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Self- and parent-reported depressive symptoms rated by the mood and feelings questionnaire

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ABSTRACT

The Mood and Feelings Questionnaire (MFQ) was developed to measure depressive symptoms in children and adolescents. It includes a self-report and a parent-report part. This study set out to test the psychometric properties of the MFQ in a Danish population of children and adolescents.The study included a population-based sample of $n = 992$ individuals aged 9–17 years and $n = 703$ parents from five schools. The internal consistencies of both MFQ versions were excellent with high alpha coefficients. With few exceptions, correlation between items and the total score was moderate to high. Vegetative symptoms were among the lowest correlating items while cognitive symptoms were among the highest. Girls reported more depressive symptoms than boys, and reports from offspring indicated more depressive symptoms than reports from parents. There was no difference in depressive symptoms by respondents aged 9 to 11 compared to respondents aged 12 to 17 in schools where all pupils participated. However, in schools where pupils participated by choice, an increase in depressive symptoms by age was found. This study suggests that MFQ is reliable for evaluating depressive symptoms in a population of children and adolescents. Furthermore, it is of clinical relevance that parents tend to underreport depressive symptoms of their offspring.

1. Introduction

Depressive disorders are among the five most common mental disorders for children and adolescents and affect 47 million individuals up to age 18 all over the world (Polanczyk et al., 2015). Furthermore, depression affects all age groups, even children of preschool age (Luby, 2010). Childhood and adolescent depression is associated with psychosocial impairment, delay in social and cognitive development, suicidal behaviour and alcohol and drug use (Geller et al., 2001; Rao and Chen, 2009) .

Worldwide, depression prevalence rates are higher for women than for men (Nolen-Hoeksema et al., 1999; Rao and Chen, 2009) . However, it seems that predominance of depression among females occurs only after puberty (Rao and Chen, 2009). Previous research finds that prepubertal rates of depressive disorders are equal in boys and girls, or even higher in boys (Rao and Chen, 2009). Girls report having more depressive symptoms than is the case for boys (Sund et al., 2001). Moreover, it seems as though boys' self-reported depressive symptoms drop throughout their adolescence (Angold et al., 2002).

Children and adolescents tend to report more depressive symptoms than their parents report on their behalf (Angold et al., 1987). Correlation of parent-child reports of depressive symptoms at any specific point in time is 0.5 (Cole et al., 2002). Parents report more depressive symptoms on behalf of female than male adolescent offspring, but this gender difference surfaces at a later juncture (8th–10th grade) than is the case with self-reported depressive symptoms (5th–7th grade) (Cole et al., 2002).

Proper assessment tools are needed to identify children suffering from depressive disorders. Semi-structured clinical interviews are often preferred, but these are time-consuming and not well suited for large population-based surveys or for general practice, as they require a trained interviewer. Questionnaires on the other hand are easily managed and do not require psychiatric expertise. Furthermore, they provide the opportunity to monitor depressive symptoms over time.

In 1987, Angold and colleagues developed the Mood and Feelings Questionnaire (MFQ) for use in epidemiological studies of childhood depression (Costello, 1987). The MFQ is based on criteria taken from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)

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(American Psychiatric Association. Task Force on DSM-IV, 1994) and consists of a child report called MFQ-C and a parent report part called MFQ-P, containing 33 and 34 items respectively. Several studies show that the MFQ has satisfactory criterion validity in its ability to identify individuals with a Major Depressive Episode in both clinical and non-clinical samples (Daviss et al., 2006; Kent et al., 1997; Wood et al., 1995). In addition, the four MFQ items relating to suicidal ideation perform very well in identifying concurrent suicidal ideation (Hammerton et al., 2014).

The current study had three objectives: 1) To test the internal consistency of the Danish child and adolescent versions of the MFQ, 2) to compare MFQ scores and item responses provided by children/adolescents and parents, 3) to define a cut-off score (based on the 90th percentile of a sample representative of the normal population) that could be used to identify individuals 'at risk' of having a depression.

2. Methods

2.1. Study design

A cross-sectional study testing the psychometric properties of the MFQ in a Danish population-based sample.

2.2. Sample

The study was carried out in 2016 and included a population-based sample of Danish children and adolescents aged from 9 to 17 years and their parents. Pupils and parents were recruited from five schools on the island of Funen: two state schools, two independent schools, and a state school with only 10th graders. In Denmark, attendance at state schools is free (paid by through taxes). Independent schools have a user charge, but 75% (2017) is also paid through state taxes (Finansloven, 2016).

The percentage of pupils attending independent schools in Denmark is 17% (Undervisningsministeriet, 2017). The state school in the study with the highest response rate was located in a medium-sized town in a district with the lowest parental incomes. All together, the five schools had a total of 1,751 pupils. Three children were refused permission to participate by their parents. Two state school third grade classes (including 42 pupils) were not able to be included in the study due to absence at the time of data collection. Accordingly, the final number of accessible pupils was 1.706. A total of 992 pupils and 703 parents filled out the questionnaires leading to response rates of 58% and 41%, respectively. Forty-seven percent of the participating pupils and 46,7% of the participating parents were from state schools.

Criteria for inclusion were that they should be 3rd to 10th grade pupils who had the ability to read and understand the Danish language.

2.3. Procedure

First, pupils and parents were informed about the study through the school website. Parents were encouraged to declare by email if they did not wish their child to participate in the study. Next, the first author of the present study visited the schools and all children in grades three to ten were requested to fill in the self-report version of the MFQ online. Two participating schools (one state school and one independent school) allowed us to ensure that all pupils attending school on the day of our visit filled in the MFQ during school hours (mandatory response). Even though there was no consequences if a pupil did not want to participate, no one refused to do so. Pupils from the three remaining schools filled in the online questionnaire in their spare time on their own initiative (voluntary response). These two respondent approaches are from now on referred to as the 'mandatory group' and the 'voluntary group' . Finally, all parents were invited to fill in the parent version of the MFQ from the school website.

2.4. Measures

The MFQ consists of a child self-report part called MFQ-C, which has 33 items, and a parent-report part called MFQ-P, which has 34 items. Both are available for free. The questionnaire is intended to reflect the presence and severity of depressive symptoms in children and adolescents within the last two weeks on the basis of the DSM-IV criteria (American Psychiatric Association. Task Force on DSM-IV, 1994). Each item is scored as 'not true' (score 0), 'sometimes true' (score 1) or 'true' (score 2). A total score for each report is calculated by adding all scores for the 33–34 items (total score 0–66 and 0–68).

We translated the MFQ into Danish in 2015 applying the Guidelines for Translation of Instruments and Scales (Wild et al., 2005). First, an independent professional translator (Danish native speaker) translated MFQ from English into Danish. Next, the Danish translation was discussed and adjusted by specialists in child and adolescent psychiatry to ensure that depressive symptoms were properly addressed. Third, an independent professional translator (English native speaker) back-translated the adjusted Danish version into English. Finally, the back translation was discussed and approved by the developers of MFQ (Adrian Angold and E. Jane Costello).

2.5. Data analysis and statistics

We used descriptive statistics to characterize probands according to age, gender, school type and type of respondent approach. Internal consistency (reliability) was measured using Cronbach's alpha. Relationships between data were measured using the Pearson correlations coefficient. Means and mean differences between groups were measured using *t*-tests. Interactions between variables were measured by one-way- and two-way ANOVAs.

3. Results

3.1. Study sample

Our study included $n = 1{,}695$ children/adolescents and parents. Table 1 shows demographics and overall mean MFQ-scores.

The response rate among pupils at the two mandatory schools was 93.1% while it was 27.3% at the three voluntary schools.

3.2. Correlations with total MFQ score

Internal consistency of the MFQ-C and MFQ-P showed high alpha values ($\alpha = 0.93$ and $\alpha = 0.92$, respectively). We examined the correlations between each child report item score and the total MFQ-C score. They were moderate to high (0.39–0.74, mean = 0.56) for all items, except for the items 'I ate more than usual' (0.20) and 'I slept a lot more than usual' (0.14). The item showing the highest correlation with the total MFQ-C score for the complete sample was 'I did everything wrong'

Table 1
Demographics and mean Mood and Feelings Questinnaire (MFQ)-scores.

	MFQ-C	*MFQ-P*
n	992	703
Male (%)	456 (46.0)	342 (48.7)
Pre-puberty (9–11 years) (%)	344 (34.7)	298 (42.4)
Mean Age (*SD*)	12.9 (2.4)	12.3 (2.4)
Mean MFQ (*SD*)	13.2 (10.8)	7.1 (7.8)
Pupils from state schools (%)[a]	464 (47.0)	327 (46.9)
Mandatory response (%)[b]	740 (74.9)	–

[a] Information about school-type was missing in four child-reports and six parent-reports.

[b] Information about mandatory/voluntary response was missing in four cases.

Table 2
Mood and Feelings Questionnaire child self-report (MFQ-C) items with the highest and lowest correlations with the total MFQ-C score for boys and girls, respectively.

	Boys	*Girls*
Highest correlating items:	I did everything wrong (0.67)	I hated myself (0.75)
	I hated myself (0.65)	I did everything wrong (0.75)
	I felt I was no good anymore (0.65)	I felt I was a bad person (0.71)
Lowest correlating items:	I slept a lot more than usual (0.23)	I slept a lot more than usual (0.12)
	I ate more than usual (0.25)	I ate more than usual (0.23)
	I was less hungry than usual (0.39)	I was very restless (0.33)

(0.74). Table 2 shows the items with the highest and lowest correlations to total MFQ-C score for boys and girls, respectively. We also examined the correlations between each parent report item score and the total MFQ-P score. These were moderate to high (0.30–0.72, mean = 0.54) and the highest correlation was found for the item 'S/he felt s/he was no good anymore' (0.72), while the lowest correlation was found for 'S/he ate more than usual' (0.30). These items were also among the highest and lowest correlating items for parents reporting on boys only. Looking at parents reporting on girls separately, the highest correlation with total score was found for the item 'S/he hated him/herself' (0.72), while the lowest correlation was found for: 'S/he was less hungry than usual' (0.30).

3.3. Gender differences

Girls had a MFQ-C mean score of 15.6 (range 14.7–16.6, $SD = 11.4$), which was higher than the boys' mean score of 10.3 (range 9.5–11.2, $SD = 9.2$) ($p < 0.001$). In the report from parents (MFQ-P), the mean score for girls (8.2, range 7.3–9.1, $SD = 8.7$) was likewise significantly higher than the score for boys (6.0, range 5.3–6.7, $SD = 6.6$) ($p < 0.001$). In order to be able to compare to another Nordic study (Sund et al., 2001), the MFQ mean scores for 13 to 14-year-olds were calculated. The mean MFQ-C score for 13 to 14-year-old boys was 10.5 while it was 16.5 for girls.

3.4. Age group differences

When comparing MFQ-C mean scores between age groups, children aged 9–11 years did not differ from adolescents aged 12–17 years ($mean_{9\text{-}11\ years}$ 12.4, range 11.4–13.4, $SD = 9.7$ and $mean_{12\text{-}17\ years}$ 13.6, range 12.7–14.5, $SD = 11.3$) ($p = 0.10$). Nevertheless, we found a trend towards higher MFQ-C scores among the oldest age group. Neither did the parent-reported MFQ-P mean scores differ between age groups ($mean_{9\text{-}11\ years}$ 7.0, range 6.2–7.8, $SD = 7.1$ and $mean_{12\text{-}17\ years}$ 7.3, range 6.5–8.1, $SD = 8.3$) ($p = 0.60$). A two-way ANOVA testing gender by age group effect showed that only gender had an impact of the total MFQ score ($p < 0.001$), while age group did not ($p = 0.13$).

3.5. Offspring vs. parents

Table 3 presents the numbers and percentages of offspring and parents who reported that the statement was 'true' for each MFQ-item.

Generally, children responded 'true' to more MFQ items than parents did. Two exceptions were a) 'S/he felt grumpy and cross with his/her parents', which parents of pre-pubertal children confirmed more often than the offspring did themselves, and b) 'S/he felt miserably or unhappy', which parents of boys and pre-pubertal children confirmed more often than did their children. Some of the items displaying significant disagreement between child and parent reports included the suicidal items, e.g. 'I/she/he thought about death or dying' and 'I/she/he thought about killing my/him/herself' .

Data was available from both parent and child in 534 cases, giving us the opportunity to compare depressive symptoms reported by parent and child. This dyad sample showed a MFQ-C mean score of 12.7 (range 11.8–13.6, $SD = 10.6$), while the MFQ-P mean score was significantly lower: 7.3 (range 6.7–8.0, $SD = 8.0$) ($p < 0.001$). The correlation between the total MFQ-scores of the child and parent report was 0.44 for the full sample of dyads and highest in the older age group of 12-17-year-olds compared to the younger (0.52 and 0.31, respectively).

3.6. Cut-off scores

Two respondent approaches were used for children and adolescents: mandatory (completion of the MFQ in school hours was ensured by the first author) and voluntary (completion of MFQ was carried out voluntarily in spare time).

The 90th percentile of the total MFQ score in the group of mandatory respondents ($n = 740$) was 28.5. This resulted in a cut-off score of 29. Of the total child report sample (including both mandatory and voluntary respondents) 11% reached this cut-off score, and 75% of these were girls.

For parent reports, the 90th percentile of the total MFQ score was found to be 17. Of the responding parents reaching this cut-off score 66% were reporting on girls.

In Table 4 we divided the participants into youths at risk or not at risk of depression using the > 90th percentile cut-off of ≥ 29. The table presents all MFQ items and the number of participants who reported the statement (item) to be true. Furthermore, it shows the correlation of each item with the total MFQ-score of each group.

3.7. Mandatory vs. voluntary response

The fact that we had two respondent approaches (mandatory and voluntary) gave us the opportunity to conduct post-hoc analyses. The response rates in the mandatory and the voluntary groups were 92.6% and 27.3% respectively. The mean MFQ-C score in the total mandatory group was 12.9 (range 12.2–13.6, $SD = 10.2$), and the mean MFQ-C score in the total voluntary group was 14.2 (range 12.6–15.8, $SD = 12.4$). The MFQ-C means did not differ significantly between groups ($p = 0.10$). When looking at the youngest age group only (9–11 years), the MFQ-C means for mandatory and voluntary respondents were 13.1 (range 12.0–14.3, $SD = 9.7$) and 9.5 (range 7.3–11.8, $SD = 9.0$), respectively ($p = 0.008$). The MFQ-C means in the oldest age group (12–17 years) was 12.8 for mandatory respondents (range 11.8–13.7, $SD = 10.5$) and 15.8 (range 13.9–17.7, $SD = 13.0$) for voluntary respondents ($p = 0.002$). Figs. 1 and 2 show the MFQ means by age and gender in the mandatory and voluntary group. The dotted trend lines show a flatter and more constant graph for the mandatory group, while the trend in the voluntary response group rises with increasing age. One-way ANOVAs testing age-by-group interaction showed that age group was not a statistically significant factor in the mandatory group ($F = 0.17$, $p = 0.68$) while it was a significant factor in the voluntary group ($F = 10.71$, $p = 0.001$).

3.8. State vs. independent schools

We also made post-hoc analyses comparing data from state and independent schools. State school pupils had a mean MFQ-C score of 14.4 (range 13.5–15.5, $SD = 11.2$), which was higher than for independent school pupils (mean 12.1, range 11.3–13.0, $SD = 10.3$) ($p < 0.001$). Similarly, the mean MFQ-P total score for state school pupils was 7.9 (range 7.0–8.9, $SD = 8.4$), which was higher than the MFQ-P score for independent school pupils of 6.4 (range 5.7–7.1, $SD = 7.2$) ($p = 0.009$).

Table 3
Frequency distribution (n/%) of the Mood and Feelings Questionnaire (MFQ) items by gender.

MFQ-item		Boys		Girls	
		Child report n = 456 n (%)	*Parent report n = 342 n (%)*	*Child report n = 536 n (%)*	*Parent report n = 361 n (%)*
1.	Felt miserable or unhappy	12 (2.4)	14 (4.1)	47 (8.8)	25 (6.9)
2.	Didn't enjoy anything at all	8 (1.8)	3 (0.9)	20 (3.7)	6 (1.7)
3.	Was less hungry than usual	27 (5.9)	1 (0.3)	48 (9.0)	5 (1.4)
4.	Ate more than usual	47 (10.3)	3 (0.9)	37 (6.9)	5 (1.4)
5.	Felt so tired I/s/he just sat around and did nothing	42 (9.2)	6 (1.8)	77 (14.4)	15 (4.2)
6.	Was moving and walking more slowly than usual	21 (4.6)	0 (0.0)	24 (4.5)	4 (1.1)
7.	Was very restless	25 (5.5)	5 (1.5)	35 (6.5)	10 (2.8)
8.	Felt I/s/he was no good anymore	31 (6.8)	8 (2.3)	74 (13.8)	25 (6.9)
9.	Blamed my/him/herself for things that weren't my/his/her fault	18 (4.0)	6 (1.8)	46 (8.6)	13 (3.6)
10.	Was hard for me/him/her to make up my/his/her mind	33 (7.2)	8 (2.3)	69 (12.9)	20 (5.5)
11.	Felt grumpy and cross with my/his/her parents	47 (10.3)	25 (7.3)	68 (12.7)	43 (11.9)
12.	Felt like talking less than usual	27 (5.9)	5 (1.5)	56 (10.5)	7 (1.9)
13.	Was talking more slowly than usual	13 (2.9)	0 (0.0)	16 (3.0)	0 (0.0)
14.	Cried a lot	5 (1.1)	3 (0.9)	41 (7.7)	13 (3.6)
15.	Thought there was nothing good for me/him/her in the future	12 (2.6)	4 (1.2)	28 (5.2)	6 (1.7)
16.	Thought that life wasn't worth living	12 (2.6)	3 (0.9)	19 (3.5)	6 (1.7)
17.	Thought about death or dying	23 (5.0)	5 (1.5)	45 (8.4)	7 (1.9)
18.	Thought my/his/her family would be better off without me/him/her	8 (1.8)	3 (0.9)	18 (3.4)	0 (0.0)
19.	Thought about killing my/him/herself	11 (2.4)	3 (0.9)	10 (1.9)	1 (0.3)
20.	Didn't want to see my/his/her friends	17 (3.7)	1 (0.3)	32 (6.0)	6 (1.7)
21.	Found it hard to think properly or concentrate	28 (6.1)	3 (0.9)	66 (12.3)	16 (4.4)
22.	Thought bad things would happen to me/him/her	16 (3.5)	1 (0.3)	29 (5.4)	5 (1.4)
23.	Hated my/him/herself	17 (3.7)	2 (0.6)	46 (8.6)	9 (2.5)
24.	Felt I/s/he was a bad person	17 (3.7)	3 (0.9)	35 (6.5)	9 (2.5)
25.	Thought I/s/he looked ugly	26 (5.7)	3 (0.9)	89 (16.6)	14 (3.9)
26.	Worried about aches and pains	19 (4.2)	4 (1.2)	56 (10.5)	11 (3.1)
27.	Felt lonely	20 (4.4)	6 (1.8)	44 (8.2)	16 (4.4)
28.	Thought nobody really loved me/him/her	11 (2.4)	2 (0.6)	27 (5.0)	7 (1.9)
29.	Didn't have any fun in school	27 (5.9)	8 (2.3)	45 (8.4)	22 (6.1)
30.	Thought I/s/he could never be as good as other kids	28 (6.1)	7 (2.1)	54 (10.1)	13 (3.6)
31.	Did everything wrong	13 (2.9)	5 (1.5)	38 (7.1)	8 (2.2)
32.	Didn't sleep as well as I/s/he usually sleep	48 (10.5)	4 (1.2)	70 (13.1)	10 (2.8)
33.	Slept a lot more than usual	54 (11.8)	4 (1.2)	47 (8.8)	6 (1.7)
34.	Wasn't as happy as usual, even when s/he was praised or rewarded	–	2 (0.6)	–	9 (2.5)

4. Discussion

This study examined the usability of the MFQ in a large Danish sample of children, adolescents and parents. We found that girls report more depressive symptoms than boys and that children and adolescents report more depressive symptoms than their parents do on their behalf. Furthermore, we found that 9 to 11-year-olds representative of the background population report more depressive symptoms than 9 to 11-year-olds that volunteer to participate. Conversely, 12 to 17-year-old respondents representative of the background population report fewer depressive symptoms than 12 to 17-year-old voluntary respondents.

The internal consistency of both MFQ-C and MFQ-P was found to be excellent in accordance with the rules of thumb with alpha-values ≥ 0.9 (Okada, 2015).

Correlations between specific items and the total MFQ score were with few exceptions moderate to high in both MFQ-C and MFQ-P. All the items with highest correlation involved cognitive symptoms (e.g. 'I hated myself' and 'I did everything wrong'). Most of the items with lowest correlation involved vegetative symptoms (e.g. 'I slept a lot more than usual' and 'I ate more than usual'). Vegetative symptoms are defined as functions necessary to sustain life, e.g. sleep, appetite and libido (Bebbington et al., 1988). Both of these results are in line with those of a previous study made by the developers of the MFQ (Angold et al., 1995). They found that MFQ items addressing cognitive and to a lesser degree affective components of depression tended to be the best predictors of child depressive status in children and adolescents aged 6–17 years (Angold et al., 1995). Furthermore, the study found that the two items 'I ate a lot more than usual' and 'I slept a lot more than usual' were among the three items that had lowest correlation with the total-item score (Angold et al., 1995). The finding is consistent with a Norwegian study as well, as they found that vegetative symptoms had the lowest correlations with total MFQ score (Sund et al., 2001). Interestingly, they found that the item about concentration problems were among the three highest correlating items in boys (Sund et al., 2001). This finding is contrary to ours which solely found self-devaluating items among the three highest correlating items for both genders. Our results suggest that vegetative symptoms may only play a minor role in child and adolescent depressive symptomatology. On the other hand, cognitive symptoms seem to have a high correlation to high depression scores. Clinicians may benefit from paying attention to cognitive symptoms as they seem to correlate to a high level of depressive symptoms.

Several studies have demonstrated that girls tend to report more depressive symptoms than boys (Angold et al., 2002; Sund et al., 2001) . This was found in our study as well, with MFQ-C mean scores of 15.6 for girls and 10.3 for boys. When looking at the MFQ-C mean scores among 13-14-year-olds, we found higher scores for girls and boys (16.5 and 10.5 respectively) than a Norwegian study (12.8 and 8.4 respectively) conducted in 1998 (Sund et al., 2001). An explanation for this finding could be national differences or a time trend showing a general increase in self-reported depressive symptoms among adolescents over recent decades. The latter suggestion is supported by a recent study,

Table 4
Frequency distribution (n/%) of the Mood and Feelings Questionnaire (MFQ) items by risk group.

MFQ-item		Not at risk of depression < 90th percentile		At risk of depression > 90th percentile	
		n = 882 n (%)	*Correlation*	*n = 110 n (%)*	*Correlation*
1.	Felt miserable or unhappy	23 (2.6)	0.52	36 (32.7)	0.22
2.	Didn't enjoy anything at all	19 (2.2)	0.33	9 (8.2)	0.44
3.	Was less hungry than usual	46 (5.2)	0.40	29 (26.4)	0.16
4.	Ate more than usual	61 (6.9)	0.23	23 (20.9)	−0.05
5.	Felt so tired I just sat around and did nothing	63 (7.1)	0.47	56 (50.9)	0.26
6.	Was moving and walking more slowly than usual	18 (2.0)	0.34	27 (24.6)	0.29
7.	Was very restless	35 (4.0)	0.34	25 (22.7)	0.20
8.	Felt I was no good anymore	43 (4.9)	0.55	62 (56.4)	0.37
9.	Blamed myself for things that weren't my fault	23 (2.6)	0.40	41 (37.3)	0.32
10.	Was hard for me to make up my mind	56 (6.4)	0.47	46 (41.8)	0.24
11.	Felt grumpy and cross with my parents	74 (8.4)	0.38	41 (37.3)	0.18
12.	Felt like talking less than usual	31 (3.5)	0.47	52 (47.3)	0.28
13.	Was talking more slowly than usual	14 (1.6)	0.26	15 (13.6)	0.33
14.	Cried a lot	15 (1.7)	0.42	31 (28.2)	0.36
15.	Thought there was nothing good for me in the future	9 (1.0)	0.46	31 (28.2)	0.47
16.	Thought that life wasn't worth living	5 (0.6)	0.37	26 (23.6)	0.55
17.	Thought about death or dying	29 (3.3)	0.43	39 (35.5)	0.34
18.	Thought my family would be better off without me	4 (0.5)	0.39	22 (20.0)	0.36
19.	Thought about killing myself	4 (0.5)	0.26	17 (15.5)	0.48
20.	Didn't want to see my friends	19 (2.2)	0.41	30 (27.3)	0.34
21.	Found it hard to think properly or concentrate	43 (4.9)	0.54	51 (46.4)	0.44
22.	Thought bad things would happen to me	11 (1.3)	0.47	34 (30.9)	0.46
23.	Hated myself	17 (1.9)	0.51	46 (41.8)	0.47
24.	Felt I was a bad person	11 (1.3)	0.49	41 (37.3)	0.37
25.	Thought I looked ugly	53 (6.0)	0.53	62 (56.4)	0.18
26.	Worried about aches and pains	38 (4.3)	0.42	37 (33.6)	0.22
27.	Felt lonely	23 (2.6)	0.53	41 (37.3)	0.20
28.	Thought nobody really loved me	12 (1.4)	0.38	26 (23.6)	0.30
29.	Didn't have any fun in school	40 (4.5)	0.47	32 (29.1)	0.25
30.	Thought I could never be as good as other kids	36 (4.1)	0.49	46 (41.8)	0.32
31.	Did everything wrong	8 (0.9)	0.59	43 (39.1)	0.50
32.	Didn't sleep as well as I usually sleep	69 (7.8)	0.43	49 (44.6)	0.34
33.	Slept a lot more than usual	80 (9.1)	0.21	21 (19.1)	−0.12

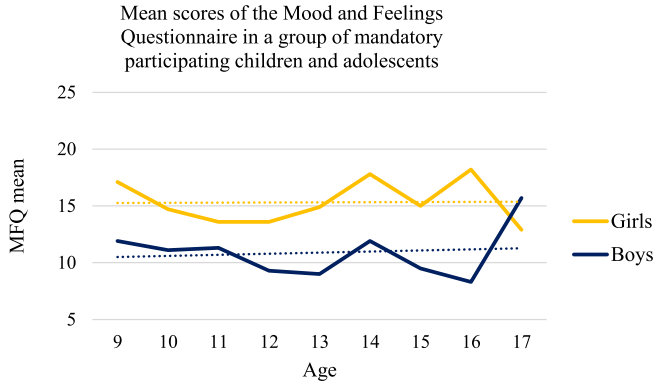

Fig. 1. about here Mood and Feelings Questionnaire (MFQ) mean scores collected at schools, where all pupils responded (mandatory). The dotted lines are the trend lines.

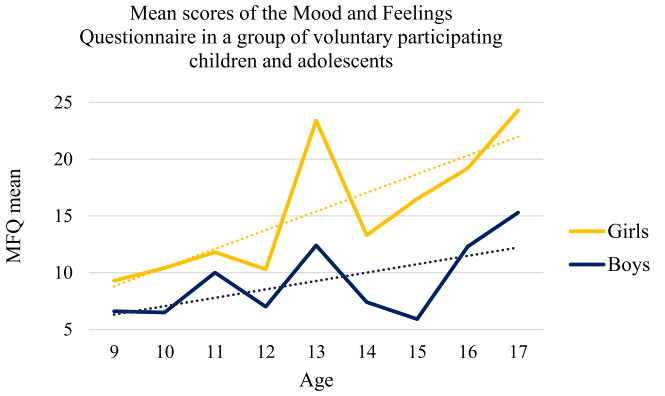

Fig. 2. about here Mood and Feelings Questionnaire (MFQ) mean scores collected at schools, where pupils responded by their own initiative (voluntary). The dotted lines are the trend lines.

which found an increase in the prevalence of self-reported major depressive episodes among 12 to 20-year-old Americans from 2005 to 2014 using a structured interview and conducted using computer-assisted interviewing (Mojtabai et al., 2016). Furthermore, they found the increase in depressive symptoms to be larger for girls than boys (Mojtabai et al., 2016). Another fact, which might have resulted in higher total depression scores in girls in this study, might be the fact that more girls than boys were in the highest age group of our voluntary group of respondents. Respondents in this group had a higher average MFQ-score than the rest of the probands. The parents in our study reported a higher level of depressive symptoms among girls than boys (means 8.2 vs. 6.0). As previously discussed, girls report more depressive symptoms than boys and therefore it is not surprising that parents of girls report more depressive symptoms as well.

When looking at the whole study population, there was no difference in total MFQ mean scores between the youngest age group and the oldest age group. This is true both of self-reports and parental reports. Even though we did not find a significant difference between our two age groups, we found a reduction in depressive symptoms in our mandatory group for both genders around age 10 (Fig. 1). A decrease in depressive symptoms prior to the age of 11 has been described in a previous study (Angold et al., 2002). The reason for this drop is not clear, but it has been suggested that pre-pubertal elevation in androgens or psychosocial factors could be involved (Angold et al., 2002).

The total self-report MFQ mean score was significantly higher than the parental report MFQ mean score in the 534 dyads where data was

available from both child/adolescent and parent. These results are consistent with another study, which found that adolescents tended to rate themselves higher than parents on all kind of problems (Rescorla et al., 2013). The correlation between the self-report and parental report was 0.44, which is lower than the correlations of 0.51 (Wood et al., 1995) and 0.65 (Kent et al., 1997) found in English samples. Surprisingly, our results showed that the correlation between child report and parental report increased with age, the correlation being 0.52 in the oldest age group but 0.31 in the youngest. An explanation for this finding might be that adolescents express their depressive symptoms in a more extroverted manner than younger children giving a clearer signal to their parents. Furthermore, adolescents might be more able to articulate feelings. There are, however, other possible explanations: A previous study evaluating reliability in self-reported psychiatric symptoms in children found that younger children would be less likely to provide precise onset dates of symptoms (Angold et al., 1996). The fact that probands were asked about thoughts and feelings the last 14 days might have been more difficult to grasp for the youngest children. Still, if children have difficulties determining onset of depressive symptoms, we would not expect a systematic over-reporting but rather likely underreporting. Anyway, our finding differs from previous clinical studies, where agreement between parents and offspring regarding depression diagnosis was higher for younger than for older children (Grills and Ollendick, 2003; Rothen et al., 2009). An explanation for this might be that parents of offspring referred to a clinic are more aware of their offspring's symptoms than parents of children and adolescents from a background population and therefor they might be more aware of the youngest childrens' symptoms as well. It has previously been suggested that there is a difference between parents of a clinical and a non-clinical sample, e.g. there is some evidence to suggest that parents of children referred to a child psychiatric service are more likely to show psychopathology (Thapar and McGuffin, 1998). One study found that parental information led to lower depression prevalences in children and as a consequence the effect of applying looser criteria for the assignment of the diagnosis according to parental reports was tested. After lowering the diagnostic thresholds for depression in parental report, prevalence estimates according to child and maternal information no longer differed (Rothen et al., 2009). Our results indicate that the parental underestimation of depressive symptoms as compared to the offspring is significant and clinically relevant and most pronounced for young children.

Interestingly, as shown in table 3 there was also significant discrepancy between child and parental reports regarding the suicidal MFQ items. These results seem to be consistent with other research which found that mothers' reports of youth suicidality are likely to underestimate the prevalence of suicidal ideation and behaviour (Klimes-Dougan, 1998). Another previous study found that child reporting of suicidal MFQ items performed better than parental reporting in detecting concurrent suicidal ideation as measured by a clinically validated interview, especially in older offspring (Hammerton et al., 2014). Given this marked discrepancy and the potential superiority of child and adolescent reporting, it is imperative that clinicians take youth-reported suicidality very seriously. Suicide is the third most common cause of death among adolescents (Minino, 2013), and we strongly recommend that more clinical attention be directed towards reports by children and adolescents of their own depressive symptoms.

Our study was performed using a non-clinical sample. A US study suggested a MFQ cut-off score of 29 from clinical and non-clinical samples (Daviss et al., 2006). This score is similar to the self-report cut-off score found in our study using the 90th percentile of the mandatory sample. However, the same study identified a cut-off score of 27 in the parental version, which is much higher than the 90th percentile cut-off score of 17 found among the parental reports in this study. Only 3.3% of parents in our study reached the suggested US parent report score of 27 (Daviss et al., 2006). Our study was carried out among a general population, and the marked discrepancy may be due to parents of children in a clinical setting being more aware of their offspring's symptomatology. It might also be explained by cultural differences between American and Danish populations. A previous study showed a marked underreporting of children's emotional symptoms among Norwegian parents of 8 to 10-year-old children compared to British parents of children in the same age range (Heiervang et al., 2008). This could also be the case in our Danish sample. We did not have any information about mental health status among our probands and therefore we were not able to do ROC-analyses and sensitivity and specificity for this sample. Clinicians using the MFQ should aware of this issue and might use a lower cut-off score, especially for the parental version.

The study design used two response approaches for data collection, providing us with two groups of study participants: A mandatory group and a voluntary group. This gave us the opportunity to perform post-hoc analyses. A very interesting finding lay in the differences between these groups. The mandatory group included all pupils attending school at the day of assessment and their depressive symptoms did not increase with increasing age. The voluntary group included pupils completing MFQ on their own initiative or at their parents' request. In this group, depressive symptoms were low in 9 to 10-year-olds and increased significantly with age. When comparing the youngest age groups, the voluntary group reported significantly fewer depressive symptoms than the mandatory group. An explanation for this might be self-selection bias. In this case, we might predict that children who voluntarily filled out the MFQ could be less prone to depressive symptoms, all the more so if they had resourceful and enthusiastic parents encouraging them to participate in optional mental health surveys. Conversely, the oldest study participants (12–17 years) in the voluntary group reported significantly more depressive symptoms than the mandatory group. This could also be a consequence to self-selection bias, because people are more likely to respond to questionnaires that they find relevant (Eysenbach and Wyatt, 2002). In this case we believe that the adolescents who voluntarily participated in our mental health survey were more likely to suffer from current depressive symptoms. These findings are of importance for future research as the risk for self-selection bias and non-response bias in voluntary participation seems to be high. Our results clearly show that, if we include all school pupils in the age 9–17 years by mandatory response, there is no significant increase in depressive symptoms by age. The non-responders at the two mandatory schools were solely pupils who did not attend school at the day of assessment. Unfortunately, we did not have any information about the non-responders from the voluntary schools. The majority of voluntary responders were girls. This may be explained by research suggesting that females are generally more interested in health topics and are more likely to volunteer for participation in health questionnaires (Eysenbach and Wyatt, 2002).

We included pupils from both state and independent schools. When doing post-hoc analyses by comparing these groups, we found that mean MFQ-C and MFQ-P scores were significantly higher for state school pupils than independent school pupils. These findings are in line with a previous study (Fleitlich-Bilyk and Goodman, 2004). A possible explanation for this might be that socio-economically disadvantaged children could be more common in state schools. A Norwegian study found a significant association between stressful life events and depressive symptom level measured by the MFQ (Sund et al., 2003). Previous research shows that children from families of low-economic status are more likely to experience greater life event stresss (Guerra et al., 1995). Furthermore, lack of social support, low income and low socio-economic status are all factors that seem to increase the risk of depression (Gariepy et al., 2016; Rao and Chen, 2009).

The strengths of this study were the large sample size, the fact that both self-reports and parental reports were available, and that we included children in both state and independent schools. Furthermore, an important strength was that the response rate in two participating schools was high because it was possible to ensure the response of every

pupil attending school on the day of the survey.

A limitation was that, regardless of the high response rate of 93.1% in the 'mandatory response schools', there was a risk of selection bias as the pupils not attending school on the day of the survey may ipso facto represent a mental health risk group in themselves. Another issue could be that children as young as 9 years old were asked to fulfil the questionnaire since some of them might were too immature to rate themselves.

Also, the study was limited by the fact that we did not have the opportunity to carry out clinical examinations of our respondents. Therefore, we had no information about their clinical mental health status.

In conclusion, the Danish versions of the MFQ seem efficient for evaluating depressive symptoms in children and adolescents. We recommend that future research seeks to validate the Danish MFQ in clinical settings.

Ethics

This study was approved by The Danish Data Protection Agency (2008-58-0035). The manuscript does not contain clinical studies or patient data. According to Danish law, questionnaire data collection does not require Ethical Committee approval.

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Declaration of interest

none

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