

Trajectories of participation, mental health, and mental health problems in adolescents with self-reported neurodevelopmental disorders

Lilly Augustine, Frida Lygnegård & Mats Granlund

To cite this article: Lilly Augustine, Frida Lygnegård & Mats Granlund (2021): Trajectories of participation, mental health, and mental health problems in adolescents with self-reported neurodevelopmental disorders, *Disability and Rehabilitation*, DOI: [10.1080/09638288.2021.1955304](https://doi.org/10.1080/09638288.2021.1955304)

To link to this article: <https://doi.org/10.1080/09638288.2021.1955304>



© 2021 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



[View supplementary material](#)



Published online: 05 Aug 2021.



[Submit your article to this journal](#)



Article views: 100



[View related articles](#)



[View Crossmark data](#)

Trajectories of participation, mental health, and mental health problems in adolescents with self-reported neurodevelopmental disorders

Lilly Augustine^a , Frida Lygnegård^b  and Mats Granlund^b 

^aCHILD, SIDR, School of Learning and Communication, Jönköping University, Jönköping, Sweden; ^bCHILD, SIDR, School of Health and Welfare, Jönköping University, Jönköping, Sweden

ABSTRACT

Purpose: Having a neurodevelopmental disorder (NDD) increases the risk of mental health problems and lower participation. We investigated the trajectories of mental health problems and participation in adolescents with NDD and compared these with trajectories for peers without NDD. In addition, the relationship between participation, mental health (well-being), and mental health problems were investigated.

Materials and methods: Data from a Swedish longitudinal survey study (LoRDIA) was used and adolescents with and without self-reported NDD were followed from 12/13 to 17 years, in three waves. Mental health problems were measured using the Strength and Difficulties Questionnaire, and well-being was measured with the Mental Health Continuum short form.

Results: Adolescents with NDD experience more mental health problems than adolescents without NDD. Hyperactivity, a key feature of NDD, remains stable, while emotional problems and psychosomatic complaints, increase over time for girls, independent of NDD. Participation is stable over time but is more related to well-being than to NDD or mental health problems.

Conclusions: Gender is an important factor with girls exhibiting more problems. Mental health explains more of the variation in participation than mental health problems and NDD. Probably participation intervention can enhance mental health which may protect from mental health problems.

ARTICLE HISTORY

Received 15 September 2020

Revised 21 June 2021

Accepted 3 July 2021

KEYWORDS

Disability; participation; flourishing; internalizing and externalizing; longitudinal

► IMPLICATIONS FOR REHABILITATION

- Mental health, i.e., emotional-, social-, and psychological well-being is more strongly related to participation and to reduced levels of mental health problems than having an NDD or not, thus assessing mental health separately from measuring NDD is important.
- Interventions focusing on participation may lead to higher mental health and having high mental health (flourishing) may facilitate participation.
- Girls with self-reported NDD seem to have a higher burden of mental health problems, especially if they also are languishing, i.e., having low mental health, therefore a strong focus on this group is needed both in research and clinical practice.
- Half of all adolescents are flourishing, independently of NDD or not, even if they are experiencing some symptoms of mental health problems, adolescents with NDD who are also languishing, have much higher ratings of mental health problems.

Introduction

A relatively high prevalence of mental health problems as well as participation restrictions in everyday activities is reported for children and adolescents with neurodevelopmental disorders (NDD) compared to others [1–3]. Being diagnosed with NDD (a mental disorder) does not necessarily include having a mental illness or mental health problems [4]. Therefore, in this study, an adolescent with NDD is not immediately considered to have mental health problems. Information about the trajectories of mental health problems—e.g., sadness, anxiety, and psychosomatic complaints—for adolescents with NDD is scarce [2]. Few studies have followed the trajectories of participation, with its two dimensions of attendance and involvement in everyday life activities, for

adolescents with NDD. Both mental health problems and participation need to be tracked over time to understand how the two phenomena are related. In addition, the trajectories of positive mental health also need to be taken into consideration. For adolescents with an intellectual disability, participation is related to well-being [5] and maybe seen as an indirect positive indicator of mental health. The negative relationship between mental health problems and participation has not been investigated longitudinally; nor has the positive relationship between mental health operationalized as well-being and participation. It may be that participation interventions can promote mental health and protect adolescents from developing mental health problems. Knowledge about the possible link between participation, mental health problems, and well-being is necessary to plan participation

CONTACT Lilly Augustine  lilly.augustine@ju.se  Höskolan För Lärande och kommunikation, BOX 1026, Jönköping, SE 55 111, Sweden

 Supplemental data for this article can be accessed [here](#).

© 2021 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

interventions to promote mental health as well-being in adolescents with NDD.

Mental health, mental health problems, and NDD

Mental health can be defined as a lack of mental health problems (e.g., behaviour problems, a mood disorder) along with positive functioning in everyday life activities. The European Commission [6] says that “mental ill-health includes mental health problems and strain, impaired functioning associated with distress, symptoms and diagnosable mental disorders.” This description covers mental disorders, mental illness, and mental health problems but unfortunately makes no distinction between neurodevelopmental disorders (NDD) and mental health problems. Bremberg and Dalman [7], in their conceptual analysis of mental health, mental disorders, and mental health problems, have discussed the overlap between the constructs. Mental health problems, in most cases, overlap with mental health; that is, mental health problems are a normal part of people’s lives, but so is mental health. However, mental health problems also partly overlap with mental illness, and having persistent mental health problems in childhood increases the probability a person will be diagnosed with a mental illness [8,9]. Mental illness overlaps completely with mental disorders but some mental disorders—e.g., NDD—do not automatically overlap with mental illness or mental health problems [4]. Therefore, we propose that mental illness and mental health problems should be treated as separate constructs from mental disorders when studying trajectories of mental health in adolescents with NDD. Thus, compared to adolescents without self-reported NDD, some adolescents with self-reported NDD may overtime rate higher and with more consistency for hyperactivity problems but perhaps not for other types of mental health problems, such as sadness or psychosomatic complaints.

The overlap between NDD and mental illness in the classification of health conditions, such as ICD-11 [10] can create conceptual confusion when screening mental health in adolescents with NDD. For example, a population study of British children with an intellectual disability uses the Strength and Difficulties Questionnaire (SDQ) [11] to screen mental health by using a mental problem index based on four problem scales, one of which is hyperactivity [8,12]. In the SDQ, there are four “problem scales.” (1) hyperactivity, covering problems with both hyperactivity and inattention, the basic symptomatic criteria for ADHD; (2) conduct problems; (3) emotional problems; and (4) peer problems. But do all subscales in SDQ measure aspects of mental health problems? Hyperactivity can exist along with positive everyday functioning, as operationalized in participation in play activities in preschool [12] or high scores on measures of adaptive behaviour. Peer problems are related to how another person reacts to the adolescent and the adolescent’s communication skills; thus, the peer problems scale is not a “clean measure of mental health.” Using a mental health problem index, adolescents with ID have significantly more mental health problems than adolescents without ID. However, perhaps this fusion of what may be cognitive impairment-related factors (communication/peer problems and hyperactivity) and behaviour problems (emotion and conduct problems) leads to an overestimation of the prevalence of externalizing and internalizing mental health problems among children and adolescents with NDD. This reasoning is supported by a study focusing on diagnostic transitions from childhood to adolescence to early adulthood in mental disorders. Copeland [13] focuses on diagnostic interviews and children who fulfill the criteria for mental disorders in childhood. Homotypic transitions are common;

that is, children tend to fulfill criteria for the same diagnosis over time. The odds ratio for ADHD is strong, $OR = 17.4$. For anxiety and depression, it is much lower, $OR = <3$. Heterotypic cross prediction for anxiety and depression were strong (especially from adolescence to adulthood), but ADHD did not predict later emotional disorders (depression or anxiety). Will and Wilson [14] made a longitudinal analysis of parent and teacher ratings of problem behaviour in boys with (ID) and without developmental delays (NID). The result from this study support Copeland’s [13] view, as over time the ID group had significantly higher ratings than the NID group for social problems (communication), attention problem, and thought problem subscales, but groups did not differ significantly on the anxious/depressed, somatic complaints, withdrawn, aggression or delinquent subscales. The difference between groups decreased with time. To conclude, when excluding the hyperactivity subscale from SDQ differences in mental health problems between adolescents with and without NDD will probably decrease with time.

In addition to anxiety and depression, psychosomatic complaints are sometimes seen as indicators of mental health problems. In a Swedish cross-sectional study [15], parents of children with disabilities responded to questions about their children’s psychosomatic complaints. According to the parental ratings, 43% of the children with physical disabilities and 23% of the children with ADHD or ASD had stomach pain and 22 and 20%, respectively experienced a headache every to every other week. In comparison, ~8% of the children with typical functioning were reported by their parents to have experienced stomach pains and/or a headache in the same timeframe. Longitudinal studies of mental health problems under the threshold for mental disorder diagnoses are needed to further investigate the relationship between mental health problems and NDD.

Studying the occurrence of mental health problems may, however, be inadequate. WHO [16] defines mental health as “a state of well-being in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and can contribute to his or her community.” Westerhof and Keyes [17] suggest that mental health defined as *flourishing* should be seen as existing on a separate continuum when related to mental health problems. Flourishing is manifested as emotional, psychological, and social well-being, while low well-being is characterised as *languishing*. Persons can report significant mental health problems but still report a relatively high degree of flourishing [13]. Flourishing is an indicator of mental health in individuals that may protect them from mental health problems and promote participation (i.e., functioning in everyday activities). In a Swedish study of adolescents with a mild intellectual disability, participants were asked to rate mental health problems and mental health defined as flourishing. The results revealed that adolescents with ID rated more mental health problems than adolescents with typical functioning but also higher mental health [18]. We suggest that participation is a factor that has a positive relation to flourishing as an indicator of mental health and a negative relation to mental health problems for adolescents with self-reported NDD.

Participation

In the ICF-CY-based framework “Family of participation related constructs” (fPRC) [19], participation has been conceptualised as “involvement in life situations” and has two dimensions: “attendance” and “being involved while being there.” Most studies of participation at an individual level have an emphasis on the

attendance of persons with impairments or long-term health conditions in the same everyday activities as people without impairments [20,21]. Attending an activity does not, however, guarantee being engaged while attending. *Involvement*, the second dimension of participation, is defined as the degree of involvement when present within a situation. In this study, involvement has been operationalized as both the frequency of attendance and the self-rated importance of an activity.

In longitudinal studies of participation in children [16,17], school-aged children [19–21], and adolescents with mild impairments [22], results indicate that levels of participation (both attendance and involvement) are relatively stable over time, while the profile of activities that children and adolescents participate in changes with societal expectations and life roles [19,22]. Participation in social activities increases both in the frequency of attending and self-rated enjoyment or importance with age. Some gender differences in patterns can be seen, with girls reporting higher participation than boys. Environmental factors, such as socio-economic status, family coherence, and parent-child interaction patterns are strong predictors of level of participation in general but do not predict changes in participation patterns, as evidenced by the stable levels of participation, both in terms of frequency of attending and involvement. Regarding factors that affect participation, the influence of having an impairment seems to decrease with age during adolescence [22].

Age can affect both what activities children and adolescents participate in and the rated importance of participating in activities. A cross-sectional comparison of age groups [23] reports that both adolescents in need of special support, as well as their typically functioning peers, tend to rate their level of engagement in school activities lower in adolescence than in earlier school years. However, this change seems to be weaker for children in need of special support. A study over two-time points involving adolescents with self-identified NDD [24] reports that having a self-reported NDD has a strong relationship with the frequency of attending and self-rated importance in domestic activities and peer activities at baseline (12/13 years of age); this relation is weaker two years later. Instead, at the second time point, a pattern of relations between participation and perceived family relations, like what is seen for peers with typical functioning, shows up.

Relating mental health to participation

Several cross-sectional studies, both our own [22,25] and others [20,26] indicate that there is a moderate to the strong negative relationship between participation and mental health problems. There are also indications that a positive sense of self as well as responsive adults, and a positive family atmosphere [21,27] can enhance experiences of participation. How trajectories of participation and mental health problems interact over time is less well-known. Nor is there much information about the relationship between mental health operationalized as flourishing and participation. It might be that participation and mental health are closely related and that participation acts as a mediator affecting the negative relationship between mental health problems and participation.

Aim

This research aims to investigate the longitudinal trajectories of mental health problems, mental health, and participation in adolescents with self-reported NDD and their same-aged peers without self-rated NDD. In addition, its purpose is to cross-sectionally

study the relations between participation, mental health, and mental health problems.

1. Hypothesis: Adolescents with self-reported NDD will report higher mental health problem total scores than adolescents without NDD, but over time these differences will decrease, especially in emotional problems.
2. Hypothesis: Adolescents with self-reported NDD will rate lower participation both in terms of frequency of attendance and importance than children without NDD but over time these group differences will decrease.
3. Hypothesis: Adolescents who rate higher in mental health problems will rate lower in participation over time.
4. Hypothesis: Adolescents who are categorised as flourishing will rate higher in participation and lower in mental health problems than adolescents categorised as languishing.

Methods

Data for this study were retrieved from the Swedish research programme LoRDIA (Longitudinal Research on Development in Adolescence). Data were collected in four small- to medium-sized Swedish municipalities, representing the typical size of municipalities in Sweden. LoRDIA is a prospective longitudinal research program following two age cohorts from 12 and 13 years. The adolescents were followed until 17 years of age. The first age cohort was measured at 12, 13, 14, 15, and 17, i.e., in five waves. The second cohort was measured when 13, 14, 15, and 17 years of age. In this study, wave 1 (12/13 years), wave 3 (14/15 years), and the last point of measure (17 years) will be used, i.e., three waves.

Participants

The total population of adolescents, age 12 and 13, i.e., in Swedish grades 6 and 7, in four primary municipalities, were invited to participate ($N=2018$). Out of these, 318 opted out (202 parents and 116 adolescents). This generates a population of $N=1790$ adolescents; of these, 275 did not participate at age 12/13, thus the response rate at this age is 84.6%. When participants were 14/15 years, a total of $n=1322$ participated of the $N=1884$ in the study population, generating a response rate of 70%. At age 17, adolescents had moved from compulsory school to senior high school and were scattered over different types of schools and municipalities, making the participation rate lower, a total of $n=949$ or 50% of the study population was included (see Figure 1).

As in the case of many longitudinal studies, the LoRDIA research program struggled with retention rates. Longitudinal analyses are conducted on a total sample of $n=949$ adolescents, responding to all three waves. Rates differ between the groups with and without NDD; adolescents are missing to a higher extent in the NDD group.

To analyse the drop-out rate in adolescents with disabilities, three groups based on disability type were created: (1) NDD, such as ASD, ADHD, and dyslexia (2) physical disabilities such as hearing, visual, and motor impairments; and (3) autoimmune diseases. To analyse the deviation from what could be expected, the retention rate for adolescents without self-reported disabilities, i.e., not part of any of the three groups were used as a comparison to calculate an expected value of attrition. Adolescents with NDD differ from the expected ($\chi^2 = 11.37$), and so did those with autoimmune diseases ($\chi^2 = 7.92$, for more information, see Supplement 1). The retention rate for adolescents with NDD is lower than for other types of disabilities. The diversion from

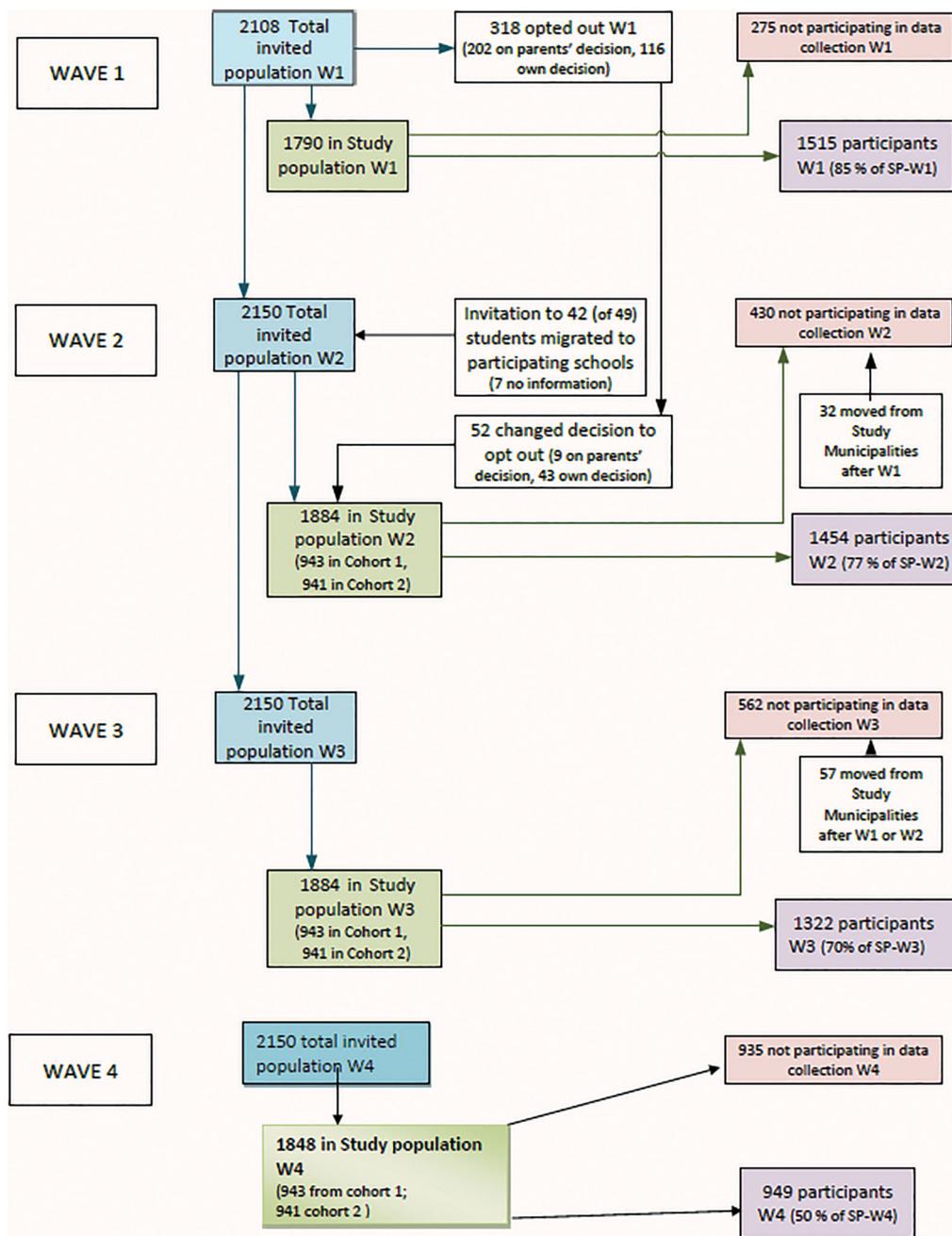


Figure 1. Response-rates and retention rates in LoRDIA.

Table 1. Number of adolescents divided by gender and neurodevelopmental disorders (NDD).

	12/13 years	14/15 years	17 years	Retention rate (%)
Girls with NDD	128	93	67	52
Boys with NDD	143	101	59	41
Girls no NDD	629	602	458	73
Boys no NDD	587	571	356	61

expected starts when students were 14/15 years, not 17 years as expected regarding Table 1.

In an in-depth analysis of retention rates, the mental health problem scales were used to investigate retention rates. The ratings at 12/13 years were used as a comparison for response vs. non-response in the following two waves of data collection. Mean differences were investigated using a *t*-test. Adolescents with

externalising problems are more likely to be missing already at 14/15 years of age (hyperactivity $t = 2.58$, $p = 0.01$), also giving an impact of total difficulties ($t = 5.03$, $p = 0.01$) (see Supplement 2). At 17 years, these trends become even more visible. The only scales without difference between those remaining and those that dropped out are peer problems and internalising symptoms. This indicates that the difficulty with retention and missing data are not random, especially for our group of interest, adolescents with NDD. The results must therefore be interpreted with caution.

Instruments

Disability

Disability was measured using self-reported answers to double questions regarding 17 types of common impairments. The first

part of the question concerns if you have the specific impairment mentioned or not (yes/no); the second part of the question concerns how severe (mild/moderate/severe) the disability is following from the impairment. To be categorized as having NDD, adolescents needed to respond yes to at least one neurodevelopmental impairment, and report at least a moderate disability. This cut-off for categorisation, has been used in previous studies adopting this scale [22]. Difficulties that were considered neurodevelopmental difficulties included speech impairment, intellectual disability, dyslexia, dyscalculia, nervous difficulties, ADHD, and ASD. Respondents with other impairments or illnesses were considered not to have NDD, for example, physical disabilities. It was possible to have multiple disabilities, for example, both a speech impairment and a physical disability. When creating the NDD variable, only information regarding the difficulties relevant was used, irrespective of what other difficulties there also might be. Information regarding disability was collected at age 12/13.

Participation in everyday activities

Participation was measured through seven items measuring both the frequency and importance of participation. A principal component analysis reveals that within the frequency component, as well as the rated importance items, two factors were identified consisting of three variables. The first factor measures the social aspect of participation (*getting along with friends, making new friends, cleaning up your room*) and the second factor measures the self-care aspect of participation (*grocery shopping, preparing something to eat, doing your laundry*). These items were measured both with a frequency scale, i.e., "how often do you ..." and as an importance scale, i.e., "how important is it ...". Both the frequency scale and the importance scale were measured on the three-point Likert scale, with higher values as more often or more important. Participation was measured with summary scales, two frequency scales, and two importance scales, relating to social participation and participation in self-care, respectively. All items are coded from 0 to 2, giving sum scales from 0 to 6, with 0 indicating low participation and 6 high participation. The four summary scales contain different activities that were classified based on the PCA as social participation and self-care participation. However, doing one activity or finding it important (e.g., doing the laundry) does not necessarily indicate that the next (e.g., grocery shopping) is done frequently or considered important. Combining items to scales based on the PCA is relevant as they do give an interpretable score related to participation, but the limited number of activities and response categories makes a Cronbach alpha less informative, as internal consistency may not be good [28]. In this study, Cronbach's alpha at 12/13 years of age was frequency $\alpha = 0.406$ and importance $\alpha = 0.550$ for self-care activities; and frequency $\alpha = 0.369$ and importance $\alpha = 0.473$ for social activities. That cleaning your room was perceived as more related to social participation for a teenager than to self-care or domestic activities, as most adults would suggest, likely also make sense, as the motivations for cleaning your room are usually socially related rather than an aspect of self-care for most teenagers.

Mental health problems

Mental health problems were measured using The Strength and Difficulties Questionnaire (SDQ) [25]; the Swedish translation by Smedje [28] was used. It has been validated by Malmberg et al. [29]. The focus was on the four problems scales: *emotional problems, peer problems, hyperactivity, and conduct*, as well as the impact supplement focusing on the perceived impact of problems on everyday life. The scales for difficulties and impact were

created in line with the recommendations proposed by Goodman [25]. SDQ data were collected at all three-time points.

Psychosomatic complaints were measured on a scale with eight variables dichotomised based on those perceiving problems often or no problems at all. A five-point Likert scale from 1 = never to 5 = always was adopted. Having often (4) or always (5) symptoms are considered as having this complaint and never (1) to sometimes (3) as not having this complaint. Based on this a summary variable of psychosomatic complaints was created with values ranging from 0 = no complaints to a maximum of 8 complaints, thus indicating the number of complaints a person had often. This scale has been used previously in a total population study of mental health [30] and has been validated by Hagquist [31].

Mental health

Mental Health Continuum-Short form (MHC-SF) [32]. The scale has been validated [33] and a Swedish version has been translated and revised in the LoRDIA project. The scale uses a six-grade Likert scale from Never to Always. The items start with "how often during the last couple of months have you felt?" This scale can be divided into three subscales measuring three forms of well-being: emotional, social, and psychological. To code *flourishing*, we used the categorisation rules developed by Keyes [33]: at least 1 of the emotional well-being items need to be almost every day or every day, and six of the 10 questions regarding social and psychological well-being need to be coded as high. Languishing in the opposite, i.e., lowest on at least one emotional well-being item, and in six of the other 10. Respondents that are coded as neither flourishing nor languishing are considered to have moderate well-being; that is, three groups are created. MHC-SF was collected at ages 14/15 and 17.

Procedure

Before the data collection, written consent was obtained from the head principals in each municipality to gain access to the schools in each municipality. Caregivers, teachers, and adolescents were informed through written information as well. A paper-based survey was administered to all adolescents in school, in their classrooms, by the research team. At each data collection point, the research team gave information regarding the voluntary nature of participation and stated that the data collected would be handled confidentially. During each data collection, participants were able to take breaks and were offered refreshments. Adolescents with intellectual disabilities used an adapted version of the questionnaire that was piloted by members of the research team with expertise in occupational therapy and disability research [22]. Adolescents with intellectual disabilities were offered the opportunity to be interviewed when considered necessary and adapted procedures were used when required, for example, with adolescents who had reading difficulties for various reasons (e.g., dyslexia or having recently immigrated to Sweden). The information regarding informed consent was also adapted. This adapted version was considered beneficial for all adolescents and hence, this version was adopted in the following data collections.

Ethical considerations

The research program and data collection procedure were approved by the Regional Research Review Board in Gothenburg for each wave (No. 362-13.2013-09-25, No T446-14, 2014-05-20, No T553, 2015-07-31, No T465 17, 2017-07-21, and No T553-18, 2018-07-26). One sensitive issue in this study is the use of passive consent from parents. As this program used questions regarding

mental health and alcohol and drug use, it was necessary to ensure that all adolescents had the opportunity to participate in the study, including those from problematic homes, as these would risk exclusion if we demanded parent's active consent. An opt-out consent method was approved by the regional ethical board, indicating that parents/caregivers could contact researchers to opt-out, by e-mail, phone, or letter. This information was provided in a total of 32 different languages and to both parents/caregivers.

Analysis

Mean values for scales were created for each timepoint based on gender and self-rated NDD or not. ANOVA for repeated measures was used to investigate the difference over time and the time x group effect. The relationship between mental health problems and participation over time was tested with linear regressions, including independent variables in different models, to investigate the additional predictive value. The first model included gender and NDD status; the second model included ratings of participation from the previous wave; the third model included SDQ measures from the previous wave; and the fourth model included mental health measured at 14/15 years. As the retention rate was

low at 17 years, the generated results needed to be analysed with caution. To investigate the relationship between gender, NDD status, and mental health, a factorial univariate ANOVA was conducted with three groups (gender, NDD, and mental health) and its interaction effects.

Results

Responding to our first hypothesis "Adolescents with self-reported NDD will report higher mental health problem total scores than adolescents without NDD, but over time these differences will decrease, especially emotional problems." In Table 2 we display mean values for each time point for our groups and differences over time. In Figures 2–6 trends for different mental health problems are visualized.

There is a significant difference between the groups of children with and without self-reported NDD, in terms of gender. Having self-reported NDD seems to increase the total risk of having high ratings of difficulties measured by SDQ and psychosomatic complaints (see Figures 2 and 4). Concerning total difficulties measured by SDQ, the analysis reveals that adolescents with self-reported NDD start with stable high values while the

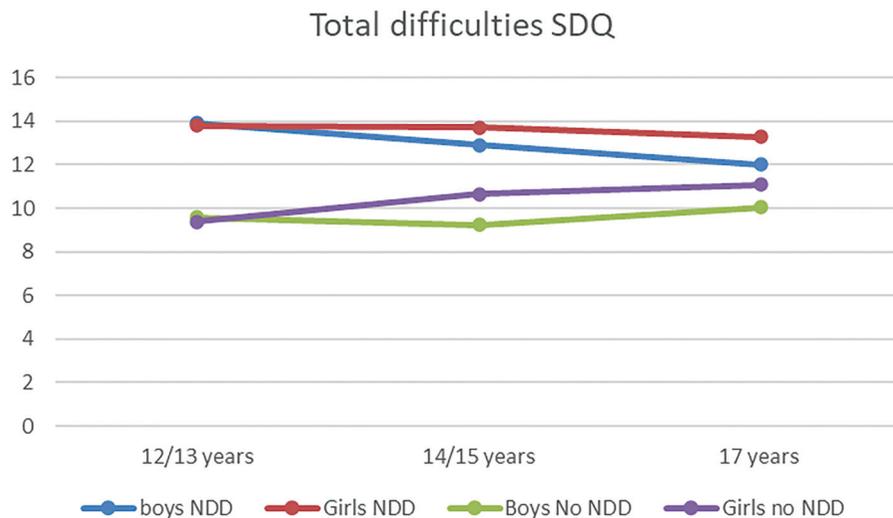


Figure 2. Trajectories of total difficulties for adolescents with and without self-rated NDD and gender.

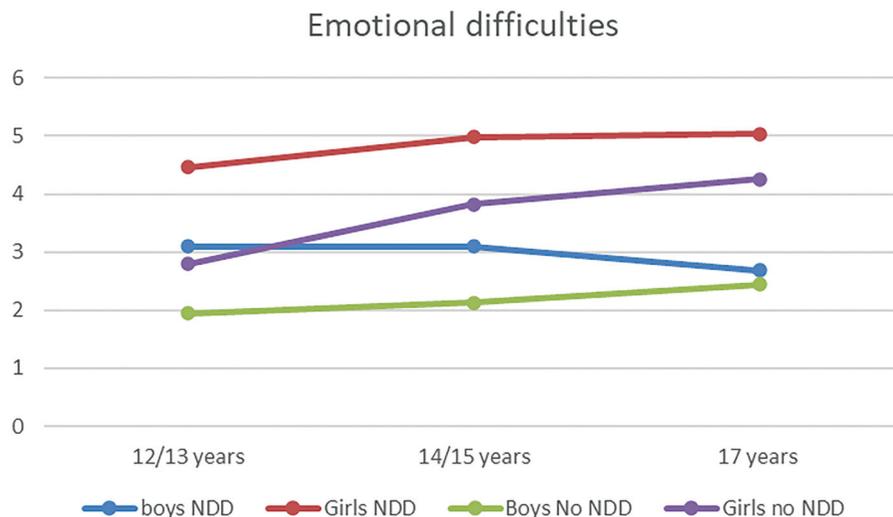


Figure 3. Emotional difficulties over time for adolescents with and without self-rated NDD and gender.

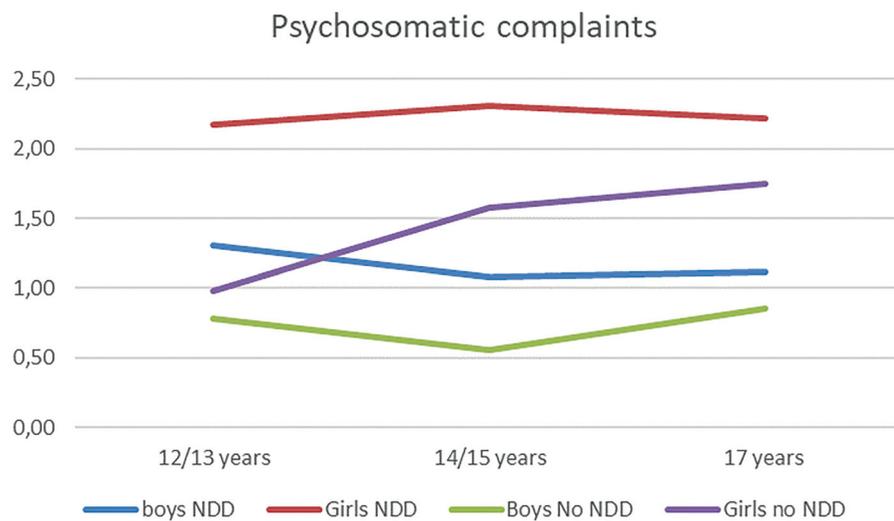


Figure 4. Psychosomatic complaints over time for adolescents with and without NDD and gender.

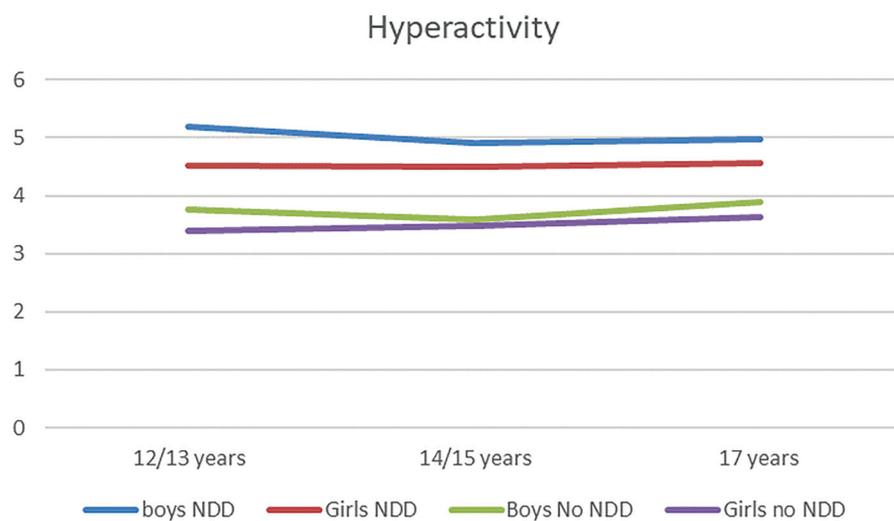


Figure 5. Hyperactivity over time for adolescents with and without self-rated NDD and gender.

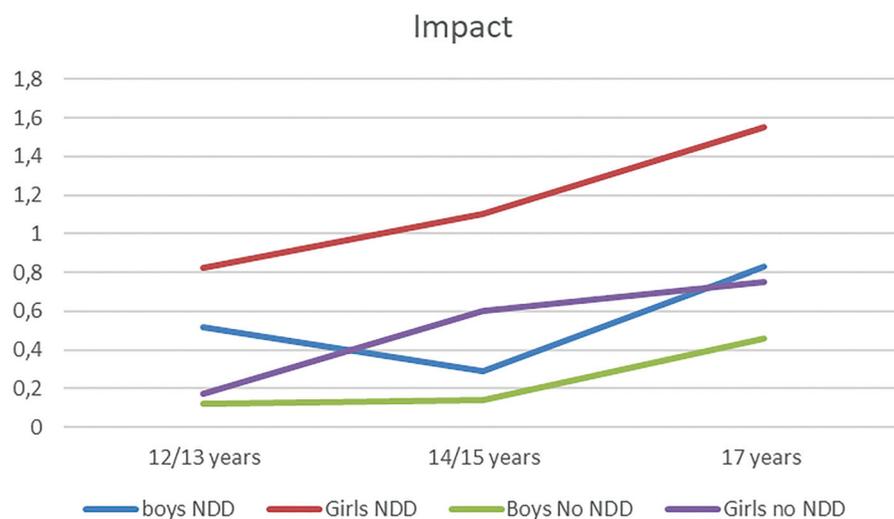


Figure 6. Impact over time for adolescents with and without self-rated NDD and gender.

levels of difficulties increase for the other groups. When estimating the marginal means within the GLM for total difficulties, NDD status makes a difference. In studying the interaction between time and group interaction was found. Concerning mean values, children with NDD decrease their value of total difficulties while children without NDD increase their values.

Two of the scales demonstrate a different pattern: emotional difficulties and psychosomatic complaints (see Figures 3 and 4). A more in-depth analysis of differences over time reveals gender differences for these variables. As revealed by Table 2, there is a strong interaction effect regarding time and group.

For peer problems and hyperactivity (see Figure 5), there is a significant time effect but no interaction effect between groups and over time. Both hyperactivity and peer problems decrease over time; more so in peer problems than in hyperactivity. Regarding conduct problems, we can see a stronger time than interaction effect. As with peer problems and hyperactivity, these mean differences are reduced over time. There is a steady drop in conduct problems that seems to be similar in all groups.

The perceived impact of difficulties increases over time (see Figure 6), especially for girls with self-reported NDD (see Table 2). Girls with self-reported NDD differ from the other groups and girls without NDD differ from boys without NDD. Girls with NDD seem to be vulnerable and report a larger impact of difficulties in their lives.

Participation and self-rated NDD

Our second hypothesis was that “Adolescents with self-reported NDD will rate lower participation both in terms of frequency of attendance and importance than adolescents without NDD but over time these group differences will decrease.” To test this hypothesis, mean values for participation frequency and importance were calculated for the two groups with and without NDD divided by gender. Overall, our hypothesis was confirmed, with larger differences between groups at 12/13 and smaller differences with time, except for the importance of participation in

self-care, where no difference between groups existed. In all four variables, girls rate their participation higher than boys, both in the frequency of attendance and importance.

Participation in self-care activities

As can be seen in Table 3, girls self-rate their participation frequency in self-care higher than boys. Over time, boys increase their participation more than girls do, and thus gender differences decrease with age. At the age of 12/13, both groups of girls have higher participation than boys, but at 14/15 and 17 years, it is girls with no NDD that differ from the other groups. There is a time effect, and an interaction effect; we do see an increase with time, and this increase is larger among boys.

Regarding the importance of self-care, there is no difference between groups in either wave. It is considered equally important by all groups and seems to be stable over time.

Participation in social activities

Girls have a higher frequency of attendance in social participation than boys. Boys with NDD demonstrate the lowest level of frequency of attendance in social participation, differing from all other groups at 12/13 years. From 14/15 years of age, girls with no NDD differ from boys. However, the frequency of participation is stable over time, and there are no time differences. There are no time or group differences regarding the importance of participation in social activities.

The relation between participation, mental health problems, and mental health

Our third hypothesis concerned the relationship between participation and mental health problems: “Adolescents who rate higher in mental health problems will rate lower in participation over time.” To answer this hypothesis, we created four hierarchical regression models with participation at 14/15 years as the dependent variable (see Table 4). We found that participation is stable over time and that primarily, previous participation predicts later participation. The highest predictive value was found for the

Table 2. Values of SDQ scales divided by timepoint, gender, and NDD status.

Index	Age	Children with NDD				Children without NDD				GLM	
		Boys		Girls		Boys		Girls		F time	Time*group
		M	SD	M	SD	M	SD	M	SD		
Total difficulties	12/13	13.93	5.74	13.80	5.70	9.58	4.72	9.37	4.76	825.79**	6.08**
	14/15	12.90	4.92	13.73	5.93	9.24	5.28	10.64	5.65		
	17	12.02	5.30	13.27	5.13	10.04	5.71	11.09	5.27		
Emotional difficulties	12/13	3.09	2.09	4.46	2.67	1.95	1.83	2.79	2.06	9.76**	9.47**
	14/15	3.09	2.27	4.98	2.69	2.13	2.03	3.82	2.50		
	17	2.68	2.26	5.04	2.56	2.45	2.17	4.25	2.37		
Peer problems	12/13	2.81	1.98	2.50	1.84	1.96	1.49	1.64	1.44	1303.43**	1.75 ns
	14/15	2.44	1.75	2.23	1.94	1.73	1.51	1.75	1.55		
	17	2.39	1.88	2.15	1.64	2.07	1.52	1.90	1.56		
Conduct problems	12/13	2.83	1.87	2.31	1.61	1.90	1.46	1.53	1.21	400.88**	3.160*
	14/15	2.46	1.82	2.03	1.47	1.80	1.64	1.59	1.36		
	17	1.98	1.74	1.51	1.34	1.65	1.68	1.30	1.32		
Hyperactivity	12/13	5.20	2.36	4.53	2.09	3.76	2.09	3.39	2.16	5.87.03**	0.73 ns
	14/15	4.91	2.27	4.49	2.37	3.59	2.28	3.47	2.35		
	17	4.97	2.36	4.57	2.15	3.89	2.53	3.64	2.43		
Impact	12/13	0.52	1.31	0.82	1.73	0.12	0.70	0.17	0.77	57.79**	3.64*
	14/15	0.29	1.03	1.10	2.27	0.14	0.79	0.60	1.56		
	17	0.83	1.67	1.55	2.45	0.46	1.43	0.75	1.78		
Psychosomatic complaints	12/13	1.31	1.77	2.17	2.20	0.78	1.41	0.98	1.52	3.52*	5.23**
	14/15	1.08	1.72	2.31	2.50	0.56	1.28	1.58	2.18		
	17	1.12	1.63	2.22	2.12	0.85	1.62	1.75	1.95		

* $p < 0.05$; ** $p < 0.01$.

Table 3. Mean value of participation in different age groups divided by NDD and gender.

	Girl NDD		Boy NDD		Girl no NDD		Boy no NDD		ANOVA	GLM Greenhouse-Geisser	
	M	SD	M	SD	M	SD	M	SD		Time	Time*group
Frequency social participation										1.99 ns	0.20 ns
12/13 years	4.17	1.17	3.75	1.18	4.39	0.91	4.05	1.07	19.04**		
14/15 years	4.13	0.97	3.94	1.24	4.29	1.00	4.20	1.06	3.59*		
17 years	4.22	1.23	3.98	1.02	4.47	0.96	4.27	1.11	5.27**		
Importance social participation										4.106 *	0.87 ns
12/13 years	5.07	1.08	4.54	1.41	5.24	0.88	4.80	1.19	23.51**		
14/15 years	4.99	1.01	4.73	1.16	5.17	0.91	4.96	1.08	7.15**		
17 years	5.03	1.21	4.57	1.16	5.11	0.88	4.82	1.15	7.96**		
Frequency participation self-care										6.27**	0.370*
12/13 years	3.39	1.49	2.79	1.38	3.25	1.20	2.88	1.31	12.45**		
14/15 years	3.32	1.42	2.87	1.59	3.35	1.29	3.04	1.30	7.24**		
17 years	3.45	1.38	3.17	1.48	3.54	1.30	3.29	1.48	2.76*		
Importance participation self-care										1.02 ns	0.73 ns
12/13 years	4.72	1.36	4.55	1.46	4.66	1.32	4.51	1.54	1.47		
14/15 years	4.62	1.35	4.53	1.25	4.65	1.27	4.68	1.30	0.42		
17 years	4.78	1.25	4.66	1.37	4.73	1.18	4.68	1.34	0.22		

* $p < 0.05$; ** $p < 0.01$.

frequency of attendance in social participation. When assessing the change value of R^2 (ΔR^2), mental health problems have a low predictive value and often a significant beta coefficient becomes insignificant when including mental health in the model. We could therefore not confirm this hypothesis.

Mental health, participation, and mental health problems

Our fourth hypothesis, "Adolescents who are categorised as flourishing will rate higher in participation and lower in mental health problems than adolescents categorised as languishing," was confirmed. Adolescents with and without self-rated NDD were categorised as languishing, having moderate well-being, or flourishing based on their response on the mental health continuum scale. Two analyses were conducted to test the hypothesis; one based only on a mental health grouping independent of whether respondents reported NDD or not (see Table 5), and another analysis including groups based on NDD and gender (see Table 6). This analysis was conducted only on students at 14/15 years, due to the limited sample size. In the first analysis, where only the flourishing categorisation was used, there are significant relations between self-rated participation and flourishing categorisation, as well as between flourishing categorisation and self-rated mental health problems.

Adolescents that are flourishing have higher levels of participation, primarily in the frequency of attending but also in importance. They also rate lower levels of mental health problems, and this relationship is strong. For example, the number of psychosomatic complaints at 14/15-year decreased from 3.8 for those classified as languishing, to 1.5 for those with moderate mental health, to 0.5 for those flourishing (see Table 5). Those who are classified as languishing demonstrate higher ratings for all types of mental health problems than those reporting moderate mental health and especially compared to those who are flourishing. This might indicate that mental health and mental health problems are related to each other independent of NDD. Therefore, in the second analysis related to hypothesis four, adolescents categorized as flourishing, as having moderate mental health, or as languishing were divided into groups based on having self-reported NDD or not and gender.

Due to the limited numbers of participants in each group especially in the languishing category, the statistical power is low. In order not to reduce groups further, analysis was conducted on age group 14/15 and not using data from 17 years. In Table 6, mean and standard deviations, as well as results from a univariate

Table 4. Relation between mental participation, mental health problems and mental health over time.

14/15 years	R	Std error	F	Adj R ²	ΔR^2
Frequency of attendance in social participation					
Model 1 ^a	0.138	1.01	9.33	0.0170	0.019
Model 2 ^b	0.390	0.94	27.69	0.1520	0.133
Model 3 ^c	0.413	0.93	17.99	0.1760	0.025
Model 4 ^d	0.475	0.90	19.94	0.2330	0.056
Importance of social participation					
Model 1 ^a	0.142	0.96	9.61	0.0180	0.020
Model 2 ^b	0.336	0.92	16.60	0.1070	0.093
Model 3 ^c	0.241	0.92	11.82	0.1130	0.011
Model 4 ^d	0.390	0.90	11.77	0.1390	0.029
Frequency of self-care					
Model 1 ^a	0.118	1.29	6.65	0.0120	0.014
Model 2 ^b	0.374	1.21	25.17	0.1340	0.126
Model 3 ^c	0.390	1.21	15.10	0.1420	0.012
Model 4 ^d	0.409	1.20	13.25	0.1550	0.015
Importance of self-care					
Model 1 ^a	0.019	1.25	0.162	-0.0020	0.000
Model 2 ^b	0.238	1.22	9.21	0.05	0.056
Model 3 ^c	0.257	1.22	5.90	0.0550	0.010
Model 4 ^d	0.287	1.21	5.86	0.0680	0.016

^aGender disability.

^bParticipation in previous wave.

^cMental health difficulties SDQ in previous wave.

^dMental health measured at 14/15 years.

factorial ANOVA, are presented. Most adolescents are, based on their self-rated mental health, classified as flourishing or having moderate mental health. Only a small portion of students are languishing ($n = 79$); in this group, there is a small overrepresentation of adolescents with NDD (23%) but not an underrepresentation of adolescents with NDD who are flourishing (13% with NDD), based on the sample at 14/15 years of age. Concerning participation, mental health status rather than other factors are related to participation. However, as participation is stable (see Table 4), the adjusted R^2 is low for participation values (see Table 6). Concerning the second part of our hypothesis, the analyses indicate that mental health is related to mental health problems in all six measures used. Regarding gender, it adds to the model regarding internalising symptoms, such as emotional problems, psychosomatic complaints, and impact. A self-reported NDD is also related to mental health problems, except for impact. Mental health conceptualised as flourishing is more strongly

Table 5. Concurrent relation between mental health, mental health problems, and participation.

Concurrent relations	Mental health	Wave 3				Wave 4			
		N	Mean	Sd.	F	N	Mean	Sd.	F
Participation									
Frequency participation self-care	Languishing	81	2.79	1.31	4.39*	40	2.68	1.67	11.73**
	Moderate	535	3.14	1.33	F > L	373	3.27	1.37	F > L
	flourishing	623	3.2	1.31		512	3.58	1.35	
Importance participation self-care	Languishing	80	4.29	1.59	5.69**	36	4.50	1.42	4.94**
	Moderate	534	4.60	1.27	F > L	369	4.58	1.25	F > L M
	flourishing	620	4.75	1.23		509	4.83	1.23	
Frequency social participation	Languishing	82	3.59	1.37	44.21**	39	3.18	1.78	59.09**
	Moderate	535	4.03	1.01	F > L M	368	4.10	1.03	F > L M
	flourishing	621	4.47	0.96	M > L	510	4.61	0.85	
Importance social participation	Languishing	81	4.83	0.93	13.59**	35	4.23	1.55	16.60**
	Moderate	534	4.90	1.05	F > L M	368	4.85	1.07	F > M
	flourishing	620	5.19	1.24	M > L	506	5.10	0.91	
Mental health problems									
Psychosomatic complaints	Languishing	83	3.81	1.17	156.78**	41	3.22	2.53	69.80**
	Moderate	547	1.56	2.01	L > F L	370	2.01	2.01	L > F L
	flourishing	629	0.49	3.01	M > F	502	0.83	1.46	M > F
Impact	Languishing	84	2.42	2.36	127.42**	41	2.83	2.85	47.43**
	Moderate	535	0.87	1.46	L > F L	370	1.43	2.03	L > F M
	flourishing	615	0.22	0.74	M > F	500	0.61	1.30	M > F
Emotional	Languishing	79	5.75	2.94	131.57**	43	6.23	2.93	90.43**
	Moderate	518	3.90	2.45	L > F M	377	4.36	2.43	L > F L
	flourishing	593	2.20	1.99	M > F	516	2.69	2.10	M > F
Peer problems	Languishing	79	3.30	2.07	79.40**	43	3.67	2.04	59.02**
	Moderate	518	2.12	1.64	L > F M	377	2.45	1.57	L > F M
	flourishing	593	1.35	1.24	M > F	516	3.67	2.04	M > F
Hyperactivity	Languishing	79	5.44	2.15	52.30**	43	6.12	2.19	36.70**
	Moderate	518	4.03	2.23	L > F M	377	4.32	2.40	L > F M
	flourishing	593	3.07	2.28	M > F	516	3.37	2.39	M > F
Conduct problems	Languishing	79	2.90	1.80	47.60**	43	2.81	1.97	29.85**
	Moderate	519	1.91	1.53	L > F M	377	1.66	1.45	L > F M
	flourishing	593	1.38	1.29	M > F	516	1.24	1.32	M > F

* $p < 0.05$; ** $p < 0.01$.

related to participation and too low levels of mental health problems than having self-reported NDD or not.

Discussion

We aimed to investigate the longitudinal trajectories of mental health problems, mental health, and participation in adolescents with self-reported NDD and their same-aged peers without self-reported NDD. In addition, we investigated the relations between participation, mental health, and mental health problems cross-sectionally. Four hypotheses were posed, of which three were confirmed and one was rejected. Overall, our study shows that, except for hyperactivity problems, adolescents with self-reported NDD start on a higher level in their ratings of behaviour problems than adolescents without NDD, but with time, the difference between the groups decreases. Concerning participation, adolescents with self-reported NDD rate their participation lower than adolescents without NDD, but this difference decreases with age. For both mental health problems and participation, gender differences became larger with age, with girls reporting more mental health problems and higher participation. Our hypothesis that adolescents that rate high in behaviour problems would rate lower in participation were not confirmed. Ratings of mental health operationalised as flourishing were, however, related both to high participation ratings and low ratings of mental health problems. It seems like participation can be both a means and an end to flourishing.

The stable ratings of hyperactivity in both adolescents with and without self-reported NDD, and the significantly higher ratings of hyperactivity in children with self-reported NDD, confirm

that hyperactivity may have other qualities aside from the subscales of emotion and conduct problems in SDQ. The ratings in these two subscales had more variable patterns and changes over time than ratings of hyperactivity, indicating a stronger sensitivity to biological changes and changes in life circumstances. It might be that the SDQ subscale hyperactivity measures more of a trait or impairment while the subscales emotion and conduct problems measure more of variations in mental state, at least for adolescents with NDD. Adolescents without NDD who are languishing do rate high levels of hyperactivity, so in this group, hyperactivity might measure mental health problems. Yet, hyperactivity should be measured with caution as it seems to measure a stable trait/impairment rather than fluctuating mental health problems. The three-way ANOVA testing gender, NDD, and mental health as independent did not explain much of the variance ($\text{adj } R^2 = 0.11$) in hyperactivity. The findings are supported by results from previous studies [10,11], which report that hyperactivity ratings primarily predict hyperactivity but no other types of mental health problems to a large degree. Perhaps hyperactivity should not be included in measures of mental health problems or at least not be indexed as externalising problems together with conduct problems. The result indicates that it is important to differentiate between mental health and mental health problems and to separate mental health problems related to puberty and environmental influences from aspects related to stable characteristics, i.e., hyperactivity, by definition being a part of NDD [10].

Another subscale in SDQ that may not be a "clean" measure of mental health problems is the subscale peer problems. The scale contains questions about how peers interact with the respondent (an environmental measure) and problems with communication

Table 6. Mental health, mental health problems and participation in groups based on NDD status and gender mean (SD).

Mental health	n	Freq. part. self-care	Imp. part. self-care	Freq. social	Imp. social	Psycho-somat	Impact	Emotional	Conduct	Hyper	Peer problem
Language											
Girl NDD	10	2.80 (1.83)	4.6 (1.51)	3.0 (0.82)	5.0 (1.24)	6.3 (1.89)	3.8 (2.35)	8.2 (2.25)	3.30 (1.70)	5.6 (1.71)	5.0 (1.63)
Boy NDD	8	2.25 (2.19)	5.17 (1.17)	3.75 (1.49)	5.17 (1.17)	1.29 (1.11)	0.38 (1.06)	3.75 (2.60)	2.88 (2.75)	5.36 (3.02)	3.50 (2.39)
Girl no NDD	41	2.92 (1.24)	4.0 (1.68)	3.52 (1.44)	4.74 (1.27)	4.69 (2.76)	3.05 (2.14)	6.68 (2.05)	2.68 (1.42)	5.46 (2.11)	2.95 (1.82)
Boy no NDD	20	2.71 (1.38)	4.45 (1.50)	3.91 (1.41)	4.83 (1.27)	1.96 (2.76)	1.42 (2.32)	3.40 (3.33)	3.15 (2.16)	5.35 (2.18)	3.10 (2.31)
Total	79	2.79 (1.46)	4.29 (1.59)	3.59 (1.37)	4.83 (1.24)	3.81 (3.01)	2.42 (2.36)	5.75 (2.94)	2.90 (1.80)	5.44 (2.14)	3.30 (2.07)
Moderate											
Girl NDD	45	3.36 (1.45)	4.68 (1.23)	4.07 (0.82)	4.77 (0.99)	2.38 (2.19)	1.52 (1.80)	5.24 (2.44)	2.09 (1.42)	4.42 (2.30)	2.38 (1.79)
Boy NDD	50	2.88 (1.35)	4.56 (1.35)	3.77 (1.32)	4.56 (1.18)	1.37 (1.88)	0.75 (1.32)	3.32 (2.27)	2.64 (1.89)	4.9 (1.99)	2.94 (1.66)
Girl no NDD	248	3.30 (1.29)	4.64 (1.21)	4.13 (0.91)	5.07 (0.94)	2.02 (2.19)	1.10 (1.60)	4.57 (2.34)	1.72 (1.35)	3.88 (2.30)	2.04 (1.63)
Boy no NDD	175	2.93 (1.26)	4.53 (1.34)	3.94 (1.08)	4.79 (1.13)	0.77 (1.38)	0.43 (1.01)	2.78 (2.16)	1.93 (1.65)	3.90 (2.11)	1.93 (1.55)
Total	518	3.14 (1.33)	4.60 (1.27)	4.03 (1.01)	4.9 (1.05)	1.56 (2.01)	0.87 (1.46)	3.90 (2.45)	1.91 (1.53)	4.03 (2.23)	2.12 (1.64)
Flourishing											
Girl NDD	36	3.28 (1.32)	4.53 (1.48)	4.49 (0.92)	5.25 (0.94)	1.12 (1.86)	0.89 (1.30)	3.92 (2.31)	1.58 (1.30)	4.44 (2.55)	1.22 (1.29)
Boy NDD	40	2.92 (1.44)	4.37 (1.14)	4.18 (1.14)	4.97 (1.11)	0.76 (1.56)	0.18 (0.51)	2.58 (2.17)	2.08 1.42	4.58 (2.38)	1.75 (1.55)
Girl no NDD	239	3.46 (1.29)	4.80 (1.88)	4.62 (0.88)	5.35 (0.77)	0.63 (1.27)	0.29 (0.90)	2.64 (2.03)	1.15 (1.16)	2.61 2.08	1.20 (1.16)
Boy no NDD	278	3.09 (1.28)	4.79 (1.24)	4.38 (0.98)	5.07 (1.01)	0.26 (0.81)	0.9 (0.40)	1.55 (1.61)	1.46 (1.33)	3.08 2.24	1.44 (1.23)
Total	593	3.24 (1.31)	4.75 (1.23)	4.47 (0.96)	5.19 (0.93)	0.49 (1.17)	0.22 (0.74)	2.20 (1.99)	1.38 (1.29)	3.07 2.28	1.35 (1.24)
Three-way ANOVA											
Corrected model	3.20 (0.028)	2.11 (0.019)	10.52 (0.085)	5.26 (0.045)	48.12 (0.298)	36.99 (0.250)	47.64 (0.308)	12.31 (0.103)	14.8 (0.121)	18.83 (0.15)	
Intercept	1806.47 (0.596)	4150.10 (0.773)	5499.83 (0.818)	7911.34 (0.866)	498.02 (0.285)	333.05 (0.214)	1305.31 (0.526)	859.06 (0.422)	1433.72 (0.549)	976.29 (0.453)	
Gender	7.66 (0.006)	ns	ns	ns	105.76 (0.078)	94.60 (0.072)	106.52 (0.083)	ns	ns	ns	
NDD	ns	ns	ns	ns	7.91 (0.006)	ns	15.99 (0.013)	7.33 (0.006)	12.71 (0.011)	19.30 (0.016)	
MHC	3.44 (0.006)	ns	22.99 (0.036)	9.0 (0.015)	71.71 (0.103)	54.94 (0.083)	52.94 (0.082)	25.97 (0.042)	15.80 (0.026)	62.32 (0.096)	
Gender*NDD	ns	ns	ns	ns	4375 (0.003)	9.98 (0.008)	ns	ns	ns	ns	
Gender*mental health	ns	ns	4.17 (0.006)	ns	23.97 (0.037)	17.19 (0.27)	9.02 (0.015)	ns	ns	ns	
Mental health*NDD	ns	3.65 (0.006)	ns	ns	ns	ns	ns	ns	4.47 (0.008)	3.84 (0.006)	
All three	ns	ns	ns	ns	3.28 (0.005)	ns	ns	ns	ns	3.545 (0.006)	
	0.02	0.01	0.08	0.04	0.29	0.243	0.301	0.095	0.113	0.142	

F: (partial Eta²) are reported. All F-values reported are significant at $p < 0.05$.

because of physical or language impairments can generate high problem ratings. In this study, adolescents with NDD scored higher in peer problems than those without NDD, but the three-way ANOVA (just as with hyperactivity) did not explain much of the variance with an adjusted $R^2 = 0.14$. In addition, in this study, the level of peer problems decreased over time in adolescents with self-reported NDD but remained stable on a lower level for children without NDD; at age 17, the level of rated problems was about the same. With age, adolescents with self-reported NDD may have gained better communication skills that contribute to a decrease in their problems with peers. In addition, when adolescents are 17 years old, they have made the transition to senior high school and therefore have been partly able to choose their school context. In Sweden, mandatory schooling ends at 15/16 years, and in senior high school, students can choose different forms of academic or vocational specialisations, creating similarities in interests; therefore, peer problems may be perceived as less severe. This is supported in a systematic literature review [34] on this topic. Again, the results of this study indicate that the subscale peer problem may partly measure something else other than behaviour problems and thus should not be indexed together with emotion as a measure of internalising problems when investigating mental health problems in adolescents with NDD.

The SDQ subscales “emotional problems” and “conduct problems” seem to measure behaviour problems that can be related to mental health problems. In both subscales, adolescents with NDD have higher ratings of problems at the age of 12/13, but the trajectories over time are different for the two subscales. All groups, independent of self-reported NDD or gender, rate less severe conduct problems with time. The decrease seen in conduct problems may be explained by maturity and the development of self-regulation skills. In addition, the transition to the more self-selected context of senior high school at age 17 may lessen conduct problems. Emotional problems are well-explained by mental health, gender, and NDD. There is a tendency, already at age 12/13, that gender is more important, than self-rated NDD, for the level of emotional problems. At age 14/15, girls rate more severe emotional problems than boys, and the difference are even larger at age 17. Gender differences do explain much of the variance in emotional symptoms, even though mental health, and to some extent, NDD also matter. It is, however, important to stress that girls with self-reported NDD are a special risk group. They start rating more emotional problems than boys in general and girls without NDD, and the difference increases with age. Girls with NDD who are languishing, seem to have more emotional problems than the other groups. The same gender differences and differences related to having an impairment or not have been reported in other population studies of mental health problems in adolescents [35]. The high risk for mental health problems in girls with self-reported NDD is alarming. It is also evident in the fact that girls report more psychosomatic complaints and again, girls with self-reported NDD have more difficulties. These gender differences, with a special focus on girls with self-reported NDD, need to be further investigated in future research. One of several possible explanations might be that girls tend to perceive more stress than boys about achievement in school in adolescence [36].

Our second hypothesis concerned trajectories of participation. The results of the study reveal that participation in both domestic and social activities was rated higher, both concerning frequency of attending and importance by adolescents without NDD, but the difference was not large. The differences appear to have a stronger relation to gender, with a tendency that girls rate both frequencies of attendance and importance higher than boys. The

gender differences seen for self-care activities may reflect traditional gender roles, and these seem to be rather stable for the measured period. The differences regarding social activities may also be partly explained by traditional gender roles.

Our third hypothesis that mental health problems have a negative relation with ratings of participation was not confirmed. This may have several explanations. A methodological explanation is that we only measured participation in two types of activities, which were treated separately in the analyses. Therefore, a relatively small variance is seen in the data. The low relevance of mental health problems for participation does not correspond with the results in cross-sectional studies, in which children and adolescents with higher mental health problems have lower participation [16,20,22,26]. If participation in a broader set of activities had been measured, the result might have been different. The fact that, in this study, the impact of previous mental health problems on participation was also assessed could be another answer. Cross-sectional data only allows analysis of the momentary relation. However, our relations between mental health problems and participation are very low, even concurrently. Another explanation for the low correlations between participation and mental health problems might be that mental health problems consist of ratings of negative functioning, while participation is focused on positive functioning. This is supported by the finding that mental health, or well-being, measured as flourishing [34], was strongly related to ratings of participation. However, ratings of flourishing also had strong negative relations to the SDQ ratings of mental health problems, with stronger relations to emotional problems and psychosomatic complaints, and weaker relations to hyperactivity and conduct problems.

The strong relations between ratings of mental health (positive aspects of functioning) and ratings of mental health problems (negative aspects of functioning) indicate that ratings of flourishing and mental health problems are conceptually related while participation ratings might capture another construct. Analysis of the last time point revealed that most adolescents with self-reported NDD were categorised as flourishing, which again confirms that self-reported NDD does not, in and of itself, represent an indicator of having problems with mental health. The result confirmed Boström et al.'s [18] finding that adolescents with an intellectual disability (a form of NDD) reported somewhat higher mental health operationalised as flourishing than adolescents without ID but also more mental health problems. Probably mental health and mental health problems are related but separate constructs. Participation has been described as both a means and an end [15] and concerning mental health interventions, a focus on participation can be a means for increasing mental health, but mental health can also be a factor that increases the probability of participating. Participation interventions will likely affect the level of mental health problems indirectly through increasing mental health.

In this study, mental health had a strong negative correlation with mental health problems. The measure of mental health was only administrated at ages 14/15 and age 17, which limited the opportunity to build a trajectory of mental health. The fact that the mental health measure (flourishing) had a stronger relation to participation at age 17 than at age 14/15 indicates that longitudinal analyses could generate more in-depth analyses of the relationship between mental health and participation.

Limitations

Missing data are unavoidable in epidemiological research and this does create challenges. When data are not missing at random,

imputations could bias the data even more than the missing responses. Therefore, only complete sets were used in this study. The relatively low retention rate at 17 years of age, especially for adolescents with NDD, creates a serious limitation, as power, as well as representativity, are reduced. The drop-out of adolescents is evident already at 14/15 years of age and seems to be related to externalising behaviours and school absenteeism. At 17 years, a reason for the high attrition in all groups is changing school form, something that occurs at 16 years of age. This change made it difficult to track all respondents into the new school. Senior high school is an optional program and thus some participants are lost because they no longer attend school, while others leave the municipalities for schools elsewhere and are therefore difficult to contact. Another possible explanation could be that students in vocational programs might be in workplaces other than school facilities on the days of data collection. Also, adolescents with difficulties might go to other types of high schools further away and be lost due to difficulties collecting data. However, this study is still relevant as efforts to include adolescents with cognitive and intellectual disabilities were made. Often, these groups are excluded.

Having a definition of NDD based on self-reports indicates that some will consider themselves as having a problem without a diagnosis, while others might not recognise that they have any of these issues. Therefore, generalisation to adolescents with diagnosed NDD should be made with caution. The fact that the adolescents with self-reported NDD rated hyperactivity significantly higher than participants without self-reported NDD at all time points do, however, confirm that the categorisation of groups is relevant. The reliance on self-reported NDD also made it possible to identify those adolescents that have problems related to NDD but do not have a diagnosed condition. The study group might therefore be more representative of the whole continuum of these difficulties than studies that include only those with a confirmed diagnosis.

The measure of participation in this study contained only a few items with minimal scale steps. Several items regarding the frequency of attendance and importance of participation were lost or altered during the process of gathering data in LoRDIA, due to a need to incorporate other measures. Consequently, the indexes created for participation were few and they contained a low number of items that were represented in all three-time points. In the current study, only domestic and social activities were related to mental health problems. This reduced the possibility to investigate the relationships between participation and mental health problems over time. The SDQ, when analysed over groups defined by gender and NDD, does not explain more than 5% of the variance in participation. This indicates that other variables are more important to investigate, such as family relations [27] and socioeconomic status [24].

Conclusions

Adolescents with high levels of emotional, social, and functional well-being—that is, those that are flourishing—exhibit higher participation in self-care and social activities than those that are not flourishing, regardless of whether the adolescent self-reports having NDD or not. Gender is an important factor to consider. Girls report more problems such, as emotional problems, and there is an interaction effect between gender and NDD for both impact and psychosomatic complaints: girls with NDD appear to be a special risk group. The degree to which an adolescent is flourishing or not seems to have a stronger impact on perceived mental

health problems than whether the adolescent self-reports an NDD or not. Therefore, the fact that more than one in three adolescents with self-reported NDD are flourishing and that less than one in ten are languishing is positive. That flourishing in this study is a predictor both for low levels of mental health problems and high levels of participation indicates that a key focus for interventions is to focus on mental health and participation. Participation interventions may enhance mental health and indirectly lead to a decrease in mental health problems.

Disclosure statement

The authors report no conflicts of interest.

ORCID

Lilly Augustine  <http://orcid.org/0000-0003-4079-8902>

Frida Lygnegård  <http://orcid.org/0000-0003-2827-9325>

Mats Granlund  <http://orcid.org/0000-0001-9597-039X>

References

- [1] Einfeld SL, Ellis LA, Emerson E. Comorbidity of intellectual disability and mental disorder in children and adolescents: a systematic review. *J Intellect Dev Disabil.* 2011;36(2):137–143.
- [2] Gorter JW, Timmons BW. Measurement of habitual physical activity and sedentary behaviour of youth with cerebral palsy: work in progress. *Dev Med Child Neurol.* 2014;56(9):911–911.
- [3] Harrowell I, Hollén L, Lingam R, et al. Mental health outcomes of developmental coordination disorder in late adolescence. *Dev Med Child Neurol.* 2017;59(9):973–979.
- [4] Granlund M, Imms C, King G, et al. Definitions and operationalization of mental health problems, wellbeing and participation constructs in children with NDD: distinctions and clarifications. *IJERPH.* 2021;18(4):1656–1675.
- [5] Arvidsson P, Granlund M, Thyberg I, et al. Important aspects of participation and participation restrictions in people with a mild intellectual disability. *Disabil Rehabil.* 2014;36(15):1264–1272.
- [6] European Commission. Green paper. Improving the mental health of the population. Towards a strategy on mental health for the European Union. Brussels: European Commission; 2005.
- [7] Bremberg S, Dalman C. Begrepp, mätmetoder och förekomst av psykisk hälsa, psykisk ohälsa och psykiatriska tillstånd: en kunskapsöversikt. Stockholm: Forte; 2015.
- [8] Shankman SA, Lewinsohn PM, Klein DN, et al. Subthreshold conditions as precursors for full syndrome disorders: a 15-year longitudinal study of multiple diagnostic classes. *J Child Psychol Psychiatry.* 2009;50(12):1485–1494.
- [9] Wesselhoeft R, Sørensen MJ, Heiervang ER, et al. Subthreshold depression in children and adolescents – a systematic review. *J Affect Disord.* 2013;151(1):7–22.
- [10] World Health Organization. International classification of diseases for mortality and morbidity statistics (11th revision). Geneva: World Health Organization; 2018.
- [11] Goodman R, Meltzer H, Bailey V. The Strengths and Difficulties Questionnaire: a pilot study on the validity of the self-report version. *Int Rev Psychiatry.* 2003;15(1–2):173–177.

- [12] Sjöman M, Granlund M, Almqvist L. Interaction processes as a mediating factor between children's externalized behaviour difficulties and engagement in preschool. *Early Child Development and Care*. 2016;186(10):1649–1663.
- [13] Copeland WE, Adair CE, Smetanin P, et al. Diagnostic transitions from childhood to adolescence to early adulthood. *J Child Psychol Psychiatry*. 2013;54(7):791–799.
- [14] Will MN, Wilson BJ. A longitudinal analysis of parent and teacher ratings of problem behavior in boys with and without developmental delays. *J Intellect Disabil*. 2014;18(2):176–187.
- [15] FHI. Hälsa och välfärd hos barn och unga med funktionsnedsättning [Health and wellbeing in children and youth with disabilities]. Östersund, Sverige: Swedish National Institute of Public Health; 2012.
- [16] World Health Organization. Mental Health: Strengthening our response, Fact sheet No 220. Geneva: World Health Organization; 2018.
- [17] Westerhof GJ, Keyes CLM. Mental illness and mental health: the two continua model across the lifespan. *J Adult Dev*. 2010;17(2):110–119.
- [18] Boström P, Åsberg Johnels J, Broberg M. Self-reported psychological wellbeing in adolescents: the role of intellectual/developmental disability and gender. *J Intellect Disabil Res*. 2018;62(2):83–93.
- [19] Imms C, Granlund M, Wilson PH, et al. Participation, both a means and an end: a conceptual analysis of processes and outcomes in childhood disability. *Dev Med Child Neurol*. 2017;59(1):16–25.
- [20] Adair B, Ullenhag A, Rosenbaum P, et al. Measures used to quantify participation in childhood disability and their alignment with the family of participation-related constructs: a systematic review. *Dev Med Child Neurol*. 2018;60(11):1101–1116.
- [21] Schlebusch L, Huus K, Samuels A, et al. Participation of young people with disabilities and/or chronic conditions in low- and middle-income countries: a scoping review. *Dev Med Child Neurol*. 2020;62(11):1259–1265.
- [22] Gustafsson BM, Danielsson H, Granlund M, et al. Hyperactivity precedes conduct problems in preschool children: a longitudinal study. *BJPsych Open*. 2018;4(4):186–191.
- [23] Sjöman M, Granlund M, Axelsson AK, et al. Social interaction and gender as factors affecting the trajectories of children's engagement and hyperactive behaviour in preschool. *Br J Educ Psychol*. 2021;91(2):617–637.
- [24] Imms C, Adair B. Participation trajectories: impact of school transitions on children and adolescents with cerebral palsy. *Dev Med Child Neurol*. 2017;59(2):174–182.
- [25] Lygnegård F, Almqvist L, Granlund M, et al. Participation profiles in domestic life and peer relations as experienced by adolescents with and without impairments and long-term health conditions. *Dev Neurorehabil*. 2019;22(1):27–38.
- [26] King G, Law M, Petrenchik T, et al. Psychosocial determinants of out of school activity participation for children with and without physical disabilities. *Phys Occup Ther Pediatr*. 2013;33(4):384–404.
- [27] King G, McDougall J, DeWit D, et al. Predictors of change over time in the activity participation of children and youth with physical disabilities. *Child Health Care*. 2009;38(4):321–351.
- [28] Eriksson L, Granlund M. Perceived participation. A comparison of students with disabilities and students without disabilities. *Scand J Disabil Res*. 2004;6(3):206–224.
- [29] Lygnegård F, Augustine L, Granlund M, et al. Factors associated with participation and change over time in domestic life, peer relations, and school for adolescents with and without self-reported neurodevelopmental disorders. A follow-up prospective study. *Front Educ*. 2018;3(28):1–13.
- [30] Aydogan C. Influences of instructional and emotional classroom environments and learning engagement on low-income children's achievement in the prekindergarten year [Ph.D. thesis]. Nashville (TN): Vanderbilt University; 2012.
- [31] Lygnegård F, Granlund M, Kapetanovic S, et al. Short-term longitudinal participation trajectories related to domestic life and peer relations for adolescents with and without self-reported neurodevelopmental impairments. *Heliyon*. 2021;7(4):e06784.
- [32] Lamers SMA, Westerhof GJ, Bohlmeijer ET, et al. Evaluating the psychometric properties of the mental health Continuum-Short Form (MHC-SF). *J Clin Psychol*. 2011;67(1):99–110.
- [33] Goodman R, Meltzer H, Bailey V. The strengths and difficulties questionnaire: a pilot study on the validity of the self-report version. *Eur Child Adolesc Psychiatry*. 1998;7(3):125–130.
- [34] Smedje H, Broman JE, Hetta J, et al. Psychometric properties of a Swedish version of the "Strengths and Difficulties Questionnaire". *Eur Child Adolesc Psychiatry*. 1999;8(2):63–70.
- [35] Bailey T, Totsika V, Hastings RP, et al. Developmental trajectories of behaviour problems and prosocial behaviours of children with intellectual disabilities in a population-based cohort. *J Child Psychol Psychiatry*. 2019;60(11):1210–1218.
- [36] Malmberg M, Rydell A-m, Smedje H. Validity of the Swedish version of the Strengths and Difficulties Questionnaire (SDQ-Swe). *Nord J Psychiatry*. 2003;57(5):357–363.