



University of Groningen

## The Strengths and Difficulties Questionnaire Self-Report

Theunissen, Meinou H C; de Wolff, Marianne S; Reijneveld, Sijmen A

*Published in:*  
Academic pediatrics

*DOI:*  
[10.1016/j.acap.2018.12.008](https://doi.org/10.1016/j.acap.2018.12.008)

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*  
Final author's version (accepted by publisher, after peer review)

*Publication date:*  
2019

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Theunissen, M. H. C., de Wolff, M. S., & Reijneveld, S. A. (2019). The Strengths and Difficulties Questionnaire Self-Report: a valid instrument for the identification of emotional and behavioral problems. *Academic pediatrics*, 19(4), 471-476. <https://doi.org/10.1016/j.acap.2018.12.008>

**Copyright**

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

**Take-down policy**

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.



# The Strengths and Difficulties Questionnaire Self-Report: a valid instrument for the identification of emotional and behavioral problems

*Meinou H.C. Theunissen PhD<sup>1</sup>, Marianne S. de Wolff PhD<sup>1</sup>, Sijmen A. Reijneveld MD PhD<sup>1,2</sup>*

<sup>1</sup> TNO Child Health, Leiden, NL

<sup>2</sup> University Medical Center Groningen, University of Groningen, Department of Health  
Sciences, Groningen, NL

Academic address and address for correspondence:

MHC Theunissen PhD

TNO Child Health

P. O. Box 3005, 2301 DA Leiden, Netherlands

Tel. +31 888666280

Fax +31 888660613

Email [Meinou.Theunissen@tno.nl](mailto:Meinou.Theunissen@tno.nl)

**Abstract**

*Purpose.* Validated questionnaires help community pediatric services to identify emotional and behavioral problems (EBP). This study assesses the psychometric properties of the self-report version of the Strengths and Difficulties Questionnaire for the identification of EBP in adolescents (13-14 years) and the added value of the SDQ parent-form.

*Methods.* We obtained data on 500 adolescents (mean age 13.5 years) from community well-child services and schools. Adolescents completed the SDQ self-report, and the Youth Self-Report (YSR). Parents completed the SDQ parent-form and the Child Behavior Checklist (CBCL) for their child. We assessed the internal consistency and validity using the YSR and CBCL as the criteria, and the degree to which the SDQ parent-form provides additional information by comparison with the self-report.

*Results.* The internal consistency of the SDQ Total Score was good (Cronbach's alpha 0.75). Sensitivity and specificity using the YSR as the criterion were 0.75 and 0.91 respectively. When the CBCL was adopted as the criterion, these validity indices were lower. The SDQ parent-form does not provide additional information by comparison with self-reporting only when the YSR score is used as the criterion (odds ratio 0.48, 95%, CI 0.14-1.65) but it does do so when the CBCL is the criterion (odds ratio 10.9, 95%-CI 4.23-27.9).

*Conclusions.* The SDQ self-report is valid for the detection of EBP in adolescents and the SDQ parent-form provides additional information by comparison with the self-report. This indicates that it is useful to involve adolescents and their parents as informants for the identification of EBP in adolescents.

**Keywords:** emotional and behavioral problems; screening; adolescents

**What's new (max 40 words)**

The self-report version of the SDQ is a valid instrument for the detection of EBP in adolescents aged 13 and 14 years. The SDQ Parent Form can provide additional information about externalizing problems in adolescents.

ACCEPTED MANUSCRIPT

## Introduction

About 10 to 25% of adolescents have symptoms of mental health problems such as low self-esteem, depressive thoughts, impulsive or maladaptive behaviors<sup>1,2</sup> These emotional and behavioral problems (EBP) can negatively impact an adolescent's development and evolve later into serious mental health problems.<sup>3,4</sup> The early recognition and identification of EBP can improve prognosis.<sup>5-7</sup>

Community pediatric services play a major role in the identification of EBP in children and adolescents. Validated short questionnaires have been shown to support identification. However, most of the evidence relates to parent-reported questionnaires such as the SDQ Parent form (SDQ-PF).<sup>8,9</sup>

The Strengths and Difficulties Questionnaire (SDQ) is currently one of the most widely used behavioral screening questionnaires. It can be completed by both parents and the adolescents themselves (aged 11–16). The psychometric properties of the SDQ-PF have been shown to be good in various settings and countries,<sup>9-13</sup> including the Netherlands.<sup>14-20</sup> However, in community pediatric services self-report questionnaires are usually used regarding adolescents. Evidence about the self-report version of the SDQ (SDQ-SR) is more limited, although the available studies generally show that the SDQ-SR is a reliable tool for the assessment of psychological adjustment in adolescents in a community setting.<sup>8,14,15,21</sup> It is needed to validate the SDQ-SR among adolescents and to provide norms in a community setting, as available studies are rather old<sup>8,14,15</sup> and have methodological limitations<sup>14,15,21</sup>, for instance they do not present norms and sensitivity and specificity indices. Furthermore, research is needed to determine whether the self-report and parent versions of the SDQ are equally valid, and to what extent the Parent Form adds unique information to the information from the self-report version. The limited available evidence indicate meaningful differences between problems as reported by adolescents and parents.<sup>22-24</sup> The first aim of this study was

therefore to assess the psychometric properties (internal consistency, scale structure and validity) of the SDQ-SR for the identification of EBP in adolescents. The second aim of this study was to assess whether the SDQ-PF provides additional information about EBP by comparison with adolescent reporting only.

## Methods

Adolescents and their parents completed the SDQ-SR and the SDQ-PF respectively, as well as the questionnaires that we used as criteria: the Youth Self-Report (YSR) and the Child Behavior Checklist (CBCL) respectively. The data were obtained from schools and in the context of the routine Preventive Child Healthcare (PCH) assessments that are provided regularly for all Dutch children. The CBCL, YSR and SDQ-PF were included for research purposes, completion of these questionnaires is not a standard procedure during routine PCH assessment. Ethical approval for this study was obtained from the Medical Research Ethics Committee of Leiden University Medical Center (LUMC) in the Netherlands.

### *Sample*

We used two samples to collect data about EBP in adolescents from PCH and from schools.

- 1) *PCH sample*: We obtained data from the routine PCH assessments provided to all Dutch children free of charge in the second year of high school at the age of 13 or 14 years. Four services invited 961 adolescents and their parents to participate in the study: 602 (62.6%) of them participated by completing the YSR and either the SDQ-SR or another questionnaire (not included in this article). We used the data of the adolescents that completed the YSR and the SDQ-SR resulting in a response of  $n=299$ . Differences between respondents and non-respondents were small (Cohen's effect sizes 0.10 for age and 0.12 for gender, both  $p < 0.05$ ). Analyses were limited to

adolescents who filled out the SDQ-SR (and the YSR). Written informed consent for participation in the study was obtained from the parents.

*School sample:* We also obtained data from a school sample as the PCH sample resulted in insufficient data to assess the validity of the SDQ with a statistical power of 0.80. We obtained data directly from six high schools covering all educational levels, and selected 12 second grade classes (ages 13-14 years) resulting in 201 students who completed the SDQ-SR and YSR questionnaires in the classroom under the supervision of a teacher. Informed consent for participation was obtained from parents but no parent-report questionnaires were completed.

### *Measures*

We used the SDQ-SR (covering the 11-17 years age range) and SDQ-PF (covering the 4-17 years age range). Both questionnaires consist of 25 items relating to children's strengths and difficulties. Each item is scored on a 3-point scale (0 = not true, 1 = somewhat true, and 2 = certainly true). The SDQ consists of five subscales, four on difficulties – Emotional symptoms, Conduct problems, Hyperactivity-inattention, Peer problems – and one on strengths: Pro-social behavior. An SDQ Total Difficulties Score (TDS) can be calculated by adding up the scores for the first four subscales. Adolescents were allocated to a normal range or an elevated TDS based on the SDQ-SR using the score that was associated with a specificity of at least 0.90 in our sample, with the elevated YSR as the criterion. This resulted in a cut-off point of >11 for the SDQ-SR TDS, i.e. 16.4% elevated scores. Adolescents were allocated to a normal range or an elevated range on the SDQ-PF using the score that was associated with a percentage of children with elevated scores similar to the percentage for the SDQ-SR. This cut-off point was >9 for the SDQ-PF TDS, resulting in a percentage of elevated scores of 15.3%.



The YSR (covering the 11-18 years age range) and CBCL (covering the 6-18 years age range) were used as the criteria for the assessment of EBP. The YSR and CBCL are, respectively, self-reports and parental reports about children's emotional and behavioral problems in the preceding six months. Their good reliability and validity have been established.<sup>25-28</sup> Both questionnaires comprise 112 problem items that are combined with a Total Problem Score (TPS), and Internalizing and Externalizing Problem scores, the latter two representing emotional and behavioral problems respectively. Adolescents were allocated to a normal range or an elevated range using 90<sup>th</sup> percentile sex-specific cut-off points.<sup>25</sup>

### *Procedure*

In the first sample, adolescents aged 13 and 14 years were invited for a routine health assessment at school at which child healthcare professionals (CHP) completed a routine examination. In addition to this routine assessment, questionnaires were sent to the adolescents' homes for their parents (SDQ PF and CBCL) and for themselves (YSR). These longer questionnaires were completed at home and then returned to the research institute.

In the second sample, adolescents in the second year of high school completed questionnaires (SDQ-SR and YSR) in the classroom under the supervision of a teacher. Data about child age, gender and educational level, ethnic background and parental educational level were obtained from the adolescents.

### *Analysis*

Our first step was to assess the background characteristics of the sample. Secondly, we assessed the psychometric properties (internal consistency, scale structure and validity) of SDQ-SR for the identification of EBP in adolescents. Internal consistency was assessed by computing Cronbach's alphas. We examined the fit between the scale structure and the

observed data with confirmatory factor analysis (CFA) using Mplus Structural Equation Modeling (SEM).<sup>29</sup> In the CFA, the models were considered to be a good fit when the Parsimony Comparative Fit Index (PCFI) was  $> 0.90$ . Because the PCFI index is a strict criterion, we considered the model to be an approximate fit when the Root Mean Square Error of Approximation (RMSEA) was  $< 0.08$  and a good fit when the RMSEA was  $< 0.05$ . Items with regression weights  $< 0.30$  were considered not to be a fit.<sup>29</sup> The validity of the SDQ SR was assessed with sensitivity and specificity indices using YSR TPS and CBCL TPS, internalizing and externalizing problems scores as criteria. Cohen's kappa and Spearman correlation coefficients were calculated to assess the overall agreement between the SDQ and the criteria.

Thirdly, we assessed whether the SDQ-PF provides additional information by comparison with the self-report. Logistic regression analysis was performed with the YSR and CBCL criterion measures (TPS, internalizing or externalizing). In the first step, the SDQ-SR TDS score or SDQ-PF TDS was included in the analyses (crude analyses) and the SDQ-PF TDS score was added to the SDQ-SR TDS as an independent variable in the second step.

## Results

### *Background characteristics of the sample*

The mean age of the sample was 13.5 years (SD: 0.6 years). Further demographic information is presented in Table 1.

[Table 1]

*Internal consistency and scale structure*

The internal consistency of the SDQ-SR TDS was 0.75. The Cronbach's alphas for the five subscales of the SDQ-SR varied between 0.54 and 0.71 (Table 2).

[Table 2]

SEM for a model with the five SDQ subscales produced a PCFI of 0.82 and a RMSEA of 0.05 (Confidence interval [CI] 0.045-0.056), suggesting an approximate/good fit. One item had a regression weight  $< 0.30$  (item 11).

*Validity*

The SDQ-SR scales correlated significantly with the YSR and CBCL scales (Table 3). The highest correlation coefficient was found between the SDQ-SR emotional symptoms score and the YSR internalizing score (Spearman's  $r = 0.72$ ) and the lowest was between the SDQ prosocial score and the YSR TPS score.

[Table 3]

Table 4 presents Cohen's kappa, sensitivity, and specificity for all criteria. Cohen's kappa for the SDQ-SR TDS varied between 0.34 and 0.52 for the YSR criterion, and between 0.26 and 0.44 for the CBCL criterion. Sensitivity and specificity for the SDQ-SR TDS varied from 0.57 to 0.75 and 0.88 to 0.90 respectively for the YSR criterion, and from 0.39 to 0.59 and 0.90 to 0.92 respectively for the CBCL criterion.

[Table 4]

*Added value*

Table 5 presents the added value of the SDQ-PF TDS for the assessment of EBP by comparison with adolescent reporting on the basis of YSR and CBCL criteria (TPS, internalizing, or externalizing). These results show that the SDQ-PF TDS does not improve the identification of EBP than adolescent reporting only using an elevated YSR score as the criterion. The adjusted odds ratios (ORs) for elevated SDQ-PF TDS scores were non-significant, ranging from 0.48 to 1.20. When the CBCL criterion was used, elevated SDQ-PF TDS scores significantly added to the SDQ-SR TDS scores for identification. The adjusted ORs for elevated SDQ-PF TDS scores ranged from 3.66 to 10.9.

[Table 5]

## Discussion

This study examined the psychometric properties of the self-report version of the SDQ (SDQ-SR) and the degree to which the SDQ Parent Form (SDQ-PF) provides additional information for the identification of emotional and behavioral problems by comparison with adolescent reporting only. Our findings show that the SDQ-SR discriminates between adolescents with and without problems as measured by the YSR and CBCL. When the CBCL criterion was applied rather than the YSR criterion, the validity indices were slightly lower. The SDQ-SR was somewhat more sensitive to internalizing problems than to externalizing problems when using adolescent reporting (YSR) as the criterion; when parental reporting (CBCL) was used as the criterion, the reverse was seen. The SDQ-PF does not improve the identification of EBP by comparison with adolescent reporting using elevated YSR scores as the criterion. However, when parent reporting is adopted as the criterion (CBCL), SDQ-PF identifies EBP better than adolescent reporting only.

*Match with previous literature*

Our study showed that the SDQ-SR is a valid tool for the identification of EBP in adolescents. The internal consistency of the SDQ-SR TDS was good (Cronbach's alpha was 0.75), and the sensitivity and specificity of the SDQ-SR TDS were 0.75 and 0.90 respectively when YSR was the criterion. Similarly good psychometric properties have been reported in studies assessing the validity of the SDQ-SR<sup>14,15</sup> and SDQ-PF.<sup>14,15,18</sup> Not unexpectedly, the validity indices were slightly lower with the CBCL criterion than with the YSR criterion. A possible explanation for this finding is that, when the CBCL criterion was used, the results of SDQ self-reporting by adolescents were compared with parent reports and this may lead to a lower level of agreement given the limited agreement between these two informants that has been found elsewhere.<sup>22-24</sup> Cronbach's alpha for the SDQ-SR TDS was good (0.75), but for the five subscales of the SDQ these alphas varied between 0.54 and 0.71, some of them being quite low but in line with other research reporting moderate SDQ subscale internal consistencies.<sup>14,18,30</sup> The internal consistency of the SDQ subscales does not justify using these subscales for decisions about whether individual children require further attention.

The SDQ-SR was slightly more sensitive to internalizing problems than to externalizing problems when adolescent reporting (YSR) was the criterion; the reverse was observed when parent reporting (CBCL) was the criterion. A possible explanation is that adolescents identify their own internalizing problems more accurately and that parents identify externalizing problems in their children more effectively.<sup>23</sup>

We found that the SDQ-PF did not have any added value in the assessment of EBP by comparison with adolescent reporting only when the elevated YSR score was the criterion. However, when parental reporting was the criterion (CBCL), SDQ-PF did improve identification. This indicates that parents can add some information about adolescent EBP that is not reported by the adolescents themselves. The combination of self- and parental

reporting would therefore seem to provide the best information about EBP in adolescents. This is in line with the findings of Kuhn et al.<sup>24</sup>, who found that combined parental and SDQ self-reports were more discriminating than SDQ self-reports alone. In addition, Aebi et al.<sup>23</sup> showed that SDQ-SR and SDQ-PF were both discriminating but that the combination of the two is most effective. They found that SDQ-SR is most informative in terms of detecting emotional problems and that SDQ-PF is more suitable for the identification of behavioral problems. The combination of self-reporting and parental reporting therefore provides the best information on EBP in adolescents, with self-reporting being most effective for internalizing problems and parental reporting being more suitable for identifying externalizing problems.

#### *Strengths and limitations*

The strengths of our study are the large and representative sample, and its community-based nature. Moreover, we used the YSR and CBCL as the validation criteria. Both questionnaires are well-validated for emotional and behavioral problems. Some limitations should also be taken into account when interpreting our findings. First, the use of the YSR, a self-reported questionnaire, as criterion for the validation of the short SDQ-SR. The use of the same informant could have increased indices for validity.<sup>31</sup> Clinical assessments like psychiatric interviews may provide additional information. Because of their complexity and high costs, they were not used as criteria in this study. Second, our study was in part embedded in routine Preventive Child Healthcare practice. Adolescents in the PCH sample may have been more likely to under-report their EBP due to social desirability than the adolescents in the school sample. This may limit the generalization of our results to a PCH setting.

#### *Implications*

Our results show that the self-report version of the SDQ is a valid instrument, or at least an valid short alternative for the much longer YSR, for the detection of EBP in adolescents aged 13 and 14 years in a community setting in the Netherlands. The SDQ is a promising instrument for use with adolescents in other countries and settings as well since the SDQ has been shown to be cross-culturally valid and because it is available in a broad range of languages. Nevertheless, further study is necessary to confirm this conclusion.

The early detection of EBP in adolescents may be improved if the SDQ-SR is used in combination with the SDQ-PF. The SDQ-PF has added value by comparison with adolescent reporting only, in particular for the identification of externalizing problems that may be under-reported by adolescents themselves. Attention should be paid to the barriers in the implementation of two short questionnaires during routine assessments in community pediatric services.

### *Conclusions*

The self-report version of the SDQ is a valid instrument, or at least an valid alternative for the YSR, for the detection of EBP in adolescents aged 13 and 14 years. The SDQ Parent Form can provide additional information about externalizing problems in adolescents. It is preferable to obtain information from both adolescents and their parents in order to establish a complete picture of EBP in adolescents.

### **Acknowledgement**

All authors indicate that they have no financial relationships relevant to this article to disclose. This research received financial support from the Netherlands Organization for Health Research and Development (ZonMw).

## References

1. Leaf PJ, Alegria M, Cohen P, et al. Mental health service use in the community and schools: Results from the four-community MECA study. *methods for the epidemiology of child and adolescent mental disorders study. J Am Acad Child Adolesc Psychiatry.* 1996;35(7):889-897.
2. Kieling C, Baker-Henningham H, Belfer M, et al. Child and adolescent mental health worldwide: Evidence for action. *Lancet.* 2011;378(9801):1515-1525.
3. Jaspers M, de Winter AF, Huisman M, et al. Trajectories of psychosocial problems in adolescents predicted by findings from early well-child assessments. *J Adolesc Health.* 2012;51(5):475-483.
4. Tremblay RE, Nagin DS, Seguin JR, et al. Physical aggression during early childhood: Trajectories and predictors. *Can Child Adolesc Psychiatr Rev.* 2005;14(1):3-9.
5. Lavigne JV, Meyers KM, Feldman M. Systematic review: Classification accuracy of behavioral screening measures for use in integrated primary care settings. *J Pediatr Psychol.* 2016;41(10):1091-1109.
6. Geeraert L, Noortgate van den W, Grietens H, Onghena P. The effects of early prevention programs for families with young children at risk for physical child abuse and neglect: A meta-analysis. *Child Maltreat.* 2004;9(3):277-291.
7. Cuijpers P, Van Straten A, Smit F. Preventing the incidence of new cases of mental disorders: A meta-analytic review. *J Nerv Ment Dis.* 2005;193(2):119-125.



8. Goodman R. Psychometric properties of the strengths and difficulties questionnaire. *J Am Acad Child Adolesc Psychiatry*. 2001;40(11):1337-1345.
9. Goodman R, Ford T, Simmons H, Gatward R, Meltzer H. Using the strengths and difficulties questionnaire (SDQ) to screen for child psychiatric disorders in a community sample. *Int Rev Psychiatry*. 2003;15(1-2):166-172.
10. Hawes DJ, Dadds MR. Australian data and psychometric properties of the strengths and difficulties questionnaire. *Aust N Z J Psychiatry*. 2004;38(8):644-651.
11. Koskelainen M, Sourander A, Kaljonen A. The strengths and difficulties questionnaire among finnish school-aged children and adolescents. *Eur Child Adolesc Psychiatry*. 2000;9(4):277-284.
12. Malmberg M, Rydell AM, Smedje H. Validity of the swedish version of the strengths and difficulties questionnaire (SDQ-swe). *Nord J Psychiatry*. 2003;57(5):357-363.
13. Woerner W, Becker A, Rothenberger A. Normative data and scale properties of the german parent SDQ. *Eur Child Adolesc Psychiatry*. 2004;13 Suppl 2:II3-10.
14. Muris P, Meesters C, van den Berg F. The strengths and difficulties questionnaire (SDQ)-further evidence for its reliability and validity in a community sample of dutch children and adolescents. *Eur Child Adolesc Psychiatry*. 2003;12(1):1-8.
15. van Widenfelt BM, Goedhart AW, Treffers PD, Goodman R. Dutch version of the strengths and difficulties questionnaire (SDQ). *Eur Child Adolesc Psychiatry*. 2003;12(6):281-289.

16. Mieloo C, Raat H, van Oort F, et al. Validity and reliability of the strengths and difficulties questionnaire in 5-6 year olds: Differences by gender or by parental education? *PLoS ONE*. 2012;7(5):Art e36805-8.
17. Crone MR, Vogels AG, Hoekstra F, Treffers PD, Reijneveld SA. A comparison of four scoring methods based on the parent-rated strengths and difficulties questionnaire as used in the dutch preventive child health care system. *BMC Public Health*. 2008;8:106.
18. Vogels AG, Crone MR, Hoekstra F, Reijneveld SA. Comparing three short questionnaires to detect psychosocial dysfunction among primary school children: A randomized method. *BMC Public Health*. 2009;9(1):489.
19. Theunissen MH, Vogels AG, de Wolff MS, Crone MR, Reijneveld SA. Comparing three short questionnaires to detect psychosocial problems among 3 to 4-year olds. *BMC Pediatr*. 2015;15:84-015-0391-y.
20. Stone LL, Janssens JM, Vermulst AA, Van Der Maten M, Engels RC, Otten R. The strengths and difficulties questionnaire: Psychometric properties of the parent and teacher version in children aged 4-7. *BMC Psychol*. 2015;3(1):4-015-0061-8. eCollection 2015.
21. Kim MH, Ahn JS, Min S. Psychometric properties of the self-report version of the strengths and difficulties questionnaire in korea. *Psychiatry Investig*. 2015;12(4):491-499.
22. Salbach-Andrae H, Klinkowski N, Lenz K, Lehmkuhl U. Agreement between youth-reported and parent-reported psychopathology in a referred sample. *Eur Child Adolesc Psychiatry*. 2009;18(3):136-143.

23. Aebi M, Kuhn C, Banaschewski T, et al. The contribution of parent and youth information to identify mental health disorders or problems in adolescents. *Child Adolesc Psychiatry Ment Health*. 2017;11:23-017-0160-9. eCollection 2017.
24. Kuhn C, Aebi M, Jakobsen H, et al. Effective mental health screening in adolescents: Should we collect data from youth, parents or both? *Child Psychiatry Hum Dev*. 2017;48(3):385-392.
25. Achenbach T, Rescorla L. *Manual for the ASEBA school-age forms & profiles*. Burlington: University of Vermont; 2001.
26. Achenbach TM, Dumenci L. Advances in empirically based assessment: Revised cross-informant syndromes and new DSM-oriented scales for the CBCL, YSR, and TRF: Comment on lengua, sadowksi, friedrich, and fischer (2001). *J Consult Clin Psychol*. 2001;69(4):699-702.
27. Ebesutani C, Bernstein A, Martinez JI, Chorpita BF, Weisz JR. The youth self report: Applicability and validity across younger and older youths. *J Clin Child Adolesc Psychol*. 2011;40(2):338-346.
28. Ivanova MY, Achenbach TM, Rescorla LA, et al. The generalizability of the youth self-report syndrome structure in 23 societies. *J Consult Clin Psychol*. 2007;75(5):729-738.
29. Byrne BM. *Structural equation modeling with mplus: Basic concepts applications and programming*. New York: Routledge; 2011.
30. Theunissen MH, Vogels AG, de Wolff MS, Reijneveld SA. Characteristics of the strengths and difficulties questionnaire in preschool children. *Pediatrics*. 2013;131(2):e446-54.

31. Whiting PF, Rutjes AW, Westwood ME, et al. QUADAS-2: A revised tool for the quality assessment of diagnostic accuracy studies. *Ann Intern Med.* 2011;155(8):529-536.

Table 1. Demographic characteristics of the adolescents ( $N = 500$ )

|                              | n (%)      |
|------------------------------|------------|
| Gender                       |            |
| Boy                          | 219 (44.1) |
| Girl                         | 278 (55.9) |
| Child's age (years)          |            |
| 12                           | 12 (2.5)   |
| 13                           | 240 (51.0) |
| 14                           | 200 (42.5) |
| Older than 14                | 19 (4.0)   |
| Ethnicity                    |            |
| Dutch                        | 405 (90.2) |
| OECD (except for Turkey)     | 9 (2.0)    |
| Turkish or non-OECD country  | 35 (7.8)   |
| Educational level adolescent |            |
| Vocational school            | 106 (29.8) |
| Medium and higher            | 250 (70.2) |
| Parental educational level   |            |
| Lower education              | 71 (19.3)  |
| Medium education             | 124 (33.7) |
| Higher education             | 173 (47.0) |

Missing data: gender (n=3), child's age (n=29), ethnicity (n=51), educational level adolescent (n=144), parental educational level (n=132)

Table 2. Internal consistency of scores on SDQ-SR Total Difficulties and subscales

| SDQ scales                | Cronbach's alpha |
|---------------------------|------------------|
| Total difficulties        | 0.75             |
| <i>Emotional symptoms</i> | 0.68             |
| <i>Conduct problems</i>   | 0.55             |
| <i>Hyperactivity</i>      | 0.71             |
| <i>Peer problems</i>      | 0.54             |
| Prosocial                 | 0.57             |

Table 3. Spearman correlation coefficients between continuous SDQ-SR scores and CBCL/YSR Total, scores for Internalizing and Externalizing problems

| SDQ scales                | Total  | YSR<br>N=500 |         | CBCL<br>N=289 |         |         |
|---------------------------|--------|--------------|---------|---------------|---------|---------|
|                           |        | Intern       | Extern  | Total         | Intern  | Extern  |
| Total difficulties        | 0.68** | 0.62**       | 0.51**  | 0.54**        | 0.41**  | 0.41**  |
| <i>Emotional symptoms</i> | 0.59** | 0.72**       | 0.29**  | 0.35**        | 0.47**  | 0.20**  |
| <i>Conduct problems</i>   | 0.37** | 0.23**       | 0.45**  | 0.37**        | 0.15**  | 0.39**  |
| <i>Hyperactivity</i>      | 0.47** | 0.30**       | 0.43**  | 0.39**        | 0.17**  | 0.32**  |
| <i>Peer problems</i>      | 0.22** | 0.31**       | 0.10*   | 0.31**        | 0.33**  | 0.18**  |
| Prosocial                 | -0.10* | -0.06        | -0.20** | -0.28**       | -0.18** | -0.28** |

\*  $p < 0.05$ ; \*\*  $p < 0.01$

Abbreviations: SDQ-SR, Strengths and Difficulties questionnaire Self-report; Intern, internalizing; Extern, externalizing; YSR, Youth Self Report; CBCL, Child Behavior Checklist

Table 4. Test characteristics of the SDQ-SR Total Difficulties Score using elevated YSR and CBCL scores as criteria

| Test characteristics | Total       | YSR<br>N=500 |             | Total       | CBCL<br>N=289 |             |
|----------------------|-------------|--------------|-------------|-------------|---------------|-------------|
|                      |             | Intern       | Extern      |             | Intern        | Extern      |
| Kappa                | 0.52        | 0.46         | 0.34        | 0.44        | 0.26          | 0.33        |
| Sensitivity          | 0.75        | 0.70         | 0.57        | 0.59        | 0.39          | 0.50        |
| Specificity          | 0.90        | 0.90         | 0.88        | 0.92        | 0.90          | 0.90        |
| AUC                  | 0.91        | 0.90         | 0.85        | 0.83        | 0.71          | 0.79        |
| (95%-CI)             | (0.87-0.95) | (0.85-0.94)  | (0.80-0.90) | (0.75-0.92) | (0.62-0.81)   | (0.71-0.88) |

Abbreviations: SDQ-SR, Strengths and Difficulties questionnaire Self-report; AUC, area under the curve; CI, Confidence Interval, Intern, internalizing; Extern, externalizing; YSR, Youth Self Report; CBCL, Child Behavior Checklist

Table 5. Results from separate logistic regression analyses of SDQ-PF with elevated YSR and CBCL scores taking identification by the SDQ-SR into account

|                                     | YSR                           |  |  | CBCL                          |  |  |
|-------------------------------------|-------------------------------|--|--|-------------------------------|--|--|
|                                     | Total problems<br>OR (95% CI) | Internalizing<br>problems<br>OR (95% CI) | Externalizing<br>problems<br>OR (95% CI) | Total problems<br>OR (95% CI) | Internalizing<br>problems<br>OR (95% CI) | Externalizing<br>problems<br>OR (95% CI) |
| N                                   | 281                           | 281                                      | 281                                      | 288                           | 287                                      | 288                                      |
| <b>Crude</b>                        |                               |  |  |                               |  |  |
| Elevated SDQ-SR TDS<br>yes (v. no)  | 47.6 (16.0-141.6)             | 35.6 (12.7-99.6)                         | 19.7 (7.24-53.5)                         | 13.4 (5.77-30.9)              | 8.39 (4.81-14.6)                         | 8.05 (3.43-19.9)                         |
| Elevated SDQ-PF TDS<br>yes (v. no)  | 3.94 (1.60-9.70)              | 5.95 (2.46-14.4)                         | 3.11 (1.18-8.23)                         | 18.0 (7.5-43.1)               | 7.37 (3.29-16.5)                         | 6.17 (2.62-14.5)                         |
| <b>Adjusted</b>                     |                               |  |  |                               |  |  |
| Elevated SDQ-SR TDS<br>yes (v. no)# | 68.4 (19.3-243.1)             | 32.8 (10.3-103.9)                        | 25.0 (7.89-79.2)                         | 5.74 (2.18-15.1)              | 2.27 (0.87-5.92)                         | 4.61 (1.75-12.1)                         |
| Elevated SDQ-PF TDS<br>yes (v. no)# | 0.48 (0.14-1.65)              | 1.20 (0.38-3.79)                         | 0.60 (0.17-2.04)                         | 10.9 (4.23-27.9)              | 5.83 (2.39-14.2)                         | 3.66 (1.40-9.61)                         |

# Adjusted ORs taking into account the identification of problems with SDQ-SR TDS or SDQ-PF TDS.

Abbreviation: CBCL, Child Behavior Checklist; SDQ, Strengths and Difficulties Questionnaire, TDS, total difficulties score, SR, self-report; PF, parent form; OR: odds ratio; CI: confidence interval