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The reliability of the General Functioning Scale in Norwegian 13-15-year-old

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adolescents and association with family dinner frequency

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27

28 **Abstract**

29 **Background:** Family environment is crucial to the development of health behaviors into
30 adolescence and adulthood. The aims of this study were (1) to explore the reliability of the
31 General Functioning Scale (GFS) among Norwegian 13-15-year-olds, and (2) to assess
32 whether family functioning reported by adolescents was associated with family dinner
33 frequency.

34 **Methods:** In total 440 secondary-school students were invited to participate in this cross-
35 sectional web-based questionnaire survey, with 54 participating in the test-retest study. Test-
36 retest and internal consistency were assessed for the 12-item GFS-scale. Associations
37 between family functioning and family dinner frequency were tested using multiple logistic
38 regression.

39 **Results:** The GFS had high internal consistency (corrected item-total correlations ranging
40 from 0.40 to 0.65, Cronbach's $\alpha=0.85$), and excellent test-retest reliability (intra-class
41 correlation coefficient =0.83). In the logistic regression model, a higher score on GFS (poorer
42 family functioning) was associated with a reduced likelihood of having dinner together on a
43 daily basis (i.e., 6-7 times per week, OR=0.36, CI= 0.20-0.64) after adjusting for age, gender,
44 ethnicity, living situation and parental education level.

45 **Conclusions:** The GFS had high reliability. As poorer family functioning was associated
46 with less frequent family dinners, the family environment may be an important (contextual)
47 target to influence adolescent health behaviors. It would be of interest to further explore the
48 role of family functioning in relation to adolescents' dietary habits, besides shared family
49 meals, and to reveal the mechanisms underlying such relationships.

50

51 **Keywords**

52 Family functioning

53 Family dinners

54 Adolescents

55

56 **Background**

57 Studies have shown that health behaviors in adolescence can be maintained into adulthood
58 (1,2). Adolescence is therefore considered an important developmental period for establishing
59 favorable health behaviors such as healthy eating habits. The family and the home
60 environment are important settings for influencing and shaping children's' and youths' eating
61 habits (3). Factors such as parenting style and parenting practices (e.g., modeling behavior)
62 have been well studied in relation to adolescents' food consumption and/or weight status
63 (4,5). However, these factors do not account for the overall effect of the family environment
64 on adolescents' eating habits. A sociocultural factor that has been studied to a limited degree
65 is family functioning (6). Family functioning refers to the relationship within the family, the
66 social connectedness and closeness of the family, as well as the level of problem solving and
67 behavioral control (7). Previous research reports that family functioning can be an important
68 protective factor against adolescents' fast food intake, lack of physical activity, disordered
69 eating, sedentary behavior and low breakfast frequency (5,6). Furthermore, an American
70 study (6) highlights that it is important to identify whether, and how, family functioning is
71 associated with other behavioral outcomes, like family meals. According to a systematic
72 review by Harrison et al. (8), frequent family meals are inversely associated with negative
73 behaviors (e.g., disordered eating, alcohol, substance use) and positively related to increases
74 of self-esteem and school success. Exactly how family meals are related to family functioning
75 is, however, yet to be determined.

76

77 Family functioning becomes visible during family meal activities, such as in the planning,
78 preparation, and eating situation (5). The family meal may promote family conversation
79 about food, give parents an opportunity to model healthy eating and build a sense of
80 community and belonging (9, 10). Even if adolescence is a time for increased independence

81 and spending more time away from home, research has shown that family meals are
82 perceived as a positive experience by both parents and adolescents (9). Research also
83 underscores the importance of eating family meals (mainly dinner) on a regular basis as this
84 is associated with lowered odds of poor diet quality and breakfast skipping (10).

85

86 Few studies assess both family functioning and the frequency of family meals. One study
87 from America found that a good family functioning was associated with more frequent family
88 meals, even after adjusting for age, socioeconomic status and race/ethnicity (6). Furthermore,
89 to our knowledge, no Norwegian study has explored family functioning using a Norwegian
90 version of the General Functioning Scale (GFS) in relation to family meal frequency. Dinner
91 is the most important family meal among Norwegian adolescents according to a national
92 survey from 2000 (11), and therefore dinner was chosen as the measure of family meals in
93 this study.

94

95 The aim of the present study was two-fold: 1) to explore the reliability of the General
96 Functioning Scale (GFS) in Norwegian 13-15-year-old adolescents, and (2) to assess whether
97 family functioning reported by adolescents is associated with family dinner frequency.

98

99 **Methods**

100 *Sample and data collection*

101 The participants in this study were students from a convenience sample of five secondary
102 schools in three Norwegian counties (Akershus, Oslo and Østfold). In total, 1136 adolescents
103 (13-15-year old) were invited to take part in the cross-sectional study, of which 440 (39%)
104 participated. Of these, 204 were invited to engage in a test-retest study, of which 54
105 adolescents (26%) participated. For practical reasons the retest was conducted among pupils

106 in only one of the schools participating. The test and retest were conducted 10-14 days apart.
107 Informed parental consent was obtained from all participants. The adolescents filled in a web-
108 based questionnaire at school. Details about the questionnaire development are presented
109 elsewhere (12). All measures were assessed by self-report, except parental education, which
110 was reported by the parents in the parental consent form. A group of experts (five professors,
111 four postdoctoral researchers and one lecturer with different backgrounds related to family
112 processes and dietary habits) assessed the content and face validity of the applied measures.
113 The Norwegian Social Science Data Services has approved the study and The Regional
114 Committees for Medical and Health Research Ethics has been informed, but no approval was
115 needed.

116

117 *Family dinner frequency*

118 Frequency of family dinners was assessed by one question: “How often does your mother
119 and/or father usually sit down and eat dinner with you?” with eight categories ranging from
120 never/seldom to seven times a week (9). The family dinner variable was not normally
121 distributed; most of the adolescents ate dinner together with their parent(s) 6 or 7 times per
122 week (80.5%). Therefore, responses were dichotomized into “0-5 times a week” and “6-7
123 times a week”.

124

125 *Family functioning*

126 Family functioning was measured with a Norwegian version of the GFS, a 12-item scale
127 extracted from the McMaster Family Assessment Device (FAD) assessing the overall family
128 functioning (see Table 1 for items) (13,14). Details about the translation process of the GFS
129 are presented elsewhere (12). The response categories ranged from 1 (*Strongly agree*) to 4
130 (*Strongly disagree*), where the sum of scores was divided by 12 to give a total average score

131 ranging from 1.0 to 4.0. A higher score indicates poorer family functioning. Previous
132 research has shown good reliability and construct validity for the GFS in racially/ethnically
133 and socioeconomically diverse populations (13, 15). Recent research on adolescents have
134 showed excellent internal consistency of the GFS among Armenian adolescents ($\alpha=.80$) (16),
135 and high test-retest reliability among Chinese adolescents ($r = .77$) (17). Furthermore, the
136 scale showed a high internal consistency in different Chinese adolescent samples and
137 acceptable convergent and construct validity (17). In addition to support for the scale's
138 reliability and validity among adolescents, the two mentioned studies also supports the
139 cultural appropriateness of the scale (16,17).

140

141 *Covariates*

142 Gender was categorized into “boy” and “girl”. Parental education level was categorized into
143 three levels: “12 years or less” (level 1), “between 13-16 years” (level 2) and “more than 16
144 years” (level 3). Participant ethnicity was categorized as “Norwegian” or “other”, where other
145 was defined as those having both parents born in a country other than Norway (18). Living
146 situation was dichotomized into “living with mother and father” or “all other living
147 arrangements”. Age was measured in years.

148

149 *Statistical analysis*

150 In addition to descriptive analyses, intra-class correlation coefficient analyses (ICC) were
151 conducted to assess the test-retest reliability of the GFS. The reliability was classified as
152 follows: “excellent” (≥ 0.81), “good” (0.61 - 0.80), “moderate” (0.41 - 0.60) and “poor” (\leq
153 0.40) (19). Corrected Item-Total Correlations (CITCs) and Cronbach’s alpha were used to
154 assess the internal consistency of the scale. CITCs > 0.30 were considered good, and CITCs $<$
155 0.20 were considered unreliable as it may indicate a lack of shared variance between some

156 items included in a given scale (20). Cronbach's $\alpha > 0.70$ was considered acceptable and $\alpha >$
157 0.80 good (21).

158

159 A multiple logistic regression model was used to test for the association between family
160 functioning and family dinners while adjusting for variables known to be associated with
161 *family dinner* such as gender, age, parental education level, living situation and ethnicity.

162 Data were analyzed using IBM® PASW® Statistics, version 20.0 (IBM Corp., Somers, New
163 York, USA). The significance level was set to $p < 0.05$.

164

165 **Results**

166 The sample characteristics are presented in Table 2. The adolescents were on average 14.3
167 years ($SD = 0.6$) and 52.3% were females. Most of the adolescents lived together with both
168 parents (68.7%), while 31.3% had other living arrangements. In total, 66.2% of the
169 adolescents' parents had more than 13 years of education, and 90.9% were ethnic Norwegian.
170 Most of the adolescents ate dinner together with their parent(s) 6-7 times per week (81.2%).

171

172 Table 1 shows descriptive statistics and internal consistency of the GFS. The test-retest
173 reliability was excellent ($ICC = 0.83$). The values of CITCs were good (> 0.40 for all items).
174 The GFS had a high reliability, $\alpha = 0.85$.

175

176 The multiple logistic regression model was statistically significant, $\chi^2(7)$, 26.634, $p < 0.001$,
177 explaining 11% (Nagelkerke R^2) of the variance in family dinner frequency (Table 3). Poorer
178 family functioning was significantly associated with reduced frequency of family dinners
179 after adjusting for the effects of gender, ethnicity, age, living situation and parental education
180 (OR = 0.36, CI = 0.20-0.64).

181

182 **Discussion**

183 The GFS, assessing family functioning, had excellent test-retest and acceptable internal
184 consistency in our sample of Norwegian 13-15-year old adolescents. Family functioning was
185 significantly associated with family dinner frequency after adjusting for the effects of gender,
186 ethnicity, age, living situation and parental education level. Importantly, a poorer family
187 functioning was associated with a reduced odds ratio of having dinner together on a daily
188 basis (i.e., 6-7 times per week).

189

190 Few studies have been identified assessing relationships between family functioning and
191 family meals (6). One study found an association between a healthier level of family
192 functioning and more frequent family meals (both dinner and breakfast) in an American
193 sample, which are in line with our findings (6). These findings extend the result of a limited
194 number of previous studies on family functioning and adolescent health (22, 23), as well as
195 studies on family dinners outside America, showing that there are positive associations
196 between family functioning and health behaviors such as having regular family dinners
197 together.

198

199 The predictors in our model explained 11% of variance in family dinner. The modest amount
200 of variance explained could mean that family functioning may be quite a distal factor,
201 probably impacting on the relationships of more proximal family related variables (e.g.,
202 parenting style and more specific food parenting practices) (24). Because the family and the
203 home environment influence and shape adolescents' dietary habits, parents play a major role
204 in the development of healthful habits (3). Thus, there is a need to explore family functioning,

205 which can increase or decrease the likelihood of adolescents eating dinner together with
206 their family.

207

208 *Strength and limitations*

209 The present study is the first to use a Norwegian version of the GFS and test it among
210 Norwegian adolescents to assess reliability and investigate associations between family
211 functioning and family dinner frequency, thus expanding the research on such studies outside
212 the US. The study has been reported according to the STROBE-nut guidelines (25) (see
213 additional file 1).

214 The existing literature on family functioning and family meal frequency is cross-sectional, as
215 is this study, making it highly challenging to determine the direction of influence. Having
216 regular family meals may promote a better family functioning, as well as the other way
217 around. Additionally, the data was collected via self-report, which is prone to social
218 desirability and recall bias. Having data from both parents and children could have
219 strengthened the validity of the data. Other limitations are that the test-retest was conducted
220 at one school in a high socioeconomic status area, and together with a low response rate, this
221 will lower the generalizability of the findings. Finally, there is no information of the non-
222 responders which may have caused bias in the study.

223

224 *Conclusion*

225 The Norwegian version of the GFS used in this study showed high reliability in Norwegian
226 adolescents aged 13-15 years. The association found between family functioning and family
227 dinner frequency indicates that frequencies of family dinners could be one component to be
228 targeted in interventions aiming to improve family togetherness and eating behaviors. Future

229 research needs to investigate possible cause and effect between family functioning and
230 frequency of family dinners by using longitudinal data and to relate it to the healthiness of
231 meals. Furthermore, there is a need to explore more proximal family-related factors such as
232 parenting style and more specific food parenting practices in relation to family functioning.

233

234 **Additional files**

235 Additional file 1: STROBE-nut: An extension of the STROBE statement for nutritional
236 epidemiology. This table provides a checklist, reporting adherence of the current study to the
237 STROBE-nut guidelines (DOCX

238

239 **Declarations**

240 *Ethics approval and consent to participate*

241 Included

242 *Consent for publication*

243 Not applicable

244 *Availability of data and material*

245 The datasets used and analysed during the current study are available from the corresponding
246 author on reasonable request.

247 *Competing interests*

248 The Authors declare that they have no competing interests.

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252 *Authors' contributions*

253 All authors are responsible for the reported research. SESH and HCL worked on the
254 statistical analyses, wrote the first draft of the manuscript and made the greatest contribution
255 to the paper. SESH and MB prepared and conducted the pre-test, pilot and data collection. All
256 authors participated in the development of the framework and the questionnaires. All authors
257 provided critical revision of the paper, and read and approved the final manuscript.

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261 **Supplementary material**

262 Data are available upon request with permission sought through this
263 website <http://www.nsd.uib.no/bestilledata/survey/>

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Table 1. Scale measurement properties of the General Functioning Scale (GFS).

Item	Full sample n = 399			Test-retest n = 45	
	Mean	SD	CITC ^b	α^c	ICC ^d
Total score General Functioning Scale^a	1.72	(0.56)	-	0.85	0.83
Planning family activities is difficult because we misunderstand each other (reversed).	1.79	(0.79)	0.52		
In times of crisis, we turn to each other for support.	1.79	(0.73)	0.44		
We cannot talk to each other about the sadness we feel (reversed).	1.87	(0.91)	0.40		
Individuals are accepted for what they are.	1.68	(0.77)	0.42		
We avoid discussing our fears and concerns (reversed).	2.03	(0.76)	0.52		
We express feelings to each other.	1.84	(0.79)	0.53		
There are lots of bad feelings in our family (reversed).	1.57	(0.74)	0.52		
We feel accepted for what we are.	1.43	(0.62)	0.65		
Making decisions is a problem for our family (reversed).	1.76	(0.74)	0.58		
We are able to make decisions about how to solve problems.	1.66	(0.65)	0.62		
We do not get along well together (reversed).	1.54	(0.78)	0.52		
We confide in each other.	1.66	(0.66)	0.61		

^aAnswer categories ranging from 1 (strongly agree) to 4 (strongly disagree). The total score is then divided by the number of items on the subscale giving a total averaged score ranging from 1.0 (healthy functioning) to 4.0 (unhealthy functioning).

^bCorrected Item-Total Correlation for assessment of internal consistency.

^cCronbach's alpha for assessment of internal consistency.

^dIntra-class correlation assessing test-retest reliability.

Table 2. Characteristics of the study sample.

	Adolescents	
	Full sample N^a= 440	Test-retest N^a = 54
Age 13-15 year (mean (SD))	14.3 (0.6)	13.9 (0.3)
Gender (%)		
Boys	47.7	40.7
Girls	52.3	59.3
Dinner time together with parent(s) (%)		
0-5 times per week	18.8	17.3
6-7 times per week	81.2	82.7
Live together with (%)		
Mother and father	68.7	71.7
All other living arrangement	31.3	28.3
Ethnicity (%)		
Norwegian	90.9	88.7
Other ethnicity ^b	9.1	11.3
Parental educational level (%)		
< 12 years	33.8	9.3
13-16 years	39.3	37.0
> 16 years	26.9	53.7

^aAdolescents; n=417-440, test-retest sample; n=53-54.

^bOther ethnicity: Both parents born in other country than Norway.

Table 3. Associations between family functioning and frequency of family dinner in a sample of Norwegian adolescents.

	Multivariable OR^b (95% CI)	<i>p</i>-value
Family functioning ^a	0.36 (0.20-0.64)	0.001
<i>Covariates</i>		
Gender	0.66 (0.39-1.13)	0.132
Ethnicity	0.36 (0.10-1.25)	0.107
Age	0.73 (0.45-1.17)	0.192
Living situation	0.60 (0.32-1.12)	0.108
Parental education ^c		0.024
Parental education (1) 13-16 y	1.80 (0.91-3.54)	0.090
Parental education (2) >16 y	0.71 (0.36-1.39)	0.319
Constant	10376.24	0.013
Nagelkerke R ²	0.11	

^aA higher score indicates poorer family functioning.

^bOR = Odds ratio.

^c≤ 12 years is the reference category. Parental education (1) = 13-16 years of parental education. Parental education (2) = more than 16 years of parental education.