Externalizing behavior problems in preschool children

How engagement and interaction are correlated to different externalizing problems in preschool children over a three-year period

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Abstract

Introduction: Externalizing behavior problems, which are often operationalized to include hyperactivity and conduct problems, are among the most common detectable mental health problems in preschool children. Children experiencing these problems are at a high risk of developing disorders in the same or overlapping fields years later. Early intervention is therefore important, but which intervention is appropriate is debatable. Recent focus has been on detecting possible risk factors in the preschool setting, in the hope of studying successful interventions. Studies have shown that positive interactions with peers and preschool teachers can have a rewarding influence on a child’s mental health. Another important factor is these children’s engagement in preschool activities. Engagement is important for the child’s development and learning. Research shows children displaying externalizing behaviors tend to spend less time engaged and have more problems when it comes to interaction. More knowledge is needed regarding how different externalizing problems correlate to these factors. The aim of our study was to research how patterns of different externalizing problems, i.e. hyperactivity and conduct problems, correlated to engagement and interaction in preschool settings over a three-year period.

Methods: Data had been collected during a previous longitudinal study from 2012-2014, where preschool teachers answered questionnaires about the children. This study used data from the first and last years of that data collection. Children were divided into groups based on their behavioral patterns, evaluated by the preschool teacher’s version of the SDQ. The groups were N = Normal, H = Hyperactivity with no conduct problems, C = Conduct problems with no hyperactivity, B = Both hyperactivity and conduct problems. Chi square tests were used to compare groups with respect to demographic data. One-way ANOVAs were conducted to determine whether there were any significant differences between the means of the groups. Tukey’s and Games Howell post hoc tests were then performed to localize the differences between groups.

Results: H group stayed relatively stable in size while C group decreased over time. In general, the H group received the lowest ratings (and N group the highest) in both the first and last year for interaction and engagement. The H group was also the only group to show more functional impairment than the N group in the first year, and when it came to the last year, they also showed more functional impairment compared to the C group. The C group’s rating was lower than N group’s in the last year for the child’s interaction with other children, but no difference was found regarding engagement between those two groups. The C group had significantly higher ratings for interactions to other children and teachers compared to the H group in both the first and last year. In the last year, they also had better engagement than the H group. The B group showed better engagement than the H group in the first year. In the last year, the B group received lower ratings than the N group for their interactions with other children and teachers, and developmental delay.

Conclusion: Children with hyperactivity seemed to have more difficulties than children with conduct problems when it came to interactions and engagement in preschool settings. Engaged, interacting children are more likely to function better over time. Studies on interventions focusing on positive interactions and enhanced engagement are needed.
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Table of Contents

List of Figures ..................................................................................................................1
List of Tables ....................................................................................................................2
Abbreviations ..................................................................................................................3

1 Introduction ....................................................................................................................4

1.1 Issues of separating normal behaviors from disorders ..............................................4
1.2 Clinical presentation of mental health disorders in children .....................................5

1.3 ADHD ......................................................................................................................5
  1.3.1 Prevalence ..........................................................................................................5
  1.3.2 Characteristics and diagnostic criteria .................................................................5
  1.3.3 Course of ADHD ................................................................................................7
  1.3.4 Differential Diagnosis ........................................................................................7
  1.3.5 Comorbidity .......................................................................................................7

1.4 Disruptive behavioral disorders ...............................................................................8
  1.4.1 Oppositional defiant disorder (ODD) .................................................................8
  1.4.2 Conduct disorder (CD) .......................................................................................8

1.5 Preschool variants of externalizing behaviors .........................................................9
  1.5.1 Preschool hyperactivity ......................................................................................9
  1.5.2 Preschool conduct and oppositional problems ..................................................10
  1.5.3 Issues of comorbidity in preschoolers ...............................................................10

1.6 Longitudinal stability of preschool behavioral problems .........................................11

1.7 Diagnosis of childhood behavioral and emotional problems .....................................11

1.8 Risk factors of children behavioral disorders ..........................................................12

1.9 Neurobiology of behavioral problems .....................................................................12
  1.9.1 ADHD ...............................................................................................................12
  1.9.2 Conduct problems ..............................................................................................13

1.10 Possible interventions for pre-school externalizing behaviors ...............................14
  1.10.1 Pharmacological treatment ..............................................................................14
  1.10.2 Parent training ..................................................................................................14
  1.10.3 Other possible interventions? ..........................................................................15
  1.10.4 Interactions and engagement .........................................................................15

1.11 Aim .........................................................................................................................16

2 Methods .......................................................................................................................17

2.1 The study ...............................................................................................................17
List of Figures

Figure 1 Group sizes (n) in the first and last year.................................21
List of Tables

Table 1. DSM-5 diagnostic criteria for ADHD: symptoms of inattention, hyperactivity and impulsivity ...6
Table 2. Comparison of demographic variables between groups in the first year. .........................22
Table 3. Comparison of demographic variables between groups in the last year. .........................23
Table 4. Teachers' SDQ ratings on hyperactivity scale and conduct problem scale in the first and last year. ................................................................................................................24
Table 5. Teachers' SDQ ratings on prosocial scale and peer problems scale in the first and last year and comparison statistics ........................................................................................................24
Table 6. Teachers' ratings on interaction subscales in the first and last year and comparison statistics. .....................................................................................................................................................25
Table 7. Teachers' ratings on CEQ in the first and last year and comparison statistics ...................26
Table 8. Teachers' ratings on ICF-CY questionnaire in the first and last year and comparison statistics. ........................................................................................................................................................26
### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ADHD</td>
<td>Attention Deficits Hyperactivity Disorder</td>
</tr>
<tr>
<td>B</td>
<td>Both hyperactivity and conduct problems</td>
</tr>
<tr>
<td>C</td>
<td>Conduct problems no hyperactivity</td>
</tr>
<tr>
<td>CD</td>
<td>Conduct disorder</td>
</tr>
<tr>
<td>CEQ</td>
<td>Child engagement questionnaire</td>
</tr>
<tr>
<td>DALYs</td>
<td>Disability Adjusted Life Years</td>
</tr>
<tr>
<td>DC:0-3</td>
<td>The Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood</td>
</tr>
<tr>
<td>DSM-5</td>
<td>DSM-5</td>
</tr>
<tr>
<td>H</td>
<td>Hyperactivity no conduct problems</td>
</tr>
<tr>
<td>ICD-10</td>
<td>The international statistical classification of diseases 10th edition</td>
</tr>
<tr>
<td>ICF-CY</td>
<td>International Classification of Functioning, Disability and Health: Children and Youth version</td>
</tr>
<tr>
<td>IY</td>
<td>Incredible Years Parenting program</td>
</tr>
<tr>
<td>MPH</td>
<td>Methylphenidate</td>
</tr>
<tr>
<td>N</td>
<td>Normal</td>
</tr>
<tr>
<td>NFPP</td>
<td>New Forest Parenting Program</td>
</tr>
<tr>
<td>ns</td>
<td>Non-significant</td>
</tr>
<tr>
<td>ODD</td>
<td>Oppositional Defiant Disorder</td>
</tr>
<tr>
<td>PAPA</td>
<td>Preschool Age Psychiatric Assessment</td>
</tr>
<tr>
<td>PATS</td>
<td>Preschoolers with Attention Deficits Hyperactivity Disorder Treatment Study</td>
</tr>
<tr>
<td>SDQ</td>
<td>Strength and difficulties questionnaire</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>YLD</td>
<td>Years Lived with Disability</td>
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</table>
1 Introduction

Mental health problems are by far the largest contributor to chronic conditions affecting the world’s population (1). The WHO has reported neuropsychiatric disorders as the leading cause of years lived with disability (YLD), accounting for 36.1%. They also represent the third leading cause of disability adjusted life years (DALYs) in Europe, at 15.2%, preceded by cardiovascular diseases and malignant neoplasm. It has been estimated that mental health problems cost the economy 3.5% of gross domestic product (GDP) (1). People with a mild to moderate mental illness, such as anxiety or depression, are twice as likely to be unemployed and workers suffering from poor mental health are more likely to show less productivity when attending work (2). Studies in adults have shown that a considerable fraction of mental health disorders starts in early childhood (3). Young children showing early signs of mental health problems can have high risk of developing symptoms in the same or overlapping fields years later (4). In order to avoid later problems, early detection and intervention is therefore important (5-7). Although our knowledge of psychiatric disorders in school aged children is vast, our understanding of the nosology of preschool psychiatric problems still lags far behind (8). In this dissertation we will discuss the most common childhood mental health problems, the symptoms of their early emergence, the possibility of early detection and the hope for appropriate intervention.

1.1 Issues of separating normal behaviors from disorders

Hyperactivity, poor impulse control, disobedience and aggression are typical complaints heard from parents of young preschool children. Many children show behaviors analogous to symptoms of disorders like ADHD (fidgety, hyperactive, restless, difficulty awaiting turn), ODD (tantrums, argumentative, disobedience) and possible mild CD (aggression). Most of these symptoms will come up in an isolated form or for a short time at preschool age and the children displaying them will not meet the criteria for any of these disorders by school entry. However there are some children, who show these behaviors at relatively high levels in early childhood, who will keep on having problems up to later childhood and beyond (9). Although this indicates the importance of being able to identify predecessors of more serious disorders in this age group, many have had their doubts about whether it is possible, or even desirable, to classify psychiatric disorders in such young children. There are several reasons for these doubts. First of all, when children are so young their physical, behavioral and emotional development is rapid, so it can be hard to analyze valid symptoms or clusters of symptoms that can be truly measured. Secondly, researchers are afraid that personal differences between children in their natural development will be incorrectly classified as psychiatric symptoms or disorders and that young children will be incorrectly labeled with a disease that might shape the child’s perception of him/herself and the parents perception of the child. Lastly, it is also possible that the problematic behavior in very young children comes not from within the child but from the child’s reaction to situations in its environment, including the relationship between the parent and the child or from something in their wider environment (8). However, given that these problems might escalate towards worse mental health later in adulthood, there are disadvantages to not defining these symptoms in young preschool children.
1.2 Clinical presentation of mental health disorders in children

The most frequent universally approved standard criteria for the classification of mental disorders in children is from the American Psychiatric Association, published in the Diagnostic and Statistical Manual of Mental disorders Fifth edition (DSM-5) (10). The international statistical classification of diseases 10th revision (ICD-10) is the alternative classification standard, owned, developed and published by the World Health Organization (WHO), a specialized agency of the United Nations (10). One way of classifying mental health problems in children is as emotional, described as “internalizing”, and behavioral, described as “externalizing” (10). Behavioral disorders are the most common detectable mental health disorders in young children (4). This includes attention deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD) and conduct disorder (CD). Emotional disorders such as anxiety, depression and post-traumatic stress disorders are often more challenging to be identified early by their parents or guardians. This might be because these problems do not disturb their surroundings as much as behavioral disorders. Also, young children have not developed appropriate vocabulary and comprehension skills to express their emotions clearly. Therefore, emotional disorders tend to be discovered later in childhood (11). We will now start with a brief overview of the most common behavioral disorders, and then we will discuss how they might appear in preschool children.

1.3 ADHD

1.3.1 Prevalence

The prevalence of ADHD in school aged children is estimated to be between 8 and 11 %, making it one of the most common mental health disorders of childhood (12). Assessments of the prevalence of ADHD have commonly shown that boys are more likely to be diagnosed with ADHD than girls (13). However, it is worth noting that girls are more likely to be diagnosed with the predominantly inattentive type compared to boys, and do therefore not disturb their surroundings as much, which might result in fewer and later diagnoses (14).

No clear evidence has been found for racial/ethnic differences in the rates of ADHD in children. In some evaluations, the rate of ADHD seems to be higher in Caucasians than in African Americans or Hispanic Americans, but this might be because of the lack of clinical identification of nonwhite children who have ADHD (15).
### 1.3.2 Characteristics and diagnostic criteria

ADHD is a neurodevelopmental disorder characterized as a persistent pattern of inattention, impulsivity and hyperactivity which are inconsistent with the child’s developmental stage (16). The DSM-5 criteria distinguishes between three subtypes of the disorder; predominantly hyperactive/impulsive, predominantly inattentive and then combined. These symptoms are described in table 1. Table 1 is from the ADHD institute web page (17).

**Table 1. DSM-5 diagnostic criteria for ADHD: symptoms of inattention, hyperactivity and impulsivity**

<table>
<thead>
<tr>
<th>Symptoms of inattention</th>
<th>Symptoms of hyperactivity and impulsivity</th>
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<tbody>
<tr>
<td>Often fails to give close attention to detail or make mistakes</td>
<td>Often fidgets with or taps hands and feet, or squirms in seat</td>
</tr>
<tr>
<td>Often has difficulty in sustaining attention in task or activities.</td>
<td>Often leaves seat in situations when remaining seated is expected</td>
</tr>
<tr>
<td>Often does not seem to listen to when spoken to directly</td>
<td>Often runs and climbs in situations where it is inappropriate (in adolescents or adults, may be limited to feeling restless)</td>
</tr>
<tr>
<td>Often does not follow through on instructions and fails to finish schoolwork or workplace duties</td>
<td>Often unable to play or engage in leisure activities quietly</td>
</tr>
<tr>
<td>Often has difficulty organizing tasks and activities</td>
<td>Is often “on the go”, acting as if “driven by a motor”</td>
</tr>
<tr>
<td>Often avoids dislikes or is reluctant to engage in tasks that require sustained mental effort</td>
<td>Often talks excessively</td>
</tr>
<tr>
<td>Often loses thing necessary for tasks or activities</td>
<td>Often blurts out answers before a question has been completed</td>
</tr>
<tr>
<td>Is easily distracted by extraneous stimuli</td>
<td>Often has difficulty waiting their turn</td>
</tr>
<tr>
<td>Is often forgetful in daily activities</td>
<td>Often interrupts or intrudes on others</td>
</tr>
</tbody>
</table>

For children younger than 17, the DSM-5 diagnosis of ADHD requires more than 6 symptoms of hyperactivity and impulsivity or more than 6 symptoms of inattention. It requires that the symptoms be present before the age of 12, ongoing for at least 6 months and must be present in two or more settings. They must cause significant impairments in social, academic and personal functioning, and cannot be secondary to another disorder (17, 18). As well as primary deficits of inattention, impulsivity and hyperactivity, associated difficulties often include problems with motor co-ordination, poor self-regulation and low frustration tolerance. Social skills in children with ADHD are often impaired and problems with inattention may limit opportunities to acquire social skills, making it difficult to form friendships (19).
1.3.3 Course of ADHD

ADHD develops early in life and can remain into maturity and affect academic, behavioral, emotional and social functioning (20). Hyperactive impulsive symptoms are usually the first symptoms to appear, developing between ages 3 and 4. Although these symptoms can be hard on parents and school teachers, children are usually not introduced to mental health care providers until they begin formal schooling. Between ages 5 and 8 problems with inattention often escalate leading to a diagnosis of ADHD (21). Between 50 and 80% of children with ADHD continue to meet diagnostic criteria though adolescence. Hyperactive symptoms tend to be replaced by feelings of restlessness but these young people will however continue to experience marked problems with impulsivity, as evidence by poor decision making and planning (22). Although, when entering adulthood, most youth diagnosed with ADHD will not meet the ADHD criteria, it is thought that one- to two-thirds of children diagnosed with ADHD will continue to manifest subthreshold symptoms in adult life. Factors that might contribute to persistence of ADHD symptoms into adulthood include the severity of initial symptoms and coexisting mental health disorders (23, 24).

1.3.4 Differential Diagnosis

The differential diagnosis of ADHD includes a broad range of disorders. The typical symptoms of ADHD overlap with a number of other conditions. The most common conditions which might mimic ADHD symptoms are for example; 1) Other neurologic or developmental disorders such as learning disabilities, seizure disorders or autism spectrum disorders, 2) Emotional or other behavioral disorders such as anxiety disorder, mood disorder, conduct disorder or obsessive compulsive disorder, 3) Psychosocial problems which emerge as a result of environmental factors such as a stressful home environment or childhood neglect, 4) Certain medical problems such as thyroid abnormalities. Some of these problems might comorbid with ADHD and can either be primary or secondary (18).

1.3.5 Comorbidity

Up to half of all children with ADHD have a comorbid disorder, almost a third have two other disorders and approximately one in ten have three comorbid disorders (25). The most common comorbid disorders seen in children diagnosed with ADHD are disruptive behavior problems, prevalent in 30 – 70% of cases (16). Others are, for example, mood and anxiety disorders, cigarette and substance use disorders and learning disabilities (26). Children who have comorbid disorders are more likely to have poorer outcomes and experience more impairment (27). It is important to treat coexisting conditions concurrently with ADHD and treatment of coexisting conditions may influence treatment of ADHD (28).
1.4 Disruptive behavioral disorders

1.4.1 Oppositional defiant disorder (ODD)

Oppositional defiant disorder coexists in approximately 50% of children with ADHD. It is more common in the combined and hyperactive-impulsive subtypes and is significantly lower in the mainly inattentive subtype (29). ODD is considered to be the mildest and one of the commonest disruptive behavioral problems, with prevalence estimated at 6 – 9% for preschoolers, with boys more often affected than girls (30). It is strongly associated with a wide range of psychiatric illnesses, including both emotional and externalizing disorders (31). Young people with ODD are generally openly hostile, negativistic, uncooperative, defiant and irritable. They tend to lose their tempers easily and are mostly aggressive towards authority figures but may also act the same towards their siblings or classmates. This pattern of opposing behavior can have a negative impact on their lives at home, school, and wider society, and can seriously impair their relationships (10). ODD is more common in children aged 10 years or younger while conduct disorder is more common in those aged 11 years or older (32). Some researchers have therefore pondered whether childhood ODD might be a precursor for later CD which might then lead to later antisocial personality disorder. The role of ODD in this chain has however not been proven and some researches have actually shown the opposite, that ODD symptoms are not a developmental precursor to CD symptoms (33).

1.4.2 Conduct disorder (CD)

Conduct disorder coexists with ADHD in as many as one third of cases (34). Just like ODD, it is more common in the combined and hyperactive-impulsive subtypes (29). Conduct disorder refers to severe behavior problems, characterized by repeated and constant display of serious aggressive and non-aggressive behaviors against people, animals or property, such as refusal to obey parents or other authority figures, being defiant, destructive, threatening, physically cruel, deceitful, excessive fighting or bullying, lying and intentional injury (9). Children with CD can have trouble understanding how other people think and they may mistakenly interpret actions and intentions of other people as being mean-spirited. They can have immature language skills and lack the appropriate social skills to establish and maintain friendships, which provokes their feelings of frustration, sadness and anger (10). The major distinction between ODD and CD is the extent and severity of the antisocial behavior. It is thought that 50% of children with conduct disorder will also meet criteria for at least one other disorder including anxiety, PTSD, learning problems or thought disorders (10). Youngsters diagnosed with conduct disorders are more likely to have ongoing problems if they do not receive appropriate intervention. This group has been associated with a significantly increased rate of mental health problems in adult life, including antisocial personality disorder in which the individual repeatedly breaks social rules and carries out aggressive acts that upset other people (32). Other problems that might occur later in life, if children with CD go on untreated, are for example substance abuse, alcoholism, depression and more serious criminal behavior (35, 36).
1.5 Preschool variants of externalizing behaviors

There is no clear universally approved criteria for defining most psychiatric disorders or problems in young preschool children (8). Externalizing behavior problems are sometimes operationalized to include hyperactivity and conduct problems. These problems can be right under the threshold for what is considered to be serious enough to be a diagnosis according to ICD-10 and DSM-5, but the children might still experience problems with functioning normally in everyday life. Like previously noted, these behaviors can, in some cases, be predictors of psychiatric diagnosis in the same or overlapping domains later in life (37). Young preschool children who are higher on the dimension of inattention, hyperactivity, impulsivity or aggression are often referred to as children with early symptoms of ADHD, ODD or in few cases CD, rather than children with a disorder (38). We will therefore refer to these symptoms as “problems” rather than “disorders” in our overview of preschool variants of externalizing behaviors.

1.5.1 Preschool hyperactivity

With the rise in the rate of preschool children being diagnosed with ADHD and receiving psychotropic medications over the past decade, the debate about the nature and significance of preschool hyperactivity has been increasing (39, 40). This has driven many researchers into trying to answer the question about when it is suitable to apply the diagnosis of ADHD to the hyperactive behavior of preschoolers. Up to this point, studies have generally suggested that preschool children with symptoms of ADHD experience similar associated impairment and symptom structure as their school aged counterparts diagnosed with ADHD. They present with low cognitive or pre-academic skills, motor coordination problems, deficits in social skills and difficulties with close relationships (41, 42). A few studies have also examined the differences between separated subtypes of ADHD in preschool, secondary school and elementary school. Nolan et al., 2001 examined the prevalence of ADHD symptoms in these three different settings. In their preschool sample, the prevalence of ADHD symptoms was reported at 18.2%, with the hyperactive and combined types being equally common (prevalence rates = 6.3% and 7.7%) and inattentive type being least common (prevalence rate = 3.9%). For older children, this pattern was reversed; prevalence of the hyperactive and combined type decreased after the preschool years, while the inattentive type became more common (43). This is consistent with other studies that have found that hyperactivity is the most typical symptom detected in the early course of ADHD, and that inattentiveness is often detected later in childhood (21). This also supports other reports of hyperactive and combined type of ADHD having an earlier onset than the inattentive type of ADHD (44). Others have argued the possibility of taking another perspective on preschool hyperactivity by trying to better understand the hyperactivity’s developmental pathway instead of analyzing it as ADHD or not ADHD. This approach could help avoid over-pathologizing hyperactive children but at the same time not underestimate the clinical significance of early appearing signs of subthreshold symptoms of ADHD or mental health problems, which may be early predictors of a later onset full-blown disorder (42).
1.5.2 Preschool conduct and oppositional problems

Disruptive behaviors in preschool children often include oppositional problems or the characteristics of their corresponding disorders i.e. ODD or CD. However, as previously noted, CD includes more serious characteristics of aggressive and cruel behaviors and more often occurs in older children so it is seldom correlated to preschoolers (45). Oppositional problems in preschoolers can be characterized as defiant, non-compliant, angry, and sometimes aggressive behaviors. These problems represent the most frequent type of problematic behavior in preschool children. It has been reported that by the age of 17 months, 70% of children take toys away from other children, 46% push others to obtain what they want and 21 – 27% engage in fighting or physically attack their peers (45). Most often these behaviors in such young children are a part of their normal development and are attempts to establish self-determination, practice social skills and test limits (9). However, if these behaviors persist and get worse over time or surpass the limit seen as age appropriate expression of frustration or anger, it is possible these action might be symptoms of an emerging disorder (9). Some have hypothesized whether conduct and oppositional behaviors in such young children are correlated to the same cognitive deficits and low pre-academic skills as young hyperactivity is. These studies generally converge on that although ADHD and CD/ODD in older children are linked to academic underachievement, conduct problems in preschool children have not (46, 47). Some have therefore argued that hyperactivity is to a larger degree more of a functional impairment, while conduct problems in very young children are more often a result of interactions between the child’s characteristics and environmental influences (47, 48).

1.5.3 Issues of comorbidity in preschoolers

Researchers have also aimed to investigate the comorbidity of behavioral problems in preschool children, i.e. hyperactivity or symptoms of ADHD and conduct problems. Like previously stated, co-occurrence of ADHD and conduct problems is common in primary school children and adolescents. Gadow et al., 2002 examined if there were differences among 3 to 6-year-old children who had ODD symptoms with or without ADHD symptoms, ADHD symptoms alone and a control group. They reported that children who had comorbid symptoms of ODD and ADHD received higher ratings of severity for the symptoms of other disorders, difficulties with peers and developmental deficits compared to children who only had ADHD symptoms or ODD symptoms (41). This is consistent with other studies where older children with comorbid disorders have been found to have greater difficulties with functioning and more impairments than children with no comorbid disorders (27). Another more recent study using a large population-based sample of 3-year-old children with high ADHD characteristics, differentiated conduct problems into ODD and CD using the preschool age psychiatric assessment (PAPA) and the DSM-IV-TR criteria. They showed that concurrent ODD and CD symptoms shared many of the same features when examined by dimensional measures. Some significant differences, which supported distinctiveness, emerged in categorical analysis. Children with ADHD symptoms had concurrent ODD more often than CD but having ADHD symptoms increased the risk of CD more than twice the increase of ODD (49). This is consistent with other studies that have indicated hyperactivity is linked to more conduct problems later on, and that CD is a disorder that comes later in childhood than ODD (50).
1.6 Longitudinal stability of preschool behavioral problems

The stability of problematic behaviors in young preschool children can be difficult to determine because the prognostic implication for such young children cannot be built on the child’s behavior alone, especially in the youngest age group between 0-2 years old. This assessment must also be based on parental function and other environmental factors likely to affect the development of the child (45). Apart from that, studies on this matter have suggested that about 50% of children who show high rates of externalizing problems around 3 years old, will continue to exhibit these problems 42-48 months later (6, 51). In one study of 21 children with “pervasive hyperactivity”, followed up from age 3 to 15, only 25% of the children were evaluated as having met “recovery” criteria and 33% met criteria for attention deficit disorder (ADD) at follow up (52). Another study of 3-6-year old children, diagnosed with ADHD after undergoing a comprehensive multidisciplinary assessment, showed that 70.4% of them continued to meet diagnostic criteria for ADHD after 7 years of follow up. Interestingly, more than half of the children who no longer met criteria for ADHD were later found to have alternative developmental diagnosis, including anxiety, ASD and learning disorders (53). So, although some children who show externalizing behaviors in early childhood do not continue to show hyperactivity or conduct problems later on, this highlights the importance of continuing to monitor them for other possible neurodevelopmental disorders up to adulthood.

1.7 Diagnosis of childhood behavioral and emotional problems

There is no single gold-standard diagnostic tool available for evaluation of behavioral problems in young preschool children. The diagnosis mostly relies on the clinical skills and cooperation of professional experts with accurate history taking, including general medical, developmental, family, social, educational and emotional history (10). Current tools available to help evaluate behavioral problems often take the form of parent- or caregiver- report questionnaires, observational coding procedures and diagnostic classification systems (5). The questionnaires and observational coding procedures have both been shown to have good psychometric properties for use in young children. The classification systems have been thought to be less practical for use with this age group and further research is necessary to establish their suitability (5). Although two classification systems have been developed for use with young children, the DC:0-3R and the DSM-PC, some have argued that they may not sufficiently address the full range of possible problems because there are disadvantages in classifying young children in categorical constructs rather than applying dimensional measures (54, 55).
1.8 Risk factors of children behavioral disorders

The exact cause of behavioral problems and disorders remains unclear, but current consensus is that these problems are best viewed as a gene-environmental interaction (10). In this context, children with a more biological tendency toward having ADHD or CD/ODD will manifest the disorder when placed in the right environment. Several studies have examined various combinations of genetic predisposition and environmental factors that might increase the risk of developing any of the childhood behavioral and emotional disorders or work as protective factors. Protective factors in the child’s development can be specific to the child, the family or specific to the child’s broader social environment (56). Protective factors specific to the child are for example it’s self-efficacy. High self-efficacy describes the child’s belief in its ability to succeed in specific situations or accomplish tasks and challenges. Studies have shown association between high self-efficacy and fewer mental health problems, both in kids and adolescents (57). The family is another important factor. Many studies have shown that children raised in a home characterized by warmth, involvement and a positive atmosphere show less behavioral dysfunction later on (58). Smeeke et al., 2007 showed in a group of children 15 to 28 months old that a poor child-parent relationship characterized by such factors as rejection of the child and low parental involvement in the child’s activities was a predictor of externalizing behavior at age 5 (59). Supportive parenting and a positive parent–adolescent relationship has been reported to be associated with a lower level of impaired functioning (60). Factors from the broader social environment include factors other than the nuclear family, such as positive relationships with friends or teachers (19, 61). Other factors that have been shown to affect the child’s development are for example unfavorable perinatal factors, like maternal alcohol drinking, smoking or drug use, difficult pregnancies or premature birth (62, 63). An unfavorable socioeconomic environment has also been associated with more behavioral problems, which might result in early childhood malnutrition or financial strain on parents and therefor lots of stress in the household (64).

1.9 Neurobiology of behavioral problems

1.9.1 ADHD

Currently there are two dominating theoretical models most commonly accepted that might explain the development and maintenance of ADHD in individuals with genetic predisposition for ADHD. Both models explain a specific neuropsychological deficit. The first one describes a deficient inhibitory control mechanism which results in an executive dysfunction, associated with alterations within frontodorsal striatal circuits (16, 65). The deficiency in the inhibitory mechanism seems to affect 4 executive neuropsychological functions that depend on it for their effective execution. These functions are 1) working memory, 2) self-regulation of affect/motivation/arousal 3) internalization of speech and 4) reconstitution (behavioral analysis and synthesis) (66). These inhibitory dysfunctions result in common characteristics of ADHD, like showing insufficient forethought, planning and control because of cognitive dysregulation (67).
The second model prescribes a disturbance in motivational processes which results in delay aversion. This model implicates frontoventral striatal reward networks including the nucleus accumbens and associated limbic, cerebellar and brain stem projections (68). This is the motivation to escape or avoid delay, resulting in a desire for small immediate over large delayed rewards. This prescribes itself the way that children with ADHD may try to compensate for their delay aversion by attending to additional stimulation, that is children with ADHD behave impulsively not because of deficient inhibitory mechanism, but in order to avoid delay (69). Some studies have focused on whether these two models are applicable to preschool children with symptoms of ADHD. Sonuga-Barke et al., 2003 examined the independent effect of executive dysfunction and delay aversion on ADHD symptoms in preschool children (65). The results indicated that both models made their independent contributions to the prediction of ADHD symptoms, suggesting two independent early emerging pathways to ADHD. However, the association was larger for delay aversion than for executive dysfunction which they concluded might be because of the primitive and undifferentiated nature of executive function in preschool children. They also examined associations between executive dysfunction i.e. planning, working memory and inhibitory control and individual differences in preschool children with ADHD symptoms. No specific association was found between ADHD symptoms and working memory or planning but a significant negative association existed between inhibition and ADHD symptoms. They concluded that specific deficits in inhibitory control rather than general executive dysfunctions underpinned the symptoms of ADHD during the preschool years and that might again be because of the primitive nature of preschool executive functions (65).

1.9.2 Conduct problems

Possible neural abnormalities correlated to children diagnosed with ODD and/or CD have also been investigated. The most frequently reported abnormalities include reduced grey matter volume in the amygdala, frontal cortex, temporal lobes and the anterior insula, which is part of the network related to empathic concern for others (10). There are however not many studies that have focused on brain abnormalities in very young children with conduct problems, not diagnosed with ODD or CD. Some have reported a decrease in amygdala volume in 6-9 year old children showing aggressive behavior, but not diagnosed with a disorder (70). Walhovd et al., 2012 reported a possible association between thinner cortices in frontal and temporal lobes bilaterally with conduct problem symptoms in a group of children 8-19 years old, not diagnosed with CD or ODD. This relationship was thought to be considerably stronger for the younger children in the study. They interpreted this as a possible neurobiological association between symptoms of conduct problems and then later conduct disorder, where less gray matter and smaller neuroanatomical volumes have frequently been found, like previously noted. However, more longitudinal studies are needed to further inform us on neuroanatomical developmental trajectories underlying these problems, and younger children need to be included in research (71).
1.10 Possible interventions for pre-school externalizing behaviors

1.10.1 Pharmacological treatment

The treatment of externalizing behaviors during the preschool period is a relatively controversial topic (28). Giving preschoolers medication as a first level treatment has been considered less desirable, for a few reasons. In 2006, the Preschoolers with Attention-deficits/Hyperactivity Disorder Treatment Study (PATS) was conducted, which was the first controlled trial to assess the safety and efficiency of methylphenidate (MPH) in children between the age of 3 and 5 (72). In this study, 30% of parents described moderate to serious adverse events, including sleep disturbance, appetite decrease, irritability and emotional problems, and 11% of participating children ended treatment because of these events (72). This percentage was noticeably higher than those described in comparable trials with school aged children, for example in the multimodal treatment study of children with ADHD (MTA), where there was a less than 1% drop out rate because of adverse effects (73). In 2016, a follow–up was made of the children who participated originally in PATS. It was reported that there was a considerable heterogeneity in the long term use of pharmacotherapy, with about 1 in 4 of the children at age 10 receiving no consistent pharmacotherapy (74). Pure pharmacological treatment for young preschool children with ADHD symptoms have therefore not been considered the most convenient first level treatment because of 1) concerns about side effects, 2) lack of evidence for short- or long term effects, 3) ethical questions about the use of medication to change children’s behavior (16).

1.10.2 Parent training

As a substitute to drug therapy for young children showing symptoms of ADHD or other conduct problems, an advisable first level treatment is psychosocial treatment with parent training (10). When young children show constant challenging behavior, it is prone to bring out persistent negative reactions from parents and is likely to generate unproductive controlling strategies (75). Parent training is used to teach parents techniques that promote their abilities to correct and shape their child’s behavior and to enhance the child’s ability to regulate his or her own behavior. Parents learn to practice strategies on how to more productively provide rewards when their child shows the desired behavior, they learn what behaviors can be decreased or phased out by using for example ignoring as an active strategy, or bring on relevant consequences or punishments when their child does not meet the goals (76). These interventions are typically delivered by trained leaders in a 1-2 hour long group format session, once a week, for 4-18 weeks (10). Standardized training programs for parents of preschool children with disruptive behavior disorders that have been evaluated in systematic reviews include; Incredible Years parenting program (IY), New Forest Parenting Program (NFPP) and the Positive Parenting Program (triple P) (77). NFPP was developed specifically to treat ADHD in preschool children. The efficacy of the triple P and the IY parenting programs have only been demonstrated on children with conduct problems and comorbid ADHD (78-80). Although parental training is considered to be an advisable first level treatment for children with externalizing behaviors, there are a few limitations worth mentioning. For example, a significant minority of children fail to show any improvement from these behavior programs (81). Such failure might be attributed to inability of parents to attend the program as they should which
might lead to dropout. Studies have shown that potential barriers of attendance commonly include work and family responsibilities, socio economic disadvantages and transport problems (82). There might also be some unwillingness of parents to perform the behavioral programs as directed which might result in noncompliance and therefore failure. Even though parents say they are following the program as constructed, manipulation checks have rarely been conducted on whether they truly follow through with treatment (81). The results of behavior therapy therefor rely on the motivation and capacity of the significant adults in the child’s life. If main adults are unwilling or not able to carry out the interventions, the behavior therapy might not be effective in real world settings (81). Knowledge is therefore needed on whether characteristics in parents can be identified which predict failure or non-compliance with behavioral treatments and if they can be modified before treatment starts. The last limit mentioned here is that long term effects of parent training for preschool children have not yet been established (10). It has been shown that the short-term effects of these interventions are often limited to the period when the programs are actually in effect, but after the treatment is over, children often lose the improvements made during treatment. Few studies have carried out maintenance strategies into their treatment protocols and few have shown maintenance of gains made during treatment beyond a few months after therapy is withdrawn (81). For example, an evaluation of the IY program demonstrated 18-month stability of intervention effects, which is strong compared with NFPP and triple P (80). The triple P reported 12-month stability and the NFPP only reported 15 weeks stability after the program had ended (78, 79).

1.10.3 Other possible interventions?

After highlighting those doubts about the parent training interventions and pharmacological treatment, many have wondered about other possibilities of interventions for those children. Recently there has been more focus on possible interventions in the preschool environment. Two factors in the preschool environment are thought to be particularly important for every child’s development and are likely to have great correlation to these children’s behaviors. These factors are their interaction and engagement.

1.10.4 Interactions and engagement

Like previously stated, good interactions with teachers and peers are considered to be a protective factor for every child’s development (19, 61). Hoza et al., 2007 showed for example that rejection and negative responses from peers and teachers had an adverse impact on the child’s mental health in the long term and children who experienced the most rejection were more likely to have problems with emotional regulation and disruptive behavior later on (19). When it comes to socialization, a peers interaction is especially important, because both individuals involved in the relationship are of equal status, so it is an important ground for learning cooperation, negotiation and conflict resolution (19). Like previously noted, current literature suggests that there is a considerable negative association between behavioral problems and social interaction (83). Mikami et al., 2011 reported for example in a study of 6-10 years old children, that both those diagnosed with ADHD and those that had high conduct problems, showed more impaired peer relationships than comparison children (84). This indicates that children constantly displaying aggressive behavior, impulsion or hyperactivity tend to be less liked by
their peers and are in more risk of experiencing peer problems (83). It has also been reported that children with conduct problems tend to get less responsive teachers since the teachers seem to have negative perception of children with these difficulties (85). These children are therefore likely to be left out, which can easily lead to lower self-esteem, and possibly exclusion from developmentally important activities (86). Recent studies have also indicated that good interaction with peers and teachers are positively correlated to their engagement in the classroom later on (87). Engagement is in general defined as “the amount of time children spend interacting with the environment (with adults, peers, or materials) in a developmentally and contextually appropriate manner” (88). It is a multidimensional concept and concerns children’s behaviors, cognition and emotional expression when interacting with the environment (89). Being engaged is thought to be an important factor in the development of cognitive self-regulation, because it will further more complex thinking on behalf of the child and encourage higher level reasoning about newly acquired information and is therefore considered to be critical for learning (90, 91). Engagement is partly dependent on the child’s characteristics (like self-regulation and being able to control attention), environmental factors (like types of activities) and interaction between the child and the environment (89). Because children with externalizing behaviors tend to have low frustration tolerance and difficulty with controlling their attention and impulses they are likely to spend less time engaged, which will in turn affect their wellbeing and predict their later academic underachievement (47, 92). This has mainly been attributed to hyperactivity, but there is a lack of research on how conduct problems might influence the child’s engagement. One recent study by Searle et al., 2013 had the aim of assessing the association between mental health problems in preschool and later engagement in the 1st school year. The results showed that both hyperactivity/inattention and conduct problems in preschool children had small significant bivariate association with classroom engagement in the 1st school year, but hyperactivity was the only subscale to show a unique association with engagement when all of the problem subscales were considered simultaneously (93). More knowledge is needed on how conduct problems and hyperactivity correlate differently to engagement and interactions in the preschool environment. A greater understanding on this might help in understanding the challenges these children face in everyday preschool activities and might provide a greater hope in offering them an early successful intervention.

1.11 Aim

The main purpose with this research is to understand better mental health in preschool children so that interventions that correlate with good development can be studied. The results in this essay are a part of a bigger project with this exact aim. This study’s aim is to look at how the pattern of interaction and engagement correlates to different externalizing problems over a three-year period.
2 Methods

2.1 The study

This study uses data from a prior prospective longitudinal study, where data collection took place from 2012-2014. Here we use data from the first and last year of that data collection (4, 37).

2.2 Procedure

Data had been collected from 2012-2014. Preschools in a stratified sample of different sized Swedish towns, representing large (>200,000 inhabitants), middle sized (50,000 – 200,000 inhabitants) and small towns (<50,000 inhabitants), were invited to engage in the study. The goal was to get a representative sample with regard to number of children with a mother tongue other than Swedish and socio-economic circumstances. Preschool’s administrations were contacted, informed and asked for their approval to participate. Written and video recorded information was shared with management, teachers and parents. The preschool administrations addressed the preschool teachers (n=311) in 81 different preschool classes in six different towns. In order for a preschool class to participate, at least one preschool teacher had to give their approval. Then preschool teachers asked all parents (n=3032) for individual consent. Both parents had to give their written permission for their child’s participation. Preschool teachers with professional knowledge of the child then answered questionnaires three times, once every year. Each teacher rated an average of two children and was required to have known the child for at least six months. Answers were based on their knowledge of the child, covering a period of at least the two preceding weeks (37) (4).

2.3 Instruments

The strength and difficulties questionnaire (SDQ)

Strengths and Difficulties questionnaire (SDQ) is a 25-item, well-known screening instrument for assessing children and adolescents’ behaviors which might be indicators for mental health problems. The 25 items are divided into the following five subscales with five items each: emotional symptoms, conduct problems, hyperactivity, peer problems and prosocial behavior. Each item is scored on a three-point Likert scale: 0 = “not true”, 1 =” somewhat true”, 2 =” certainly true” (except for questions 7, 11, 14, 21, 25 which are scored in reverse). Each total subscale score ranges from 0 to 10, higher scores from the first four subscales reflect difficulties, but higher scores on the prosocial subscale reflect strength. The first four subscales are then summarized, all except the prosocial subscale (94) (4, 95). SDQ has been proven useful via parent or teacher ratings for 4 to 16 years old, or by self-report for 11 to 16 years old. Using data from the first wave of this longitudinal study, Gustafsson et al.,2017 showed that preschool teachers could use SDQ in a preschool setting as a valid instrument to identify early signs of behavioral problems in children younger than 5 years old. In children 1- 4 years old, the subscales hyperactivity and conduct problems worked well. In children 4-5 years old, all the four original SDQ problem subscale proved to be useful (4). The five hyperactivity items were; “Restless, overactive, cannot stay still for long”, “Constantly fidgeting or squirming”, “Easily distracted, concentration wanders”,...
“Can stop and think things out before acting” and “Sees tasks through to the end, good attention span”. The five conduct problems items were; “Often has temper tantrums or hot tempers”, “Generally obedient, usually does what adults request”, “Often fights with other children or bullies them”, “Often argumentative with adults” and “Can be spiteful to others”.

*Children’s Engagement questionnaire (CEQ)*

To evaluate the children’s general engagement, the Child Engagement questionnaire was used. CEQ was originally developed in the US to evaluate how children typically spent their time at preschool (96). It is a 32-item questionnaire used to rate children’s global engagement by free recall impression as: 1) not at all typical, 2) somewhat typical, 3) typical or, 4) very typical. The CEQ which was used in this study was a translated Swedish version, with minor adaptions from a 32-item questionnaire to a 29-item questionnaire.

*Social interactions in preschool*

To evaluate social interactions in preschool, an adapted version of the questionnaire *Interaction-your child your interaction* was used. This instrument consisted of 36-items. Responses were based on a 5-point Likert scale: 1) “seldom”, 2) “quite often”, 3) “50% of the time”, 4) “fairly often”, 5) “often”. This questionnaire covered social interactions between the child and the teacher (10 items), the child and other children (11 items), teacher responsiveness against the child (10 items), and the other children’s interaction/responsiveness with the child (5 items).

*International Classification of Functioning, Disability and Health; Children and Youth version (ICF-CY Code sets)*

7 questions from the ICF-CY were used to evaluate the children’s function with regard to bodily function, cognition and language. The answers were based on a 3-point Likert scale: 0 = “not true”, 1 =” somewhat true”, 2 =” certainly true”.

18
2.4 Participants

In the first year, 1,615 children were invited to participate. Parents of 663 (41.6%) gave their approval. Of these, preschool teachers completed the SDQ for 651 (40%) children. In this study we used data from the first and the last year, and only children who participated in both these years data collection and had gotten a final evaluation from all questionnaires were included. That final sample consisted of 190 (11.7%) children, 106 (56%) boys and 84 (44%) girls. Mean age in the first year was 32.42 months (SD = 8.8, range = 15–57) or 2.7 years. Mean age in the last year was 55.22 months (SD = 8.57, range = 36–71) or 4.6 years. Demographic data for the first year can be seen in table 2 and for the last year in table 3.

2.5 Evaluating different behavioral pattern

Children who were included in the data analysis were divided into groups based to their behavioral pattern. In this study their behavior was evaluated based on the preschool teacher version of the SDQ. Like previously stated, hyperactivity and conduct problems are the main problems we can detect in this age group, so in this study we used those subscales to evaluate the children. The cut-of we used was in line with Goodman’s cut-of points (95), so children who scored 5 points or less on each of the scales were regarded as normal, children who scored 6 points on each of the scale were regarded as borderline hyperactive and/or borderline conduct problems and children who scored 7 points or higher were regarded as pathologically hyperactive and/or with conduct problems. To make calculations more simple, borderline children were assigned with pathological children. Based on this, four groups were formed; 1) N = Normal, 2) H = Hyperactivity no conduct problems, 3) C = Conduct problems no hyperactivity, 4) B = Both hyperactivity and conduct problems. In the first year, group sizes were; N = 128 (67.5%), H = 9 (4.7%), C = 39 (20.5%) and B = 14 (7.3%). In the last year, group sizes were; N = 143 (75.3%), H = 12 (6.3%), C = 21 (11%) and B = 14 (7.3%). Group sizes can be seen in Figure 1. The group’s mean scores from the first and last year on the SDQ hyperactive and conduct problem subscales can be seen in table 4. SDQ prosocial scale and peer problems scale were also used to compare the groups.

2.6 Statistical analysis

All Data was analyzed using SPSS version 21.

Histograms, Shapiro Wilk- and homogeneity of variance test were used to investigate data distribution in the sample and showed normally distributed values. An alpha level of 0.05 was used for all analysis.

Chi square test was used to compare demographic variables between groups. The demographic variables were age, sex, whether children spoke Swedish or not, who they were living with and the size of town their preschool was in. In the first year, age was categorized as 15-25 months, 25-35 months, 35-45 months and 45-57 months and in the last year it was categorized as 36-48 months, 48-60 months and 60-71 months. Fisher exact test was used when more than 20 % of the cells had expected count
less than 5. When demographic variables were missing for the participating children, the proportion was calculated using total sample of those children who had existing data.

One-way ANOVA was performed to compare the mean scores from the questionnaires between groups. Results were reported with means and standard deviation. The independent variables for the ANOVA test represented the four groups: 1) N = normal; 2) H = Hyperactive no conduct problems; 3) C = conduct problems no hyperactivity; and 4) B = both. The dependent variable were the mean scores from the questionnaires.

Post hoc comparisons were used to determine which pairs of the four group means differed. For the variables that met assumption of homogeneity of variance, a post hoc tukey’s test was carried out. When the homogeneity of variance was not met, Games-Howell test was used. The values which did not meet assumption on homogeneity of variance were in the first year; Prosocial scale and Child-other children, and in the last year; Child – other children, Child-teacher, Other children – child year.
3 Results

3.1 Group sizes

Figure 1 shows that all the groups stayed relatively stable in size, except for group C, which decreased in size between years.
3.2 Demographic data

Results from comparison of demographic variables between groups can be seen in table 2 for the first year and in table 3 for the last year.

Table 2. Comparison of demographic variables between groups in the first year.

<table>
<thead>
<tr>
<th>Demographic variables</th>
<th>N (N=128)</th>
<th>H (N=9)</th>
<th>C (N=39)</th>
<th>B (N=14)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age – months ↓</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-25</td>
<td>31(24.4)</td>
<td>2(22.2)</td>
<td>9(23.1)</td>
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<td>25-35</td>
<td>47(36.7)</td>
<td>6(66.7)</td>
<td>14(35.9)</td>
<td>7(50)</td>
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<td>35-45</td>
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<td>14(35.9)</td>
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<td>45-57</td>
<td>4(3.1)</td>
<td>1(11.1)</td>
<td>2(5.1)</td>
<td>1(7.1)</td>
</tr>
<tr>
<td><strong>Sex↑</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys</td>
<td>73(57)</td>
<td>5(55.6)</td>
<td>20(51.3)</td>
<td>8(57.1)</td>
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<td>Girls</td>
<td>55(43)</td>
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<td>19(48.7)</td>
<td>6(42.9)</td>
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<td><strong>Mother tongue other than Swedish↓</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>2(22.2)</td>
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<td>12(85.7)</td>
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<td><strong>Children in need of special support↓</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
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<td>3(2.5)</td>
<td>1(12.5)</td>
<td>1(2.6)</td>
<td>1(7.7)</td>
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<td>7(87.5)</td>
<td>38(97.4)</td>
<td>12(92.3)</td>
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<td><strong>Living with↓</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both parents</td>
<td>117(94.4)</td>
<td>7(87.5)</td>
<td>37(94.9)</td>
<td>14(100)</td>
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<td>Only Mother</td>
<td>5(4)</td>
<td>1(12.5)</td>
<td>2(5.1)</td>
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<td>Only father</td>
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<td>0(0)</td>
<td>0(0)</td>
<td>0(0)</td>
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<td>Shared living</td>
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<td>0(0)</td>
<td>0(0)</td>
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<td><strong>Municipality size↓</strong></td>
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<td>Small</td>
<td>21(16.4)</td>
<td>2(22.2)</td>
<td>13(33.3)</td>
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<td>Middle</td>
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</table>

All data is expressed as absolute frequency (percentage). Chi square test used ↓, Fisher exact test use ↑. Alpha level of 0.05 was used. *p<0.05. N = Normal, H = Hyperactivity no conduct problems, C = Conduct problems no hyperactivity, B = Both
### Table 3. Comparison of demographic variables between groups in the last year.

<table>
<thead>
<tr>
<th>Demographic variables</th>
<th>N (n=143)</th>
<th>H (n=12)</th>
<th>C (n=21)</th>
<th>B (n=14)</th>
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</thead>
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<td><strong>Age – months ↓</strong></td>
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<td>31(21.7)</td>
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<td>48-60</td>
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<td>60-71</td>
<td>48(33.6)</td>
<td>3(25)</td>
<td>6(28.6)</td>
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<td><strong>Gender↑</strong></td>
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<td></td>
</tr>
<tr>
<td>Boys</td>
<td>72(50.3)</td>
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<td>14(66.7)</td>
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<td>Girls</td>
<td>71(49.7)</td>
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<td>7(33.3)</td>
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<td><strong>Mother tongue other than Swedish↓</strong></td>
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</tr>
<tr>
<td>Yes</td>
<td>33(23.1)</td>
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<td>9(42.9)</td>
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<td>Both parents</td>
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<td>Shared living</td>
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</tbody>
</table>

All data is expressed as absolute frequency (percentage). ↑ Chi square test used, ↓ Fisher exact test use. Alpha level of 0.05 was used. *p<0.05. N = normal, H = Hyperactive no conduct problems, C = Conduct problems no hyperactivity, B = Both

In the first year, no significant differences of demographic variables between groups were found (Table 1). In the last year (Table 3), a significant difference between groups was found for gender ($x^2$(3) = 8.382, p = 0.005). A higher proportion of boys was seen in the H (66.7%), C (66.7%) and B (85.7%) groups compared to the N (50.3%) group. A significant difference between groups was also found for number of children in need of special support (P <0.001) in the last year (Table 3). The proportion of children who were in need of special support was highest in the H group (33.3%) and lowest in the N group (1.4%).
3.3 SDQ ratings: hyperactivity and conduct problems

Table 4. Teachers’ SDQ ratings on hyperactivity scale and conduct problem scale in the first and last year.

<table>
<thead>
<tr>
<th>SDQ</th>
<th>N (n=128)</th>
<th>H (n=9)</th>
<th>C (n=39)</th>
<th>B (n=14)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>0.39(0.31)</td>
<td>1.42(0.19)</td>
<td>0.62(0.33)</td>
<td>1.56(0.33)</td>
</tr>
<tr>
<td>Conduct problems</td>
<td>0.16(0.19)</td>
<td>0.39(0.28)</td>
<td>0.83(0.22)</td>
<td>1.27(0.38)</td>
</tr>
<tr>
<td><strong>Last year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>0.25(0.29)</td>
<td>1.41(0.27)</td>
<td>0.6(0.38)</td>
<td>1.41(0.27)</td>
</tr>
<tr>
<td>Conduct problems</td>
<td>0.08(0.14)</td>
<td>0.21(0.36)</td>
<td>0.92(0.32)</td>
<td>0.99(0.34)</td>
</tr>
</tbody>
</table>

All data is expressed as mean (standard deviation)
N = Normal, H = Hyperactivity no conduct problems, C = Conduct problems no hyperactivity, B = both

3.4 SDQ ratings: prosocial scale and peer problems scale

The results from one-way ANOVA for teachers’ SDQ ratings on the prosocial– and peer problems subscales were significant for the prosocial scale in both the first and the last year but were only significant for the peer problems scale in the last year (Table 5). Post hoc comparison indicated that N group received the highest ratings on the prosocial scale both in the first and last year. The H group was the only group to receive higher ratings than the N group on the peer problems scale in the last year.

Table 5. Teachers’ SDQ ratings on prosocial scale and peer problems scale in the first and last year and comparison statistics.

<table>
<thead>
<tr>
<th>SDQ</th>
<th>N (n=128)</th>
<th>H (n=9)</th>
<th>C (n=39)</th>
<th>B (n=14)</th>
<th>F-rat, P</th>
<th>Post Hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer problem scale</td>
<td>0.33(0.37)</td>
<td>0.28(0.25)</td>
<td>0.44(0.41)</td>
<td>0.54(0.45)</td>
<td>25.84</td>
<td>ns</td>
</tr>
<tr>
<td>Prosocial scale</td>
<td>1.35(0.46)</td>
<td>0.84(0.4)</td>
<td>1.04(0.32)</td>
<td>0.72(0.44)</td>
<td>25.84***</td>
<td>H, C, B&lt;N</td>
</tr>
<tr>
<td><strong>Last year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer problem scale†</td>
<td>0.119(0.2)</td>
<td>0.44(0.32)</td>
<td>0.3(0.41)</td>
<td>0.275(0.28)</td>
<td>24.8**</td>
<td>N&lt;H</td>
</tr>
<tr>
<td>Prosocial scale†</td>
<td>1.67(0.36)</td>
<td>1.28(0.41)</td>
<td>1.38(0.31)</td>
<td>1.107(0.28)</td>
<td>16.9***</td>
<td>B, H, C&lt;N</td>
</tr>
</tbody>
</table>

All data is expressed as mean (standard deviation)
*p <.05, **p<.01, ***p<.001
N = Normal, H = Hyperactivity no conduct problems, C = Conduct problems no hyperactivity, B = both
Games Howell=⊥, Tukey =†
3.5 Interaction questionnaire

The results of one-way ANOVA for teachers’ ratings on the children’s interaction questionnaire were significant for all subscales, except for the person–child subscale, in both the first and the last year (Table 6). Post hoc comparison indicated that in both the first and the last year, the H group scored lower than the N group on all significant subscales. On subscales about the child’s interaction with other children and teachers, the H group got lower scores than the C group in both the first and last year, and the B group got lower scores than the N group in the last year. The C group got lower ratings than the N group on the child-other children subscale in the last year.

Table 6. Teachers’ ratings on interaction subscales in the first and last year and comparison statistics.

<table>
<thead>
<tr>
<th>Interaction</th>
<th>N (n=128)</th>
<th>H (n=9)</th>
<th>C (n=39)</th>
<th>B (n=14)</th>
<th>Frat, P</th>
<th>Post hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child-Person↓</td>
<td>4.065(0.63)</td>
<td>3.31(0.53)</td>
<td>4.05(0.52)</td>
<td>3.82(0.59)</td>
<td>4.4**</td>
<td>H&lt;N, H&lt;C</td>
</tr>
<tr>
<td>Child-Other children⊥</td>
<td>3.924(0.88)</td>
<td>3.1(0.56)</td>
<td>3.7786(0.61)</td>
<td>3.56(0.75)</td>
<td>27.2**</td>
<td>H&lt;N, H&lt;C</td>
</tr>
<tr>
<td>Other children–Child↑</td>
<td>3.957(0.96)</td>
<td>3.11(0.79)</td>
<td>3.7590(0.72)</td>
<td>3.4143(1.05)</td>
<td>3.7*</td>
<td>H&lt;N</td>
</tr>
<tr>
<td>Person–Child</td>
<td>4.58(0.33)</td>
<td>4.37(0.44)</td>
<td>4.55(0.25)</td>
<td>4.55(0.25)</td>
<td>1.357</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Last year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child-Person⊥</td>
<td>4.39(0.38)</td>
<td>3.39(0.68)</td>
<td>4.07(0.64)</td>
<td>3.9(0.5)</td>
<td>23.5***</td>
<td>H, B&lt;N, H&lt;C</td>
</tr>
<tr>
<td>Child–Other children⊥</td>
<td>4.52(0.45)</td>
<td>3.3(0.84)</td>
<td>4.12(0.6)</td>
<td>3.64(0.61)</td>
<td>31.5***</td>
<td>H, C, B&lt;N, H&lt;C</td>
</tr>
<tr>
<td>Other children–Child⊥</td>
<td>4.63(0.5)</td>
<td>3.57(1.04)</td>
<td>4.29(0.7)</td>
<td>4.16(0.63)</td>
<td>15.4***</td>
<td>H&lt;N</td>
</tr>
<tr>
<td>Person–Child</td>
<td>4.67(0.24)</td>
<td>4.42(0.29)</td>
<td>4.54(0.29)</td>
<td>4.38(0.1)</td>
<td>8.97</td>
<td>ns</td>
</tr>
</tbody>
</table>

All data is expressed as mean (standard deviation)
*p <.05, **p<.01, ***p<.001
N = Normal, H = Hyperactivity no conduct problem, C = Conduct problems no hyperactivity, B = both
Games Howell⊥, Tukey =↑
3.6 Children’s engagement questionnaire (CEQ)

The results of one-way ANOVA for teachers’ ratings on the children’s engagement questionnaire were significant both in the first and last year (Table 7). Post hoc comparison indicated that the H group received lower scores than the B and N group in both the first and last year. In the last year, the H group also received lower scores than the C group.

Table 7. Teachers’ ratings on CEQ in the first and last year and comparison statistics.

<table>
<thead>
<tr>
<th>CEQ</th>
<th>N(n=128)</th>
<th>H (n=9)</th>
<th>C (n=39)</th>
<th>B (n=14)</th>
<th>Frat, P</th>
<th>Post hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engagement†</td>
<td>3.09(0.6)</td>
<td>2.47(0.6)</td>
<td>3.0(0.51)</td>
<td>3.2(0.6)</td>
<td>3.6∗</td>
<td>H &lt; B, N</td>
</tr>
<tr>
<td><strong>Last year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engagement†</td>
<td>3.63(0.4)</td>
<td>2.83(0.65)</td>
<td>3.39(0.53)</td>
<td>3.39(0.56)</td>
<td>13.5∗∗∗</td>
<td>H &lt; B, N</td>
</tr>
</tbody>
</table>

All data is expressed as mean (standard deviation)
∗p < .05, **p < .01, ***p < .001
N = Normal, H = Hyperactivity no conduct problems, C = Conduct problems no hyperactivity, B = both
Games Howell = ⊥, Tukey = †

3.7 Children’s function (ICF-CY)

The results of one-way ANOVA for teachers’ ratings on the ICF-CY questionnaire were significant in both the first and last year (Table 8). Post hoc comparison indicated that in in both years, the H group received lower ratings than the N group and in the last year, they also received lower ratings than the C group. The B group also obtained lower ratings than the N group in the last year.

Table 8. Teachers’ ratings on ICF-CY questionnaire in the first and last year and comparison statistics.

<table>
<thead>
<tr>
<th>ICF-CY</th>
<th>N(n=128)</th>
<th>H (n=9)</th>
<th>C (n=39)</th>
<th>B(n=14)</th>
<th>Frat, P</th>
<th>Post hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function †</td>
<td>2.6367(0.35)</td>
<td>2.3015(0.38)</td>
<td>2.5495(0.31)</td>
<td>2.602(0.40)</td>
<td>2.9∗</td>
<td>H &lt; N</td>
</tr>
<tr>
<td><strong>Last year</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function ⊥</td>
<td>2.9(0.19)</td>
<td>2.48(0.39)</td>
<td>2.86(0.17)</td>
<td>2.62(0.29)</td>
<td>22.2∗∗∗</td>
<td>H, B &lt; N</td>
</tr>
</tbody>
</table>

All data is expressed as mean (standard deviation)
∗p < .05, **p < .01, ***p < .001
N = Normal, H = Hyperactivity no conduct problems, C = Conduct problems no hyperactivity, B = both
Games Howell = ⊥, Tukey = †
4 Discussion

4.1 Summary

The aim of this study was to look at how the pattern of a child’s interaction and engagement in preschool settings, correlated to different externalizing problems over a three-year period. Data from this study came from a previous prospective longitudinal study. Here, data from the first and last year was used. 190 children from a Swedish preschool sample were included, 106 (40%) boys and 84 (44%) girls. The participating children were divided into four groups based on their behavioral pattern, evaluated according to the preschool teacher version of the SDQ. The groups were; N = normal, H = hyperactivity no conduct problems, C = conduct problems no hyperactivity and B = both hyperactivity and conduct problems. The H group stayed stable in size between years, while the C group decreased. Preschool teachers answered questionnaires about the children, and the scores were then compared between groups. Post hoc tests indicated that the H group scored significantly lower than the N group on all significant subscales on the interaction questionnaire and on the CEQ in both the first and the last year. The H group also rated lower than the C group on interaction subscales regarding the child’s interaction with other children and teachers. In the last year, the H group scored lower than the C group on the CEQ and the ICF-CY. The B group scored unexpectedly higher than the H group on the CEQ in the first and the last year. In the last year the B group scored lower than the N group on the CEQ, ICF-CY and the interaction subscales regarding the child’s interaction with teachers and other children.

4.2 Interpretation

When looking over these results there are some notable patterns which can be seen and stay similar between the first and the last year. For example, the hyperactive group had the lowest scores regarding engagement and interaction for the duration of the study. The conduct problem group seemed to do better in both of these areas and did unexpectedly not show any peer problems like the hyperactive group. Compared to previously mentioned studies which have shown that children with conduct problems are likely to display aggressive behavior towards their peers and teachers and tend to be less liked and experience peer problems just like hyperactive children, our results might in some way come as a surprise (83, 84). This difference might be attributed, apart from different screening tools, to the young age of the children in our sample. Other studies exist comparing hyperactivity and aggressive behavior in such young children, which have shown similar differences between those groups when it comes to interaction (97). This might indicate that although aggressive behavior can intervene with the child’s social interaction, in such early childhood this behavior is more normative and accepted by peers compared to hyperactive behavior. Some studies have concluded that the negative correlation expected to be seen between aggression and prosocial behavior increases gradually over the childhood years (98). In our results the conduct problem group begins to receive lower scores than the normal group on child’s interaction to other children subscale in the last year. This might be interpreted as children who are still showing this behavior in later years of preschool begin to experience more problems as this form of socialisation gets less acceptable with increasing age, and when they reach primary school, their problems might escalate even further (84). Regarding the differences between groups when it
came to their engagement, these results were consistent with the previously mentioned study by Searle et al., 2013 where they found that hyperactivity in preschool had a strong negative impact on the amount of time the child stayed actively engaged later on in 1st grade, but conduct problems did not (93). Because engagement is an important factor in the process of learning, our results support other previously mentioned studies where conduct problems in preschool children have not been linked to learning problems unlike young hyperactivity (46, 47). These difficulties seen among the hyperactive children indicate the importance of having a certain level of self-regulation skills when it comes to interaction and engagement. It seems that children who can focus their attention and stay in activities long enough will exhibit more engagement and interaction compared to children who can't. The hyperactive group was also the only group to score lower than the normal group on the ICF questionnaire in the first year, and in the last year they were also lower than the conduct problem group. This difference between hyperactive and conduct problems was also seen in the previously mentioned study by Gadow et al., 2002, described as developmental deficits (41). Furthermore, when comparing demographic variables between groups, the hyperactive group had the highest proportion of children in need of special support compared to the other groups in the last year. With all this taken into account, our results might support the previously mentioned hypothesis, that hyperactivity in such early childhood is more of a functional impairment, while conduct problems might emerge more as a result of possible negative environmental influences (47). However, we cannot exclude the possibility that children already displaying clinically serious aggression or defiant behavior in such early childhood might be showing signs of early conduct- or oppositional defiant disorders. Those kinds of problems could possibly have a greater negative effect on these children’s interactions and engagement than normal conduct problems do. More research on possible identification of this subgroup in the preschool sample is needed.

The results for the B group were in some way similar to previously mentioned studies although, with regard to the literature of poorer outcomes for children with comorbid disorders, their overall severity was expected to be higher (27, 41). This group received lower scores than the normal group on the ICF questionnaire in the last year, but this was also found in the previously mentioned study by Gadow et., al 2002 (41). They also obtained lower scores than the normal group on prosocial scale, as was to be expected, and in the third year they were lower than the normal group on the child’s interaction with other children and teachers subscales. The reason this group did not show more severity, mainly in the first year, might be because of the cut point we chose. This group had considerably more children defined as “borderline” compared to the other groups so the possibility that our results are skewed because of normal development rather than real problems cannot be excluded.

What needs to be highlighted in closing are the patterns which can be seen in the development of the hyperactive group and the conduct problem group. The hyperactive group exhibits worse engagement and interaction over the course of the study and stays stable in size, while the conduct problem group has better interactions and engagement and decreases in size. These results highlight the well-studied importance of interaction and engagement in children’s mental health development. Although the lack of self-inhibition and self-regulation in hyperactive children is likely to cause them to stay less engaged, peer problems and being left out can also contribute to an even harder time for these children when
trying to participate. Constant negative social experience will also discourage the child with time and lead to it showing less interest in taking a part in play with other children, resulting in a spiral of negative development. More studies on interventions focusing on how to enhance these children’s interactions and engagement are needed. Such interventions would be likely to affect their self-regulation and influence these children's mental health and wellbeing.

4.3 Limitations

This study has some limitations; a rather high fraction of parents did not give their approval for their child’s participation and the possibility of different behavioral pattern and characteristics among these children who were not included cannot be ignored. Demographic variables which were expected to show association to the child’s mental health did not show any significant correlation. This might be attributed to not enough children being included in the data longitudinally. Another limitation was that only preschool teachers rated the children, instead of also including the parents. Possibilities on including the children’s opinions and answers in future research should also be considered.

4.4 Conclusion

Children with hyperactivity seem to have considerable problems when it comes to interaction and engagement in preschool settings. Engaged, interacting children are more likely to function better over time. Studies on interventions focusing on positive interactions and enhanced engagement are needed.
5 References


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