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Translation, adaptation, validation and performance of the American Weight Efficacy Lifestyle Questionnaire Short Form (WEL-SF) to a Norwegian version: A cross-sectional study

Background: Researchers have emphasized a need to identify predictors that can explain the variability in weight management after bariatric surgery. Eating self-efficacy has demonstrated predictive impact on patients' adherence to recommended eating habits following multidisciplinary treatment programs, but has to a limited extent been subject for research after bariatric surgery. Recently an American short form version (WEL-SF) of the commonly used Weight Efficacy Lifestyle Questionnaire (WEL) was available for research and clinical purposes.

Objectives: We intended to translate and culturally adapt the WEL-SF to Norwegian conditions, and to evaluate the new versions' psychometrical properties in a Norwegian population of morbidly obese patients eligible for bariatric surgery.

Design: Cross-sectional

Methods: A total of 225 outpatients selected for Laparoscopic sleeve gastrectomy (LSG) were recruited; 114 non-operated and 111 operated patients, respectively. The questionnaire was translated through forward and backward procedures. Structural properties were assessed performing principal component analysis (PCA), correlation and regression analysis were conducted to evaluate convergent validity and sensitivity, respectively. Data was assessed by mean, median, item response, missing values, floor- and ceiling effect, Cronbach`s alpha and alpha if item deleted.

Results: The PCA resulted in one factor with eigenvalue > 1 , explaining 63.0% of the variability. The WEL-SF sum scores were positively correlated with the Self-efficacy and quality of life instruments ($p < 0.001$). The WEL-SF was associated with body mass index (BMI) ($p < 0.001$)

and changes in BMI ($p=0.026$). A very high item response was obtained with only one missing value (0.4%). The ceiling effect was in average 0.9 and 17.1% in the non-operated and operated sample, respectively. Strong internal consistency ($r =0.92$) was obtained, and Cronbach's alpha remained high (0.86-0.92) if single items were deleted.

Conclusion: The Norwegian version of WEL-SF appears to be a valid questionnaire on eating self-efficacy, with acceptable psychometrical properties in a population of morbidly obese patients

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14 Introduction

15 Bariatric surgery is a well-established and approved treatment for patients suffering from
16 morbid obesity ([Colquitt et al., 2009](#)) {Colquitt, 2009 #19; Karen Jenum, 2003 #64} .
17 Increasing request for surgical treatment entails the epidemic dimension of morbid obesity as
18 a worldwide public health threat ([WHO, 2013](#)). The magnitude of obesity is also present in a
19 Norwegian context ([Midthjell et al., 2013](#)).

20 Bariatric procedures show excellent short term results ([Karlsen et al., 2013](#), [Andersen,](#)
21 [2011](#)), and acceptable long term results ([Sjostrom, 2013](#)) with weight loss, remission of
22 comorbidities and quality of life as the outcome measures. Nevertheless, between 30 and 40%
23 of morbidly obese patients undergoing bariatric surgery seem to experience insufficient
24 weight loss or regain of weight ([Biron et al., 2004](#), [Magro et al., 2008](#), [Livhits et al., 2012](#)).
25 Present researchers emphasize the need to identify predictors of sustained weight loss after
26 bariatric surgery ([Colquitt et al., 2009](#), [Livhits et al., 2012](#)). Changing old eating habits is for
27 some of the operated patients reported to be a persisting challenge ([Kafri et al., 2011](#)). In
28 order to offer suitable behavioral treatment for potential psychosocial obstacles in bariatric
29 patients, it seems crucial to survey the impact of specific self-management skills.

30 Self-efficacy is a key concept in social cognitive learning theory ([Conn et al., 2001](#),
31 [Bandura, 1997](#)), and has by large demonstrated a predictive impact on individuals' motivation
32 and capability toward sustained behavioral change ([Batsis et al., 2009](#), [Bock et al., 1997](#),
33 [Condiotte and Lichtenstein, 1981](#)). The concept refers to a person's confidence in his or her
34 ability to perform specific behavior in the face of perceived obstacles or challenging
35 situations ([Bandura, 1977](#)). Even though self-efficacy has demonstrated significant prediction
36 related to change in addictive behaviors, such as tobacco- and alcohol dependence ([Condiotte](#)
37 [and Lichtenstein, 1981](#), [Trucco et al., 2007](#)), and in exercise ([Sallis, 1988](#), [Sullum et al.,](#)
38 [2000](#)), the term was only recently applied to bariatric patients in their attempts on weight loss
39 maintenance ([Batsis et al., 2009](#)).

40 According to social cognitive learning theory, individuals with low eating self-efficacy
41 will have difficulties in resisting temptations to overeat in many situations ([Cargill et al.,](#)
42 [1999](#)). Several studies have demonstrated that eating efficacy changes over time and
43 improvements are associated with greater weight loss after multidisciplinary treatment
44 programs ([Bas and Donmez, 2009](#), [Martin et al., 2004](#), [Clark et al., 1996](#)). Specific

45 interventions performed to increase eating self-efficacy also obtained superior results in terms
46 of weight management ([Schulz, 2011](#), [Warziski et al., 2008](#)). Furthermore, Batsis et al.
47 (2009) demonstrated that profound weight loss after bariatric surgery was associated with
48 increased long-term eating self-efficacy in post-bariatric surgery patients when comparing
49 them with obese non-surgery patients ([Batsis et al., 2009](#)). With regard to maintaining
50 adherence to a recommended eating plan, self-efficacy therefor appears to be an important
51 predictor ([Batsis et al., 2009](#), [Linde et al., 2006](#)).

52 Research on eating self-efficacy is primarily based on global self-reported questionnaires
53 such as the Eating Self-Efficacy Scale (ESES) ([Burmeister et al., 2013](#), [Pinto et al., 2008](#),
54 [Glynn, 1986](#)). This instrument demonstrated acceptable psychometrical properties and
55 produced preliminary support for self-efficacy theory in obesity treatment ([Glynn, 1986](#)).
56 According to the authors, the predictive validity of ESES in a clinical setting would require
57 further research ([Glynn, 1986](#)). Later researchers suggested that findings based on the ESES
58 were limited due to the use of small, non-clinical samples in addition to incomplete
59 psychometric methodology ([Clark et al., 1991](#)). By developing the Weight Efficacy Lifestyle
60 Questionnaire (WEL) , the authors extended previous studies on eating self-efficacy using a
61 large sample (total N=382) of obese persons examining treatment-produced change in two
62 separate samples to explore the best fitting theoretical model of self-efficacy ([Clark et al.,](#)
63 [1991](#)).

64 Patients selected for bariatric surgery are exposed to lengthy clinical assessments, and
65 inclusion of further extensive measurements may be a burden for these patients. To address
66 this challenge Ames et al. (2012) developed a brief version of the WEL, labeled WEL-SF. A
67 cross sectional validation study indicated that the short version captured 94% of the
68 variability in the original WEL ([Ames et al., 2012](#)). Several studies indicate, accordingly, that
69 well designed brief measures can be as valid as extensive ones ([Marcus, 1992](#), [Kolotkin,](#)
70 [2001](#), [Clark, 2007](#)).

71 The aim of this study was (1) to translate and adapt the WEL-SF to Norwegian conditions
72 and (2) to test the new version's psychometric properties in a Norwegian population of
73 morbidly obese bariatric patients. A fourfold research question guided the study performance:
74 (a) Is the WEL-SF a reliable questionnaire for eating self-efficacy? (b) Is the WEL-SF
75 positively correlated with the General self-efficacy scale, the Self-efficacy for physical

76 activity questionnaire, the SF-36 and the Impact of Weight on Quality of Life – Lite
77 Questionnaire? (c) Does the WEL-SF hold an adequate structural robustness? (d) Does the
78 WEL-SF perceive the different eating patterns between non-operated and operated patients?

79 **Methods**

80 Design, respondents and setting

81 The present study was conducted with a cross-sectional design including 225 morbidly
82 obese patients accepted for bariatric surgery with laparoscopic sleeve gastrectomy (LSG) in a
83 Western Norwegian hospital. We included two subsamples in the study; 114 consecutive non-
84 operated patients from pre-operative outpatient consultations, and 111 consecutive operated
85 patients from outpatient consultations one year after surgery, all within the period from
86 October 2012 to May 2013.

87 The outpatient consultations started with a multidisciplinary informative plenary meeting,
88 wherein the patients were shortly introduced to the present study. Voluntary participation was
89 emphasized. Written information about the study was distributed with the questionnaires.
90 Informed consent was obtained, and the questionnaires were collected at the end of the day,
91 before the respondents left the hospital.

92 The inclusion criteria were morbidly obese patients eligible for LSG (BMI ≥ 40 , or ≥ 35
93 with comorbidity) and age between 18 and 60 years. Patients were excluded if they were
94 physical or mental disabled to fill in the forms.

95 Translation and adaptation (aim 1, research question a)

96 According to the recommendations in the guidelines by the World Health Organization
97 (WHO), we performed a five step, systematic approach to translation and adaptation of the
98 questionnaire ([WHO, 2007](#)) {organization, 2007 #351}. Initially, two registered dietitians with
99 Norwegian as their mother-tongue and professionally familiar with the concepts toward
100 morbidly obese patients, did an independent forward translation of the WEL-SF from
101 American-English to Norwegian. Next, a consensus panel of four persons comprised by the
102 research group compared the original version with the two translated versions. The group
103 reconciled the forward translations into one common version by identifying inadequate
104 concepts or expressions. Thirdly, two blinded backward translations into English were
105 performed by a surgeon and health educator, both with Norwegian as their mother-tongue.

106 Furthermore, the consensus panel compared the original version and the translated version
107 with respect to conceptual- and cultural equivalence and agreed on a Norwegian version for
108 pretesting. Finally two nurses, a registered dietitian and a bariatric surgeon were asked to
109 assess the feasibility of the items in the Norwegian version for the bariatric patients. They
110 found the questionnaire to be of clinical relevance for the population.

111 The Weight-Efficacy Lifestyle Questionnaire Short Form (WEL-SF)

112 In 2012 a short version of the original WEL ([Clark et al., 1991](#)) was developed - from 20
113 questions and 5 situational components to 8 questions and 1 situational component
114 representing “confidence in ability to resist eating” ([Ames et al., 2012](#)). Three of the
115 questions are related to emotional eating situations, two to availability, one to social pressure,
116 one to positive activities and one to physical discomfort. The WEL-SF correlated highly
117 significant with the WEL, accounting for 94% of the variability in the original questionnaire,
118 and was found to be a psychometric valid measure of eating self-efficacy ([Ames et al., 2012](#)).
119 The instrument range scores on a Likert-scale from 0 (not at all confident) to 10 (very
120 confident), with sum scores between 0 and 80. High scores are associated with high eating
121 self-efficacy.

122 Validating instruments

123 The instrument selection was based on a theoretical expected association with eating self-
124 efficacy ([Fayers P.M., 2007](#)). Weight loss maintenance after bariatric surgery requires a
125 balance between energy intake and energy expenditure. It has been stated that this demands
126 self-management skills toward both eating behavior and physical activity ([Sallis, 1988](#), [Morin
127 et al., 2013](#), [Wing et al., 2001](#)). Due to this, we obtained the Self-efficacy for Physical
128 Activity Questionnaire (SEPA) ([Fuchs, 1994](#)) as one of the validating instruments. Based on
129 social cognitive learning theory, we also assumed that individuals with high efficacy levels
130 toward challenging life obstacles in general would be more likely to report high confidence in
131 adequate manners of eating ([Bandura, 1977](#), [Sherer, 1982](#)). Thus, the General Self-efficacy
132 Scale (GSE) ([Luszczynska et al., 2005](#)) served as a second validating measure. Furthermore,
133 as the outcome expectations and measures of success in bariatric surgery is sustained weight
134 loss and health related quality of life, we wanted to calculate the association between eating
135 self-efficacy (WEL-SF) and health related quality of life, both in general and weight
136 specifically. For this purpose the Short Form 36 (SF-36) ([Ware, 2000](#)) and the Impact of

137 Weight on Quality of Life-Lite (IWQOL-Lite) ([Kolotkin et al., 2001](#)) where chosen as a third
138 and fourth validating instrument

139 Self-efficacy for physical activity (SEPA)

140 Self-efficacy for physical activity refers to the belief of being capable to stick to an
141 exercise program even under unfavorable circumstances. The questionnaire was first
142 developed in German by Fuchs & Schwarzer in 1994 and assesses self-efficacy for physical
143 activity using a 12-item measure on a Likert-scale ranging from 1 (very confident) to 7 (not
144 confident at all). The sum score ranges from 12 to 84. High scores indicate high levels of
145 perceived physical self-efficacy. The instrument was positively correlated with general self-
146 efficacy and with specific self-efficacy expectations toward cancer screening and healthful
147 eating behavior ([Fuchs, 1994](#)), and has been translated and adapted to Norwegian conditions
148 ([Jenum et al., 2003](#)).

149 General Self-Efficacy Scale (GSE)

150 The General self-efficacy scale (GSE) contains general questions measuring an
151 individual's confidence in his or her personal competence to fulfill difficult tasks
152 ([Luszczynska et al., 2005](#)). The instrument measures a person's ability to cope with a broad
153 range of demanding unspecific situations in life, and thereby assess his or her optimistic self-
154 belief toward difficulties in general. The questionnaire has been translated, psychometrical
155 tested and adopted for studies worldwide ([Schwarzer et al., 1997](#), [Scholz et al., 2002](#),
156 [Røysamb, 1998](#)). The GSE contains 10 items on a Likert-scale ranging from 1 (completely
157 wrong) to 5 (completely right). The sum scores ranges from 10 to 40. High scores indicate
158 high levels of general self-efficacy.

159 Short Form 36 (SF-36)

160 SF-36 is the most widely used generic self-report health questionnaire, which is based on
161 a multidimensional model of health ([Ware, 2000](#)). The scale assesses health related quality of
162 life outcomes, known to be most directly affected by unspecific disease and treatment and
163 was first translated and adapted to Norwegian in 1998 ([Loge et al., 1998](#)). The 36 items are
164 measuring 8 different aspects (subscales) of health related quality of life. The 8 subscale
165 scores can be summed into two domains: physical component sum score (PCS) and mental

166 component sumscore (MCS). The sub scores are transformed into a scale where high scores
167 indicate high health-related quality of life. A score = 50 represents the average PCS and MCS
168 scores in the US population. The psychometric properties of the SF-36 are well documented
169 ([Ware, 2000](#)) and are validated for use in a Norwegian morbidly obese population ([Karlsen et
170 al., 2011](#)).

171 Impact of Weight on Quality Life-Lite (IWQOL-lite)

172 Impact of Weight on Quality of life-lite is a validated, 31-item self-report measure of
173 obesity-specific quality of life ([Kolotkin et al., 2001](#)). The questionnaire consists of a total
174 score and scores on each of five scales; physical function, self-esteem, sexual life, public
175 distress and work – exhibiting strong psychometric properties ([Kolotkin et al., 2001](#)). The
176 subscores are transformed into a scale from 0-100 where high scores indicate high obesity
177 specific quality of life. The version in use is linguistically-, but not yet psychometrically,
178 validated in a Norwegian morbidly obese population.

179 Socio-demographic and clinical data

180 Socio-demographic variables of age, gender, marital status, level of education and work
181 participation were recorded. The clinical variables include initial weight, weight loss, BMI,
182 changes in BMI, height, diabetes, hypertension, psychiatric disorder, muscular- and skeletal
183 pain and whether the respondents had undergone surgery or not. Changes in BMI were
184 collected retrospectively. Data were coded and registered as categorical or continuous
185 variables.

186 Statistical analysis

187 Data are presented as mean and standard deviation (SD) or number (%) unless otherwise
188 stated. Between-group comparisons at baseline were analyzed using independent samples t-
189 test for continuous variables and Pearson's chi-square test for categorical variables. We
190 employed two-tailed tests and considered P values < .05 statistically significant. The statistical
191 analysis was conducted using SPSS version 21.0.

192 Internal validity (aim 2, research question a and c)

193 Data quality was examined comparing mean values for each item with standard deviation,
194 median, percentage of missing values and extent of ceiling and floor effects. Optimal floor-

195 and ceiling effects were defined to stay between 1-15% ([McHorney and Tarlov, 1995](#)).
196 Internal consistency was assessed by calculating Cronbach's alpha coefficients. According to
197 Clark & Watson (1995) the alpha coefficient should be benchmarked at .80 to raise reliability
198 to an acceptable level. To eliminate the risk of a potentially false high reliability coefficient,
199 we also calculated alpha if single items were deleted ([Polit D.F, 2008](#)). Further, we measured
200 the internal item convergence in terms of each items' correlation with the rest of the scales'
201 total score. A minimum item-total correlation was benchmarked at the level of .3 ([Fayers](#)
202 [P.M., 2007](#)). In order to examine face validity, nine bariatric patients, included from the
203 outpatient consultations one year after surgery, evaluated the questionnaire. The scales
204 feasibility was assessed by four professional health workers.

205 Construct validity and factor analysis (aim 2, research question c)

206 To examine the structural validity of the WEL-SF we applied principal component
207 analysis (PCA) with a varimax rotation ([Tabachnick B., 2006](#)). The Kaiser-Meyer-Olkin
208 measure and Bartlett's test of sphericity were computed to determine whether the data in this
209 sample were suitable for PCA. Following Kaiser's criterion, eigenvalues of 1.0 were chosen
210 to ensure that the extracted components accounted for a reasonably large proportion of the
211 total variance ([Tabachnick B., 2006](#)). The PCA was first applied on the total sample (n=225)
212 and then on each subsample to compare the component structure between samples.

213 Convergent validity (aim 2, research question b)

214 Convergent validity was tested by comparing Pearson correlation coefficients between the
215 WEL-SF and SF-36, the Impact of Weight on Quality of Life (IWQoL-Lite) questionnaire,
216 the Self-Efficacy for Physical Activity Questionnaire (SEPA) and the General Self-Efficacy
217 Scale (GSE).

218 Sensitivity (aim 2, research question a and d)

219 Multiple linear regression analyses were conducted to evaluate whether the WEL-SF
220 discriminated between non-operated and operated patients, adjusted for age, gender, work
221 participation, marital status and education.

222 Ethical approval

223 The study was approved by the Regional Committee for Medical Research Ethics in
224 Western Norway and performed in accordance with the Helsinki Declaration (Saksnr
225 2012/1481).

226 **Results**

227 Characteristics of the participants

228 We included consecutively 225 Caucasian morbidly obese patients (69.3% women)
229 accepted for bariatric surgery; 114 patients prior to surgery and 111 patients one year post-
230 surgery. All patients that were asked to take part in the study agreed to participate, giving a
231 response rate of 100%. A very high item response was obtained with missing values of only
232 0.4%. The missing items were not substituted. The distribution of answers was right-skewed
233 with no floor effect and a ceiling effect of 8.9% for the entire sample; respectively 0.9% and
234 17.1% for the non-operated and operated subsample. A further characteristic of the
235 respondents and description of data is shown in Table 1-2 and figure 1.

236 Face validity of the WEL-SF

237 To be able to compare the results from the original WEL-SF with the psychometric
238 properties obtained in the translated version, it is of major concern that the item construction
239 in the two versions is semantic equivalent. Banduras' test-theoretical approach to the
240 development of self-efficacy scales worked as a guide during the item evaluation. We aimed
241 to take the readers perspective using an everyday vocabulary jargon. Furthermore, we aimed
242 to avoid ambiguous or multi-barreled items that include different types of attainments within
243 the same item, where the respondents may have different levels of perceived efficacy. Item 4
244 in the American WEL-SF (I can resist overeating when I am watching TV (or use the
245 computer) may, in a Norwegian context, represent a double-wording problem in which it
246 refers to disparate situations challenging eating self-efficacy. To assess our assumptions
247 toward this potentially double-wording problem, we extracted the PC- item into a new item 9:
248 "I can resist eating too much when I am using my PC/Ipad" and placed it elsewhere in the
249 questionnaire-fold. The mean score for the TV-item in the non-operated group was 6.07 and
250 in comparison 8.90 for the PC-item. The difference was respectively the same in the operated
251 group. Due to this immediate account, the respondents seemed to experience significant less
252 eating efficacy while watching TV than by using the computer. As most respondents were
253 checking the same, high response point on the PC-item, followed by a ceiling effect and low
254 variability, it did not add relevant clinical information. We therefore decided to eliminate the

255 PC-item from the questionnaire and maintained the original item amount. We worded the item
256 closer to the original global WEL: “I can resist eating too much when I am watching TV”.

257 The translation process revealed divergence in translation of the concept “overeat”. The
258 American “overeat” can qualify as a medical diagnosis (F50.4. ICD-10) within the broader
259 framework of eating disorders (F50. ICD-10). Culturally and semantically “overeat” was
260 interpreted as closer to the Norwegian “eating too much”. The Norwegian “overeating” seems
261 as such conceptually more related to the American “binge-eating” which involves a
262 pathological pattern of compulsive food intake. As we do not assume that all bariatric patients
263 suffer from an eating disorder, we chose to reformulate “overeating” into “eating too much”.
264 By this reformulation we also aimed to avoid potential stigmatizing and biases.

265 A pretest was performed to assess face validity and feasibility. Nine patients were for this
266 purpose consecutively recruited from outpatient consultations one year after undergoing
267 bariatric surgery. They were asked to complete the questionnaire and thereafter express
268 whether the questionnaire was clear and easy to understand, covering topics of interest and if
269 any items had been difficult to answer. In addition they were asked whether the questions
270 were relevant for their situation. The pretest presented no corrections to the items and
271 confirmed their clearness and relevance. Some of the respondents considered the
272 introduction-text inappropriately long and reiterating. We shortened and simplified the
273 introduction accordingly. The participants in the pretest were not included in the
274 psychometrical test performance of the translated version of the WEL-SF.

275 Reliability, internal consistency and sensitivity of WEL-SF

276 Cronbach’s alpha coefficients were 0.92 for the whole sample, 0.89 for the non-operated
277 sample and 0.92 for the operated sample (Table 2). The Alpha value remained high (0.86-
278 0.92) if single items were deleted (Table 3).

279 Construct validity and factor analysis

280 The data met the Kaiser-Meyer-Olkin measure (0.89) and the Bartlett’s test of sphericity
281 criterion ($p < 0.001$) for performing PCA. Following the Kaiser’s criterion components with an
282 eigenvalue > 1.0 were contained. The PCA was performed on the entire sample ($n = 225$) and
283 the eight items of the WEL-SF loaded on one component only (Table 4) with an eigenvalue of
284 5.04 explaining 63% of the total variance. When performing the PCA on each of the

285 subsamples this picture did not change. The 1 component solution had an eigenvalue
286 (explained variance) of respectively 4.5 (56,4%) and 5.2 (65%) for the non-operated and
287 operated sample. In comparison, Ames' one-component solution accounted for 49% of the
288 variance.

289 Convergent validity

290 The correlation matrix for the sum score of the WEL-SF and the validating instruments
291 covering our sample is illustrated in table 5. The correlations ranged from .34 to .45 for all
292 patients which represent a medium strong correlation ([Cohen, 1988](#)). Separating the groups,
293 the correlations ranged from .12 to .37 in the non-operated group and .08 to .30 in the
294 operated group, i.e. non to moderate strong correlations (Table 5).

295 Sensitivity

296 WEL-SF sum score was lower in the non-operated than in the operated group in
297 unadjusted analysis (Table 1). This difference remained using multiple regression as the
298 WEL-SF sum score was 12.55 (95% CI: -16.59, 8.51) points lower in the non-operated than
299 in the operated group ($p < 0.001$). (Not shown)

300 Discussion

301 In this project we have translated and adapted the WEL-SF to Norwegian conditions, and
302 tested its psychometrical properties in a population of morbidly obese patients accepted for
303 bariatric surgery. During the translation and adaption process we discovered a few conceptual
304 differences that were due to semantic or cultural conditions. The psychometric assessment of
305 the final Norwegian version was consistent with those from the original WEL-SF in terms of
306 internal consistency and data quality ([Ames et al., 2012](#)).

307 The structural validity of the translated WEL-SF was high, and the items all loaded on
308 one component as suggested by Ames (2012). Deciding how many factors to retain is a
309 critical component of exploratory factor analysis, and the one component solution remained
310 when performing PCA on the two subsamples. There is no clear consensus concerning sample
311 size requirements for factor analysis ([Williams, 2012](#)), but even though the present study was
312 based on samples less than 200 subjects ([Kline, 2000](#)) we consider the results indicative of a
313 structural robustness.

314 We obtained high item to sum score correlations calculated for both the entire sample and
315 the subsamples indicating that the instrument measures one underlying construct ([Streiner
316 D.L., 2008](#)). A high overall reliability coefficient and corresponding alpha values if single
317 items were deleted provides further evidence in support of the construct validity.

318 The WEL-SF sum score was correlated with SEPA and GSE sum scores in the subsamples
319 as well as for the entire sample, where patients who reported high levels of efficacy
320 expectations toward eating behavior also tended to present high levels of confidence toward
321 physical activity and challenging obstacles in general. The association between eating
322 efficacy and physical activity expectations is in correspondence with earlier findings ([Morin
323 et al., 2013](#), [Sallis, 1988](#), [Wing et al., 2001](#)), and was equally pronounced in the subsamples
324 as in the entire sample. We also found an association between the WEL-SF and the IWQOL-
325 Lite in both subsamples. Patients reporting high levels of confidence toward eating behavior
326 seem to experience higher quality of life in spite of their obesity. Furthermore, we measured
327 the correlations between WEL-SF and the SF36' two subdomains: Mental and physical
328 composite scores. The obtained association between eating efficacy and the mental domain
329 were significantly correlated for all the samples. This corresponds with Ames remark during
330 the item selection for the WEL-SF, where the highest loaded items on the component
331 "confidence in ability to resist eating", appeared to represent negative emotions ([Ames et al.,
332 2012](#)). Former studies have emphasized the association between emotional eating and poor
333 weight loss maintenance ([Niemeier et al., 2007](#), [Phelan et al., 2009](#)). From this we might
334 deduce that highly reported eating efficacy expectations may be connected to personal skills
335 and strategies for managing emotional eating situations. A significant correlation also
336 appeared between WEL-SF and the SF36' physical domain accounting for the entire sample.
337 We did not, however, find any significant associations between WEL-SF and the SF36'
338 physical domain in the two subsamples. Overall the correlations were largest in the analysis
339 using the whole sample, probably reflecting that the variation in scores was greater in this
340 group.

341 Strength and limitations

342 A cross-sectional design represents potential limitations due to its lack of time
343 measurement ([Polit D.F, 2008](#)). Nevertheless, we find this methodological approach
344 appropriate for the present study due to our intention of inferring WEL-SF's present
345 psychometrical properties for future predictive purposes.

346 Data from both non-operated and operated patients strengthened the study in terms of a
347 larger sample-size, and by bringing the opportunity to assess the WEL-SF's sensitivity for the
348 overall different eating pattern between the two groups. The subgroups were similar regarding
349 socio demographic variables, but had different health profiles, as expected. This was,
350 nevertheless, taken into account in means of conducting the statistical analysis for the two
351 subsamples in addition to the entire sample to visualize the outcome differences and
352 similarities.

353 We noted some possible problems with ceiling effect in the operated group. This may be a
354 problem if the WEL-SF is to be used for measuring change over time, because of potentially
355 low responsiveness beyond one year after surgery. Studies with longer follow-up should be
356 performed in order to explore this issue, and caution must be taken in future studies if ceiling
357 effects are common in Norwegian bariatric patients.

358 The response bias ([Polit D.F, 2008](#)) was reduced due to the consecutively and convenient
359 sampling procedure, contributing to a very high response rate and only one missing value.
360 The referral of patients to the hospital from general physicians throughout the country
361 strengthens the representativeness and generalizability of the results. Nevertheless, as most
362 of the respondents were Caucasian, all admitted for surgery, the results may not be valid for
363 obese patients from other ethnic groups, or for those seeking non-surgical treatment.

364 **Conclusion**

365 With the present study, a Norwegian version of the WEL-SF is made available for use for
366 clinical work and research assessing eating self-efficacy in morbidly obese patients eligible
367 for bariatric surgery. Morbidly obese patients not seeking bariatric surgery should be
368 addressed in future studies to increase the utility of the WEL-SF in a Norwegian population.

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Table 1: Characteristics of the respondents. Morbidly obese patients (N=225)

	All patients (N=225)	Non operated patients (N=114)	Operated patients (N=111)	p^a
Age	42.5 (11.0)	41.9 (11.4)	42.9 (10.5)	0.47
Female	156 (69.3%)	76 (66.7%)	80 (72.1%)	0.37
Marital status				0.52
Single	75 (37.8%)	43 (37.7%)	42 (37.8%)	
Partners	140 (62.2%)	71 (62.3%)	69 (62.4%)	
Education				0.61
Primary/High	173 (76.9%)	88 (77.2%)	65 (76.6%)	
Bachelor/Master	52 (23.1%)	26 (22.8%)	26 (23.4%)	
Non employed	66 (29.3%)	39 (34.2%)	27 (24.3%)	
Initial BMI	43.2 (4.9)	42.7 (4.6)	43.8 (5.1)	
Comorbidities				
Diabetes	30 (13.3%)	25 (21.9%)	5 (4.5%)	< 0.001
Hypertension	57 (25.3%)	37 (32.5%)	20 (18.0%)	0.01
Psychiatric disorder	44 (19.6%)	26 (22.8%)	18 (16.2%)	0.21
Muscular-/skeletal	54 (24%)	45 (39.5%)	9 (8.1%)	< 0.001
WEL-SF sum score	59.6 (16.1)	53.5 (16.2)	65.9 (13.3)	< 0.001
GSE sum score	31.3 (4.4)	30.7 (4.2)	31.9 (4.5)	0.04
SEPA sum score	54.5 (14.2)	52.3 (13.7)	56.8 (14.4)	0.01
IWQoL-lite sum score	67.9 (26.3)	47.9 (20.2)	88.5 (13.3)	< 0.001
SF-36 PCS score	45.1 (11.7)	39.9 (8.6)	53.5 (7.8)	< 0.001
SF-36 MCS score	46.2 (11.4)	40.7 (10.7)	51.9 (9.3)	< 0.001

Abbreviations:

BMI: Body Mass Index

WEL-SF: Weight Efficacy lifestyle Questionnaire Short Form

SEPA: Self-efficacy for physical activity Scale

GSE: General Self-efficacy Scale

IWQoL-Lite: Impact of weight Quality of Life Lite Questionnaire

SF36 PCS and MCS: Short Form 36 Physical- and Mental component summary

^ap for group differences between non-operated and operated samples

All values in mean, (SD) =standard deviation and (%)

Table 2: Values for the Weight Efficacy Lifestyle Questionnaire Short Form (WEL-SF). Morbidly obese patients (N=225).

WEL-SF	Ceiling effect % max	Floor effect % min	Cronbach's alpha
All Responders (N=225)	8.9	0	0.92
Non Operated (N=114)	0.9	0	0.89
Operated (N=111)	17.1	0	0.92

Table 3. Mean, Standard deviation (SD) and Cronbach's alpha if item deleted in the Norwegian version of the WEL-SF (N=225).

Item	All patients (N=225)			Non-operated (N=114)			Operated (N=111)		
	Mean	SD	Alpha	Mean	SD	Alpha	Mean	SD	Alpha
1. I can resist eating too much when I am anxious or nervous.	7.48	2.52	0.91	6.67	2.69	0.88	8.31	2.03	0.91
2. I can resist eating too much on the weekend.	6.77	2.60	0.90	6.04	2.62	0.87	7.53	2.36	0.90
3. I can resist eating too much when I am tired.	7.89	2.46	0.90	7.28	2.63	0.87	8.51	2.11	0.91
4. I can resist eating too much when I am watching TV.	7.11	2.51	0.91	6.17	2.59	0.88	8.08	2.03	0.91
5. I can resist eating too much when I am depressed or down	6.78	2.85	0.90	5.91	3.05	0.86	7.67	2.33	0.91
6. I can resist eating too much when I am in a social setting or at a party.	7.44	2.50	0.91	6.83	2.69	0.88	8.06	2.13	0.92
7. I can resist eating too much when I am angry or irritable.	7.72	2.36	0.90	6.90	2.59	0.87	8.57	1.74	0.91
8. I can resist eating too much when others are pressuring me to eat.	8.37	2.44	0.91	7.67	2.75	0.88	9.09	1.82	0.91

Table 4: Factor analysis results – Comparison between reported one-component solutions in the samples. Morbidly obese patients (N=225).

WEL-SF item text	Factor loading		
	Component 1		
	All patients (N=225)	non-operated (N=114)	operated (N=111)
1. When I am anxious or nervous	0.77	0.73	0.77
2. On weekends	0.85	0.81	0.89
3. When I am tired	0.80	0.77	0.82
4. When I am watching TV	0.78	0.71	0.79
5. When I am depressed or down	0.85	0.84	0.84
6. When I am in a social setting or party	0.71	0.66	0.73
7. When I am angry or irritable	0.83	0.80	0.82
8. When others are pressuring me to eat	0.74	0.68	0.77

Total variance explained: 63.0% (All patients), 56.4% (non-operated), 64.7% (operated)

Table 5: Correlation between Weight Efficacy Lifestyle Questionnaire Short Form and other measures (N=225).

Variables	Pearson (<i>r</i>)		
	All patients (N=225)	Non-operated (N=114)	Operated (N=111)
SEPA	0.37 (p<0.001)	0.37 (p<0.001)	0.30 (p<0.001)
GSE	0.30 (p<0.001)	0.29 (p=0.002)	0.25 (p=0.008)
IWQoL-lite	0.45 (p<0.001)	0.25 (p=0.008)	0.27 (p=0.004)
SF36 (MCS)	0.40 (p<0.001)	0.26 (p=0.005)	0.26 (p=0.006)
SF36 (PCS)	0.34 (p<0.001)	0.12 (p=0.191)	0.08 (p=0.427)
BMI	-0.39 (p<0.001)	-0.20 (p=0.034)	-0.10 (p=0.162)
Change in BMI	NA	NA	-0.22 (p=0.026)

Abbreviations:

WEL-SF: Weight Efficacy lifestyle Questionnaire Short Form

SEPA: Self-efficacy for physical activity Scale

GSE: General Self-efficacy Scale

IWQoL-Lite: Impact of weight Quality of Life Lite Questionnaire

SF36: Short Form 36 Scale

MCS: Mental Composite Score

PCS: Physical Composite Score

NA: Not applicable

Figure 1

Histogram

Illustration of reported eating self-efficacy in the subsamples

