 (0.1)	0 (0)	0 (0)	0 (0)	2 (0.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0.6)	0 (0)	1 (0.5)	0 (0)
Bariatric surgery	16 (0.5)	16 (1.1)	15 (1.0)	1 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Other	13 (0.4)	6 (0.4)	2 (1.0)	4 (6.9)	7 (0.4)	1 (0.6)	2 (1.0)	1 (0.5)	0 (0)	1 (0.5)	0 (0)	1 (0.6)	0 (0)	1 (0.05)	0 (0)
Excess skin n (%)	717 (17.7)	492 (24.0)	470 (23.7)	22 (30.6)	225 (11.3)	13 (8.2)	14 (6.7)	23 (11.0)	25 (12.0)	40 (19.0)	16 (7.8)	12 (6.7)	17 (8.0)	44 (21.4)	21 (10.2)
Body contouring surgery n (%)	17 (2.4)	11 (2.2)	11 (2.3)	0 (0)	6 (2.7)	0 (0)	0 (0)	1 (0.5)	0 (0)	2 (0.9)	0 (0)	0 (0)	1 (0.5)	1 (0.5)	1 (0.5)

TABLE 2 Continent-specific and combined normative scores

A Appearance scales						
Scale	**Country**	**Mean (SE/SD)**	**N**	**95% Confidence Int.**		**p Value***
Body						
	North America	45.78 (0.51)	1487	44.78	46.77	.134
	Europe	46.88 (0.42)	1993	46.05	47.7	.134
	Total	46.41 (19.46)	3480			
Abdomen						
	North America	37.03 (0.71)	1487	35.65	38.42	.196
	Europe	38.44 (0.67)	1604	37.12	39.76	.196
	Total	37.76 (27.55)	3091			
Arms						
	North America	52.66 (0.66)	1487	51.36	53.95	<.001*
	Europe	58.45 (0.63)	1605	57.21	59.69	<.001*
	Total	55.66 (24.65)	3092			
Back						
	North America	54.11 (0.75)	1487	52.63	55.58	<.001*
	Europe	60.613 (0.72)	1605	59.21	62.02	<.001*
	Total	57.48 (27.22)	3092			
Buttocks						
	North America	51.96 (0.68)	1487	50.63	53.3	.004*
	Europe	54.99 (0.65)	1605	53.72	56.26	.004*
	Total	53.53 (24.68)	3092			
Hips						
	North America	53.82 (0.74)	1487	52.37	55.27	.474
	Europe	54.64 (0.71)	1605	53.25	56.02	.474
	Total	54.24 (27.61)	3092			
Thighs						
	North America	50.58 (0.78)	1487	49.05	52.11	.008*
	Europe	53.80 (0.75)	1605	52.34	55.27	.008*
	Total	52.25 (30.02)	3092			
Skin						
	North America	48.24 (1.478)	365	45.34	51.15	.015*
	Europe	55.07 (2.021)	222	51.1	59.04	.015*
	Total	50.82 (27.25)	587			
Chest						
	North America	51.08 (1.06)	579	49	53.17	.004*
	Europe	55.52 (0.87)	792	53.81	57.23	.004*
	Total	53.65 (23.12)	1371			
Nipples						
	North America	65.64 (1.18)	579	63.33	67.94	<.001*
	Europe	71.60 (0.96)	793	69.71	73.49	<.001*
	Total	69.08 (24.54)	1372			
Stretch marks						
	North America	71.63 (0.96)	857	69.75	73.52	<.001*
	Europe	79.69 (1.15)	640	77.43	81.96	<.001*
	Total	75.08 (26.01)	497			

TABLE 2   (Continued)

A Appearance scales						
Scale	Country	Mean (SE/SD)	N	95% Confidence Int.		p Value*
Cellulite						
	North America	58.25 (1.04)	402	56.2	60.3	0.411
	Europe	60.73 (2.78)	64	55.28	66.19	0.411
	Total	58.59 (20.81)	466			

B Health-related quality of life scales						
Scale	Country	Mean (SE/SD)	N	95% Confidence Int.		p Value*
Psychological function						
	North America	58.03 (0.63)	1485	56.81	59.26	.884
	Europe	57.89 (0.60)	1605	56.72	59.06	.884
	Total	57.96 (21.81)	3090			
Physical function						
	North America	81.35 (0.56)	1485	80.24	82.45	.366
	Europe	80.61 (0.56)	1992	79.69	81.53	.366
	Total	80.92 (19.70)	3477			
Social function						
	North America	54.21 (0.54)	1485	53.15	55.26	.026*
	Europe	55.94 (0.45)	1993	55.06	56.82	.026*
	Total	55.20 (18.05)	3478			
Sexual function						
	North America	58.56 (0.74)	1099	57.11	60.01	.018*
	Europe	61.19 (0.68)	1277	59.87	62.52	.018*
	Total	59.98 (22.47)	2376			
Body image						
	North America	45.34 (0.63)	1485	44.1	46.58	.017*
	Europe	47.67 (0.60)	1605	46.49	48.85	.017*
	Total	46.55 (23.72)	3090			
Distress						
	North America	44.22 (0.57)	1487	43.09	45.341	<.001*
	Europe	38.77 (0.65)	1211	37.5	40.046	<.001*
	Total	41.77 (21.48)	2698			
Work						
	North America	70.21 (0.61)	837	69	71.41	<.001*
	Europe	75.43 (1.34)	202	72.8	78.06	<.001*
	Total	71.22 (18.18)	1039			

C Eating-related concerns scales						
Scale	Country	Mean (SE/SD)	N	95% Confidence Int.		p Value*
Eating-related symptoms						
	North America	79.86 (0.34)	1487	78.92	80.25	.712
	Europe	79.59 (0.59)	572	78.7	81.02	.712
	Total	79.66 (12.92)	2059			
Eating-related distress						
	North America	76.79 (0.49)	1487	79.86	83.19	<.001*
	Europe	81.52 (0.85)	572	75.83	77.74	<.001*
	Total	78.10 (19.21)	2059			

(Continues)

TABLE 2 (Continued)

C Eating-related concerns scales						
Scale	Country	Mean (SE/SD)	N	95% Confidence Int.		*p* Value*
Eating behaviour						
	North America	54.09 (0.32)	1487	53.47	54.72	.409
	Europe	54.66 (0.55)	572	53.57	55.74	.409
	Total	54.25 (12.00)	2059			

Note: SD in total, SE in North America and Europe specific.

Abbreviations: 95% Confidence Int., Confidence Interval; SD, standard deviation; SE, standard error.
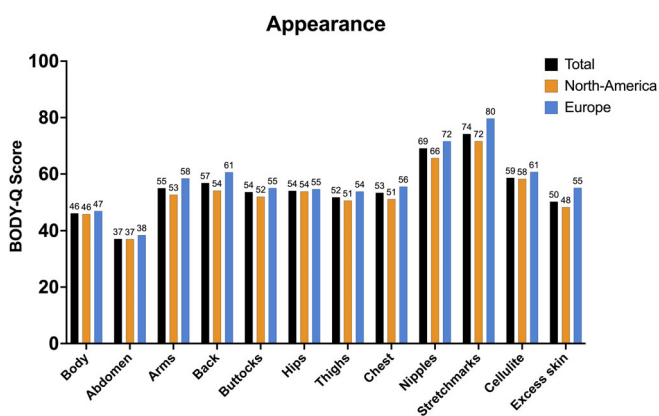
*p Value < .05.

FIGURE 2 Appearance. Normative values for the appearance scales in North America, Europe, and the combined values.

FIGURE 3 Health-related quality of life (HRQL) and eating-related concerns. Normative values for the scales for the HRQL and eating-related concerns in North America, Europe, and the combined value

Overall, appearance scores tended to decrease with higher BMI for all age groups. Females had lower satisfaction with appearance compared with males. This lower satisfaction with appearance in females were more pronounced for appearance of the abdomen, where females with a BMI 25.5–29.99 kg/m^2 scored below 25, while males with a BMI 35–39.99 kg/m^2 scored below 25. For the HRQL scales, the same pattern was seen with females scoring below 25 on the body image scale from BMI 30–34.9 kg/m^2, whereas males scored below 25 from BMI 35–39.9 kg/m^2 in the age group 17–29 years, and BMI >40 for all age groups. For the remaining HRQL and eating-related concerns scales similar scores were observed for males and females.

4 | DISCUSSION

In this study, we presented BODY-Q normative scores generated from an international sample of 4051 participants from a total of 12 North American and European countries. The overall and continent-specific normative scores were provided for 22 BODY-Q scales from three domains – appearance (12 scales), HRQL (7 scales), and eating-related concerns (3 scales). The normative scores for all
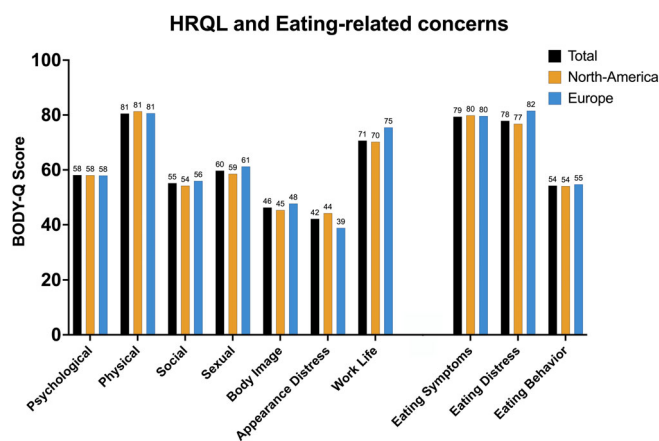
scales are presented stratified by age, BMI, and gender (male and female). These normative values provide means to interpret the BODY-Q scores for use in research and clinical practise.

The development of PROMs that evidence validity, responsiveness and reliability, the BODY-Q, have facilitated investigation of the unique outcomes of weight loss and/or BC from the patient perspective.[4,14,22] The BODY-Q can be used clinically and as a research tool to shed light on our understanding of the effects of losing weight and following BC procedures on perceptions of appearance, HRQL and eating behaviour.[12,16] This is the first study to date to generate normative values for interpreting the BODY-Q. Previous outcome studies using the BODY-Q to measure change of satisfaction with appearance and HRQL in BaS and BC patients revealed significantly higher mean BODY-Q scores after BaS. In addition, the studies showed significantly higher scores for patients who received BC following BaS compared to patients who did not.[4,6,23,24] However, these scores were limited by not being able to compare their findings to reference values from the general population. Measuring a return to normality is important; thus, there is a need for an appropriate reference point for weight loss- and BC patients. The values provided in this study

TABLE 3 Normative scores split by age, BMI and gender

Appearance scales

Scale	BMI	Age	Body	Abdomen	Arms	Back	Buttocks	Hips	Thighs	Chest	Nipples	Stretch Marks	Skin	Cellulite
Female	<18.5	17–29	52.81	52.70	60.73	62.66	47.74	54.23	55.60	NA	NA	74.11	50.63	58.54
		30–39	56.42	45.58	58.87	62.53	47.53	54.77	47.41	NA	NA	60.49	50.88	30.03
		40–49	66.05	82.10	86.40	86.85	72.31	90.67	91.20	NA	NA	70.50	63.18	77.54
		50–59	47.14	40.11	45.87	46.72	41.27	54.08	54.33	NA	NA	64.60	31.43	69.52
		>60	59.80	64.06	65.02	92.28	73.83	97.68	48.69	NA	NA	NA	57.39	59.00
	18.5–25	17–29	49.06	45.95	59.90	64.62	53.85	51.89	50.91	NA	NA	74.78	54.89	62.77
		30–39	49.19	39.07	60.34	65.12	53.02	51.90	50.17	NA	NA	76.01	44.52	62.13
		40–49	50.13	37.88	61.11	69.40	55.42	55.79	51.49	NA	NA	79.51	55.71	61.12
		50–59	50.12	36.06	53.25	61.53	52.14	54.46	43.66	NA	NA	79.51	58.85	54.48
		>60	58.92	48.81	55.01	71.68	56.66	58.89	53.44	NA	NA	94.93	61.95	64.97
	25–30	17–29	33.40	23.39	40.32	44.28	43.71	38.57	34.69	NA	NA	67.48	37.74	53.80
		30–39	37.14	23.63	45.14	47.55	46.49	46.82	42.50	NA	NA	64.79	36.34	60.75
		40–49	36.52	22.90	44.60	50.41	46.01	40.92	35.69	NA	NA	67.79	43.92	61.68
		50–59	39.91	24.36	48.64	52.39	47.72	49.06	44.37	NA	NA	77.32	48.14	59.75
		>60	42.90	26.33	42.20	51.91	48.71	46.88	42.33	NA	NA	79.65	46.55	53.93
	30–35	17–29	33.44	22.17	41.64	47.19	50.68	44.89	33.35	NA	NA	65.85	44.12	48.72
		30–39	34.94	18.14	44.24	40.63	41.63	37.29	33.20	NA	NA	73.35	38.58	54.56
		40–49	27.67	13.74	29.08	34.87	32.10	32.33	25.94	NA	NA	63.69	27.21	64.95
		50–59	28.22	20.61	38.20	43.92	34.58	34.20	32.01	NA	NA	69.10	39.17	56.00
		>60	34.93	21.86	37.01	45.29	42.27	36.15	40.09	NA	NA	91.23	56.04	82.80
	35–40	17–29	24.00	10.09	24.73	11.43	29.54	36.81	25.16	NA	NA	49.42	20.63	60.15
		30–39	23.09	8.602	20.14	29.36	31.81	26.11	17.95	NA	NA	60.71	39.55	53.34
		40–49	23.80	12.48	33.39	31.87	34.89	23.36	22.76	NA	NA	60.20	39.91	62.55
		50–59	30.76	10.10	27.53	28.87	33.00	26.63	22.59	NA	NA	67.89	35.42	65.21
		>60	29.08	15.06	37.25	42.13	36.88	31.14	31.59	NA	NA	78.00	45.76	50.24
	>40	17–29	17.20	15.72	13.97	5.098	20.28	26.37	11.83	NA	NA	50.85	13.60	62.74
		30–39	20.04	15.99	24.14	19.55	26.44	23.36	19.25	NA	NA	60.05	28.44	39.34
		40–49	23.22	11.70	25.71	37.17	27.67	27.32	19.05	NA	NA	79.22	40.55	61.25
		50–59	23.69	16.73	28.32	32.88	25.98	25.01	20.19	NA	NA	69.40	44.90	52.32
		>60	22.31	14.94	25.98	37.86	22.54	22.33	17.44	NA	NA	72.56	40.73	47.15
Male	<18.5	17–29	47.40	57.43	52.93	49.91	54.73	60.57	59.44	51.56	64.16	73.14	73.33	NA
		30–39	47.59	32.22	40.47	33.25	40.22	47.00	56.21	34.81	50.67	62.89	NA	NA
		40–49	62.91	40.05	54.25	44.59	54.38	59.11	55.75	33.21	71.12	84.33	NA	NA
		50–59	57.47	40.37	61.82	75.28	63.58	77.36	75.42	52.19	88.04	NA	NA	NA
		>60	57.04	29.46	45.09	47.06	60.24	86.34	66.53	62.44	90.00	NA	NA	NA
	18.5–25	17–29	57.97	56.73	64.82	66.58	64.94	68.28	69.71	60.42	70.58	87.94	61.92	52.50

(Continues)

TABLE 3 (Continued)

Appearance scales

Scale	BMI	Age	Body	Abdomen	Arms	Back	Buttocks	Hips	Thighs	Chest	Nipples	Stretch Marks	Skin	Cellulite
		30–39	57.13	52.06	62.24	62.15	61.80	64.98	65.51	58.21	70.88	81.34	68.08	NA
		40–49	57.97	55.62	66.98	63.64	63.10	71.52	74.81	63.10	75.51	88.85	79.00	74.00
		50–59	58.43	56.22	65.00	63.30	68.20	75.73	74.72	63.17	80.82	62.34	77.95	NA
		>60	62.87	52.21	65.31	71.92	72.20	80.17	73.98	62.08	79.56	92.20	71.30	NA
	25–30	17–29	49.99	41.43	64.41	62.72	56.85	59.26	59.12	54.00	67.52	79.62	60.62	48.00
		30–39	45.58	33.25	62.24	59.32	58.77	61.54	60.2	51.42	64.03	80.39	65.58	51.09
		40–49	44.47	27.39	63.16	57.66	58.44	60.57	63.49	50.83	68.70	81.78	66.00	65.60
		50–59	48.85	36.83	67.46	62.84	61.40	67.23	65.69	51.32	72.05	83.59	67.88	66.00
		>60	51.35	38.65	69.75	68.08	66.25	72.35	71.47	56.41	74.26	95.49	59.33	44.29
	30–35	17–29	37.47	23.31	52.40	50.94	53.09	46.43	42.72	34.62	56.22	70.24	58.00	60.00
		30–39	39.02	27.38	63.56	59.43	61.57	57.96	52.35	42.23	73.45	83.72	57.57	49.00
		40–49	37.61	25.34	65.07	54.52	50.28	54.61	58.88	44.93	66.60	79.12	65.67	72.00
		50–59	37.62	26.44	65.30	60.43	61.14	61.21	57.33	47.18	73.83	82.86	46.25	72.50
		>60	46.49	26.27	68.56	66.80	74.63	69.05	69.92	55.82	75.5	90.99	73.29	NA
	35–40	17–29	26.95	16.88	49.57	34.83	31.89	30.33	22.42	26.00	38.81	47.22	48.33	62.50
		30–39	27.07	17.56	47.53	28.68	27.02	32.59	31.23	25.87	59.97	58.79	32.00	43.50
		40–49	31.09	23.86	60.95	44.98	39.66	46.03	53.39	32.25	66.11	83.75	62.00	NA
		50–59	38.47	26.35	54.32	51.20	50.43	49.26	48.87	39.10	73.52	69.43	40.50	49.50
		>60	44.47	31.50	58.78	68.71	63.20	68.69	71.31	55.07	79.30	96.26	68.00	83.00
	>40	17–29	21.03	15.22	35.08	25.46	25.69	24.68	20.23	18.10	57.48	62.45	40.33	11.84
		30–39	29.41	19.32	31.79	24.53	29.73	21.68	16.61	28.94	46.77	69.08	NA	40.60
		40–49	27.20	18.00	56.30	46.28	53.77	53.6	40.78	37.98	65.64	68.14	37.25	93.80
		50–59	19.77	7.60	26.48	27.95	31.61	24.11	13.89	19.43	57.52	54.27	42.00	68.98
		>60	40.71	19.88	53.20	47.40	50.20	43.86	36.00	34.80	57.51	71.65	53.50	NA

Health-related quality of life (HRQL) and eating-related concerns scales

| Scale	BMI	Age	Psychological well-being	Physical well-being	Social well-being	Sexual well-being	Body image	Work life	Distress	Eating-related symptoms	Eating-related distress	Eating behaviour
Female	<18.5	17–29	53.23	80.89	52.20	60.49	53.88	64.71	42.15	72.74	78.44	58.02
		30–39	41.35	83.67	45.28	51.26	48.96	56.09	52.83	76.89	83.94	57.35
		40–49	67.64	71.58	50.64	56.92	70.27	82.68	38.76	85.45	91.96	66.09
		50–59	52.31	66.67	53.06	42.00	43.65	57.67	54.34	76.48	77.01	62.80
		>60	69.32	76.76	76.01	70.21	54.04	67.29	29.58	85.23	96.89	70.47
	18.5–25	17–29	57.54	85.69	64.45	64.16	52.77	72.93	44.47	77.45	75.29	55.54
		30–39	55.41	85.76	52.07	62.46	49.23	71.24	43.14	77.75	76.55	52.97
		40–49	61.30	82.29	57.49	63.41	52.35	76.86	35.10	83.44	84.61	55.96

TABLE 3 (Continued)

Health-related quality of life (HRQL) and eating-related concerns scales

Scale	BMI	Age	Psychological well-being	Physical well-being	Social well-being	Sexual well-being	Body image	Work life	Distress	Eating-related symptoms	Eating-related distress	Eating behaviour
		50-59	62.24	80.57	57.52	57.32	50.35	76.61	33.16	80.97	85.58	59.25
		>60	73.32	83.40	65.56	62.81	60.34	89.49	22.17	89.06	93.15	62.51
	25-30	17-29	46.00	82.92	48.48	54.46	33.06	56.81	57.69	76.54	68.40	49.66
		30-39	49.11	81.52	48.96	55.93	36.20	64.33	50.21	77.36	68.76	50.32
		40-49	58.49	75.15	57.00	57.12	38.73	69.30	43.09	77.31	71.80	53.05
		50-59	67.39	79.88	62.22	55.84	43.55	75.20	37.30	79.54	79.16	57.69
		>60	70.16	83.64	65.18	60.34	44.09	77.61	34.05	82.94	81.74	59.01
	30-35	17-29	50.10	77.47	50.09	53.39	34.02	62.38	53.13	77.25	64.64	49.43
		30-39	54.46	75.80	54.06	55.51	35.54	72.28	49.83	79.19	71.25	51.33
		40-49	51.33	73.81	52.30	51.81	24.79	66.52	50.30	75.17	67.64	51.55
		50-59	58.46	69.84	59.34	43.04	27.87	66.42	47.69	76.30	73.38	51.12
		>60	61.57	79.19	66.45	51.45	33.97	71.70	35.59	82.37	81.58	58.14
	35-40	17-29	27.09	69.68	36.58	39.30	17.12	46.81	67.40	71.1	51.18	45.45
		30-39	48.47	76.46	47.64	47.55	24.33	52.92	60.61	71.77	61.24	47.13
		40-49	38.04	52.00	43.91	42.07	23.03	70.40	60.13	68.62	60.20	53.12
		50-59	50.29	69.06	51.24	43.72	24.42	69.47	53.95	77.95	69.90	47.70
		>60	60.20	69.74	54.41	48.73	30.52	61.40	46.08	80.14	75.32	54.11
	>40	17-29	31.36	69.32	37.06	53.40	20.38	66.52	71.27	71.1	48.48	45.41
		30-39	54.63	69.25	55.02	53.17	24.36	67.04	56.01	74.1	75.88	58.55
		40-49	43.27	60.33	47.60	55.64	21.47	66.15	58.74	73.26	63.97	45.08
		50-59	55.75	58.94	49.61	37.88	25.30	53.53	57.12	77.91	67.69	53.32
		>60	62.71	45.22	52.72	36.84	22.56	67.39	43.30	81.28	78.71	53.37
Male	<18.5	17-29	51.59	77.62	48.90	59.62	44.51	55.80	47.47	78.3	85.67	51.81
		30-39	41.85	89.19	44.77	46.46	18.58	61.00	45.65	72.74	71.06	48.98
		40-49	58.66	93.39	52.20	39.93	60.44	67.58	47.85	73.76	82.20	49.17
		50-59	59.52	75.22	42.00	46.62	48.88	NA	32.27	84.63	93.26	56.96
		>60	73.80	54.21	47.18	41.26	49.44	NA	13.00	96.08	82.08	91.20
	18.5-25	17-29	63.30	83.70	57.47	67.57	58.52	75.32	39.66	81.66	85.15	56.40
		30-39	59.68	87.24	54.43	64.33	57.97	72.83	34.64	81.66	86.03	55.90
		40-49	59.89	83.31	56.98	61.67	57.37	80.34	28.01	84.37	90.05	56.64
		50-59	68.04	91.06	61.69	70.45	65.53	81.30	27.72	87.72	89.67	60.26
		>60	67.93	81.87	64.63	67.48	59.01	75.64	19.65	84.77	92.83	58.81
	25-30	17-29	61.14	83.94	59.52	69.32	50.54	70.26	40.33	79.71	77.46	51.70
		30-39	56.49	83.78	55.23	62.10	45.79	73.62	37.04	79.76	76.59	50.55
		40-49	56.10	77.08	54.39	58.99	43.13	70.12	38.49	79.42	78.59	51.99

TABLE 3 (Continued)

Health-related quality of life (HRQL) and eating-related concerns scales

Scale	BMI	Age	Psychological well-being	Physical well-being	Social well-being	Sexual well-being	Body image	Work life	Distress	Eating-related symptoms	Eating-related distress	Eating behaviour
		50–59	70.15	82.32	62.17	61.29	51.54	79.63	27.40	85.31	87.81	57.73
		>60	74.66	79.05	65.78	66.66	54.45	80.01	22.21	89.32	90.44	58.91
	30–35	17–29	48.97	83.37	51.79	59.45	31.66	71.79	45.48	80.33	66.64	45.57
		30–39	56.22	82.32	51.66	55.07	41.79	66.16	53.93	75.72	70.45	51.10
		40–49	56.06	79.38	52.28	53.10	40.23	65.46	44.99	78.07	74.28	49.61
		50–59	58.11	67.09	56.59	52.35	38.95	69.70	35.17	77.24	74.51	51.22
		>60	69.57	70.85	60.91	58.38	48.32	74.82	32.76	86.25	85.61	54.76
	35–40	17–29	40.36	75.87	45.95	50.71	14.66	31.28	70.78	76.63	54.56	38.15
		30–39	44.33	79.36	46.35	48.97	20.16	51.62	60.09	71.38	64.81	42.29
		40–49	56.30	73.07	49.93	62.15	29.05	58.66	41.23	79.39	74.53	52.51
		50–59	57.07	68.28	66.57	56.87	41.37	78.43	39.13	78.05	83.32	57.36
		>60	64.05	68.99	59.30	34.75	46.02	79.96	26.20	93.54	96.61	56.46
	>40	17–29	35.67	61.84	41.72	45.75	20.26	27.02	68.31	72.77	42.75	33.58
		30–39	45.97	50.37	49.97	45.17	20.04	76.75	37.81	62.37	94.65	59.32
		40–49	48.70	61.70	44.02	25.04	17.13	69.62	44.28	74.21	69.78	52.28
		50–59	24.94	46.23	39.24	21.28	12.58	49.25	71.14	73.75	52.70	42.00
		>60	51.60	54.75	64.51	37.75	31.91	55.49	35.74	85.25	79.17	53.15

BODY-Q Scores

75–100
50–75
25–50
0–25
NA
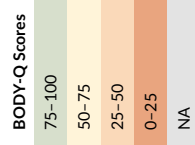
Abbreviation: NA, not applicable.

enables accurate comparison with the general population enhancing the interpretation of BODY-Q data to understand the actual impact of weight loss and BC on different aspects of patient's lives. The findings of this study have important implications for research, future clinical care, and healthcare policy.

Normative scores have been generated for the generic 36-Item Short-Form Health Survey (SF-36), and European-Quality of life-5 Dimensions (EQ-5D) which is the most widely used generic PROMs in obesity and weight loss treatment.[36–38] However, generic PROMs lack content validity and may not capture specific concepts of matter for weight loss and BC patients.[35] The lack of sensitivity or responsiveness for weight loss and BC specific outcomes, may minimise or not detect changes as a result of weight loss or BC.[19,39] Nonetheless, our findings were in line with the normative SF-36 scores with females having lower scores than males in regards of satisfaction with appearance and body image.[36,37] In contrast to other studies investigating population norms, there are no differences in the scores of females and males in HRQL and eating-related concerns scales.[36,40] Younger age was negatively associated with BODY-Q scores contradictory to normative EQ-5D scores, where younger age was associated with higher scores.[38,41]

Opposing to our hypothesis of minimal differences between scores across the 12 countries, we detected significant differences between North America and Europe, and between some European countries in all appearance scales and social function, sexual function, body image, and work life within the HRQL scales. Differential item functioning (DIF), which describes the stability of the BODY-Q instrument to determine whether items are responded differently by subgroups within a population, has been examined elsewhere in the original BODY-Q population, and found to have a negligible impact.[14,18] The differences detected in this study are therefore most likely not due to DIF, but rather due to cross-cultural differences between countries. There might be differences in the experience and conceptualization of HRQL across different socio-cultural groups, which further emphasized the need of general norms to understand the clinical significance and magnitude of the change weight loss and/or BC have on patient's lives.[42,43] Interestingly, there were no differences between North America and Europe in eating-related symptoms- and eating behaviour scales, while European participants scores significantly higher scores in eating-related distress. Cross-cultural factors such as cultural beliefs regarding food preferences and culinary habits have shown to influence individual's eating behaviour and relationship with food.[44,45] Due to differences in eating cultures, we expected differences between countries, especially between the two continents. The eating-related concerns domain is however a newly developed scale, and only available in few languages (English, Danish, and Dutch). Therefore, data is solely based on North America, the Netherlands, and Denmark. More cross-cultural research is needed to identify causes of differences and similarities between countries. However, all data were adjusted for country as a covariate when the total normative value was determined, due to these differences between the distribution of BODY-Q scores from different countries and continents. The sample was more representative when both continents were combined, with a mean age of 36 (±14.7 SD)

years, 11 996 (49.3%) female, 2023 (49.9%) male, and 32 (0.8%) other gender identifications. Therefore, we recommend the use of the combined normative values for comparative purposes.

The secondary aim of this project was to investigate factors associated with BODY-Q scores. BMI and age were inversely associated with BODY-Q scores in all satisfaction with appearance and HRQL scales. Our results points to the fact that living with obesity represents a significant health impairment.[46] In the normative data split by gender for the different age and BMI groups, females had lower satisfaction with appearance corresponding with the normative SF-36 scores.[36,37] Female participants with a BMI 25.5–30.0 kg/m^2 scored below 25, while male participants scored below 25 from BMI 35–40 kg/m^2. The same pattern was seen in body image, where female participant scored below 25 from BMI 30–35 kg/m^2, whilst male participants scored below 25 from BMI >40. The only exception was for male participants in the age group 17–29 years, who scored below 25 from BMI 35–40 kg/m^2. In the remaining HRQL and eating-related concerns scales, male and female participants scored similarly.

Strengths of our study is the large international sample of 4051 participants to match the diverse population of weight loss and BC patients. Online crowdsourcing databases such as Prolific and MTurk has shown to be a valid and reliable method for recruitment of research participants, facilitating cross-cultural and international research with low costs and high validity.[47–50] However, a potential limitation of this study is whether the recruitment of participants via the crowdsourcing platforms is representative of the general population of the included countries or not. An important limitation of this study is the ethnical diversity. In total, the population consisted of 87.9% participants who identified themselves as white, while only 12.1% identified themselves as another ethnicity. Therefore, the ethnical homogeneity should be considered with caution when interpreting these normative results. In addition, participants were paid to participate, which may have impacted incentives of participation in this study and their responses to the questions. In the European sample, the participants were younger. This is in line with other studies using crowdsourcing databases, with participants being younger, more educated, reporting lower rates of unemployment and marriage.[47] However, all mean scores were adjusted for age, employment, and marital status. The skin, stretch marks and cellulite scales consisted of a small number of participants, which should be considered when interpreting these results. Future research is needed to compare longitudinal BODY-Q patient results to these normative data.

5 | CONCLUSION

The normative values generated in this study provide clinically relevant reference points for the interpretation of the BODY-Q with appearance, HRQL, and eating-related concerns scales. The normative BODY-Q scores were inversely associated with age and BMI for all appearance, HRQL, and eating-related concerns scales. These normative data enable us to understand the impact of weight loss and BC on patient's lives for research, future clinical care, and health care policy.

CONFLICT OF INTEREST

Anne F. Klassen and Andrea L. Pusic are co-developers of the BODY-Q and receive a share of any licence revenues based on their institutions inventor sharing policy. Anne F. Klassen is an owner of EVENTUM Research which provides consulting services to the pharmaceutical industry. The remaining authors declare no conflicts of interest.

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APPENDIX A

TABLE A1 Country specific normative scores for each scale

Appearance scales					
Scale	Country	Mean	Std. error	N	95 % Confidence interval
Body					
	Denmark	50.33	1.34	159	47.7	52.96
	Poland	46.54	1.19	210	44.2	48.87
	Netherlands	52.32	1.18	208	49.02	53.63
	France	46.70	1.17	210	44.41	48.98
	Belgium	46.55	1.27	178	44.07	49.04
	England	42.26	1.18	205	39.95	44.56
	Germany	49.59	1.17	205	46.2	50.88
	Italy	46.13	1.19	204	43.8	48.45
	Finland	47.05	1.17	205	44.75	49.35
	Sweden	45.45	1.16	209	43.17	47.73
	United States	45.63	0.51	1429	44.63	46.63
	Canada	44.17	2.23	58	39.79	48.54
Abdomen					
	Denmark	41.74	1.92	158	37.98	45.5
	Poland	36.53	1.7	210	33.2	39.86
	Netherlands	43.00	1.68	208	39.71	46.3
	England	32.52	1.67	205	29.25	35.8
	Germany	40.56	1.67	205	37.3	43.83
	Italy	38.36	1.7	204	35.04	41.69
	Finland	39.03	1.67	205	35.75	42.3
	Sweden	38.17	1.66	209	34.92	41.42
	United States	36.93	0.71	1429	35.54	38.33
	Canada	33.74	3.16	58	27.55	39.94
Arms					
	Denmark	58.72	1.79	159	55.21	62.23
	Poland	60.89	1.59	210	57.77	64.01
	Netherlands	62.92	1.57	208	59.83	66
	England	51.45	1.57	205	48.39	54.52
	Germany	60.64	1.56	205	57.58	63.69
	Italy	58.4	1.59	204	55.28	61.51
	Finland	58.43	1.57	205	55.36	61.5
	Sweden	58.00	1.55	209	54.95	61.04
	United States	52.35	0.67	1429	51.05	53.66
	Canada	53.42	2.96	58	47.61	59.22
Back					
	Denmark	61.24	2.04	159	57.25	65.23
	Poland	62.06	1.81	210	58.51	65.61
	Netherlands	64.78	1.79	208	61.27	68.29

TABLE A1 (Continued)

Appearance scales					
Scale	Country	Mean	Std. error	N	95 % Confidence interval
	England	53.60	1.78	205	50.11	
	Germany	64.22	1.77	205	60.75	67.7
	Italy	59.83	1.81	204	56.29	63.37
	Finland	60.59	1.78	205	57.1	64.08
	Sweden	60.67	1.77	209	57.21	64.14
	United States	53.99	0.76	1429	52.5	55.48
	Canada	49.79	3.37	58	43.19	56.39
Buttocks					
	Denmark	57.92	1.84	159	54.3	61.53
	Poland	54.23	1.64	210	51.02	57.45
	Netherlands	57.95	1.62	208	54.77	61.13
	England	52.18	1.61	205	49.02	55.34
	Germany	57.84	1.61	205	54.69	60.99
	Italy	52.37	1.63	204	49.16	55.58
	Finland	55.61	1.61	205	52.45	58.77
	Sweden	52.92	1.60	209	49.78	56.05
	United States	51.86	0.69	1429	50.52	53.21
	Canada	52.80	3.05	58	46.82	58.78
Hips					
	Denmark	59.10	2.00	159	55.18	63.03
	Poland	52.76	1.78	210	49.27	56.26
	Netherlands	59.02	1.76	208	55.57	62.47
	England	50.94	1.75	205	47.50	54.37
	Germany	57.29	1.75	205	53.86	60.71
	Italy	48.56	1.78	204	45.07	52.04
	Finland	55.34	1.75	205	51.90	58.78
	Sweden	55.28	1.74	209	51.88	58.69
	United States	53.64	0.75	1429	52.17	55.10
	Canada	57.40	3.31	58	50.90	63.90
Thighs					
	Denmark	56.88	2.11	159	52.73	61.02
	Poland	53.59	1.88	210	49.90	57.27
	Netherlands	57.67	1.86	208	54.03	61.32
	England	48.97	1.85	205	45.35	52.59
	Germany	58.15	1.84	205	54.54	61.76
	Italy	45.67	1.88	204	41.00	49.34
	Finland	56.43	1.85	205	52.80	60.05
	Sweden	53.93	1.83	209	50.34	57.53
	United States	50.38	0.79	1429	48.84	51.92
	Canada	54.56	3.50	58	47.7	61.41

TABLE A1 (Continued)

Appearance scales

Scale	Country	Mean	Std. error	N	95 % Confidence interval	
Chest						
	Denmark	53.66	2.08	112	49.57	57.74
	Poland	53.25	1.88	145	49.56	56.93
	Netherlands	60.15	2.00	121	56.24	64.97
	England	52.91	3.15	47	46.73	59.09
	Italy	56.38	2.18	102	52.11	60.65
	Finland	58.27	2.01	118	54.33	62.2
	Sweden	53.94	1.80	147	50.40	57.47
	United States	51.46	1.07	558	49.37	53.56
	Canada	37.39	4.81	21	27.96	46.82
Nipples						
	Denmark	73.88	2.3	112	69.36	78.39
	Poland	68.04	2.08	145	63.97	72.12
	Netherlands	74.08	2.21	121	69.75	78.41
	England	68.67	3.45	48	61.89	75.44
	Italy	65.21	2.01	102	60.5	69.93
	Finland	73.66	2.22	118	69.31	78.01
	Sweden	74.69	1.99	147	70.78	78.59
	United States	65.87	1.18	558	63.56	68.18
	Canada	62.2	5.31	21	51.78	72.62
Stretch marks						
	Denmark	81.35	2.89	78	75.68	87.03
	Poland	76.10	2.53	108	71.05	80.97
	Netherlands	85.25	2.62	98	80.12	90.38
	England	72.09	2.35	118	67.49	76.69
	Italy	80.47	2.31	127	75.94	84.99
	Sweden	85.58	2.43	111	80.41	89.95
	United States	71.26	0.97	820	69.97	73.16
	Canada	77.46	4.91	37	69.24	85.68
Excess skin						
	Denmark	63.41	7.04	13	49.58	77.24
	Poland	57.56	4.35	40	49.02	66.10
	Netherlands	66.78	6.95	14	53.14	80.42
	France	48.40	6.24	17	36.14	60.66
	Belgium	47.32	7.35	12	32.88	61.76
	England	41.85	5.07	25	31.90	51.81
	Germany	56.53	5.51	21	45.7	67.35
	Italy	56.03	6.81	14	42.65	69.42
	Finland	58.25	4.00	43	50.39	66.11
	Sweden	67.13	5.55	23	56.23	78.02

(Continues)

TABLE A1 (Continued)

Appearance scales

Scale	Country	Mean	Std. error	N	95 % Confidence interval	
	United States	47.13	1.51	349	44.17	
	Canada	54.15	6.35	16	41.68	66.63
Cellulite						
	Netherlands	78.70	6.72	10	65.5	91.91
	England	57.72	2.93	54	51.96	63.48
	United States	58.08	1.05	391	56.02	60.14
	Canada	62.8	6.27	11	50.47	75.12

Health-related quality of life scales

Scale	Country	Mean	Std. error	N	95 % Confidence interval	
Psychological function						
	Denmark	63.10	1.70	159	59.78	66.43
	Poland	58.04	1.51	210	55.08	60.99
	Netherlands	61.51	1.49	208	58.59	64.43
	England	54.13	1.48	205	51.23	57.04
	Germany	56.88	1.47	205	53.98	59.78
	Italy	55.94	1.51	204	52.99	58.89
	Finland	58.10	1.48	205	55.19	62.01
	Sweden	57.98	1.47	209	55.09	60.86
	United States	57.93	0.63	1427	56.70	59.17
	Canada	55.44	2.81	58	49.94	60.94
Physical function						
	Denmark	84.31	1.49	159	81.39	87.24
	Poland	77.10	1.32	210	74.5	79.69
	Netherlands	81.23	1.31	208	78.67	83.79
	France	79.00	1.29	210	76.46	81.55
	Belgium	74.49	1.41	178	71.72	77.25
	England	80.70	1.31	204	78.13	83.27
	Germany	83.23	1.29	205	80.68	85.78
	Italy	83.31	1.32	204	80.72	85.89
	Finland	80.77	1.30	205	78.21	83.32
	Sweden	81.86	1.29	209	79.33	84.40
	United States	83.45	0.57	1427	80.34	83.56
	Canada	79.67	2.48	58	74.81	84.54
Social function						
	Denmark	61.16	1.43	159	58.36	63.96
	Poland	56.16	1.27	210	53.68	58.64
	Netherlands	59.53	1.25	208	57.08	61.98
	France	55.81	1.24	210	53.38	58.24

(Continues)

TABLE A1   (Continued)

Health-related quality of life scales

Scale	Country	Mean	Std. error	N	95 % Confidence interval	
	Belgium	56.41	1.35	178	53.77	
	England	53.64	1.25	205	51.19	56.1
	Germany	54.51	1.24	205	52.08	56.95
	Italy	55.41	1.26	204	52.94	57.89
	Finland	52.39	1.25	205	49.94	54.83
	Sweden	56.80	1.24	209	54.37	59.22
	United States	54.10	0.54	1427	53.04	55.16
	Canada	52.46	2.37	58	47.8	57.11
Sexual function						
	Denmark	65.89	2.09	108	61.79	70
	Poland	57.61	2.09	112	53.52	61.7
	Netherlands	67.88	1.99	119	63.98	71.78
	France	58.67	1.84	140	55.06	62.27
	Belgium	58.95	1.98	121	55.07	62.83
	England	60.64	1.86	134	56.99	64.29
	Germany	59.82	1.87	134	55.15	62.49
	Italy	63.77	1.81	147	60.23	67.31
	Finland	57.59	1.81	142	54.04	61.15
	Sweden	63.50	1.96	120	59.66	67.34
	United States	58.46	0.75	1050	57.00	59.93
	Canada	60.05	3.12	49	53.92	66.17
Body image						
	Denmark	51.76	1.71	159	48.41	55.10
	Poland	47.46	1.52	210	44.48	50.43
	Netherlands	53.45	1.50	208	50.51	56.39
	England	42.17	1.49	205	39.24	45.09
	Germany	48.74	1.49	205	45.82	51.65
	Italy	47.03	1.51	204	44.06	49.99
	Finland	46.31	1.49	205	43.48	49.23
	Sweden	47.07	1.48	209	44.17	49.97
	United States	45.12	0.63	1427	43.87	46.37
	Canada	44.72	2.82	58	39.19	50.26
Distress						
	Poland	38.86	1.44	210	36.03	41.69
	France	37.36	1.41	209	34.60	40.11
	Belgium	37.30	1.52	178	34.32	40.29
	England	43.91	1.4	205	41.16	46.66
	Germany	35.58	1.40	205	32.84	38.33
	Italy	38.39	1.43	204	35.85	41.20
	USA	44.29	0.58	1429	43.15	45.42
	Canada	46.3	2.63	58	41.14	51.46

TABLE A1   (Continued)

Health-related quality of life scales

Scale	Country	Mean	Std. error	N	95 % Confidence interval	
Work						
	Denmark	80.20	1.98	86	76.31	84.08
	Netherlands	76.15	3.42	26	69.44	82.87
	England	71.22	1.90	90	67.50	74.94
	United States	70.41	0.62	812	69.20	71.62
	Canada	61.62	3.51	25	54.74	68.51

Eating-related concerns scales

Scale	Country	Mean	Std. error	N	95 % Confidence interval	
Eating-related symptoms						
	Denmark	82.05	1.05	159	79.99	84.11
	Netherlands	80.29	0.93	208	78.46	82.11
	England	78.06	0.90	205	76.3	79.82
	United States	79.58	0.34	1429	78.92	80.26
	Canada	78.53	1.66	58	75.29	81.78
Eating-related distress						
	Denmark	84.92	1.51	159	81.96	87.88
	Netherlands	83.34	1.34	208	80.71	85.96
	England	77.83	1.29	205	75.30	80.36
	United States	76.83	0.49	1429	75.86	77.79
	Canada	73.12	2.38	58	68.45	77.78
Eating behaviour						
	Denmark	55.67	0.98	159	53.74	57.59
	Netherlands	56.79	0.87	208	55.09	58.49
	England	52.17	0.84	205	50.52	53.81
	United States	54.06	0.32	1429	53.43	54.69
	Canada	53.3	1.55	58	50.27	56.34