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AUDITORY HALLUCINATIONS IN YOUTH

Occurrence, clinical significance and intervention strategies

Kim van Slobbe-Maijer

Part of the research described in this thesis was performed at the Department of Psychiatry, University Medical Center Utrecht & Brain Center Rudolph Magnus, Utrecht, the Netherlands

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Occurrence, clinical significance and intervention strategies

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TABLE OF CONTENTS

Chapter 1	General introduction	7
Chapter 2	Auditory hallucinations across the lifespan: a systematic review and meta-analysis	15
Chapter 3	Children seeking help for auditory verbal hallucinations: who are they?	31
Chapter 4	Clinical significance of auditory hallucinations in youth: comparison between a general population and a help-seeking sample	49
Chapter 5	Hallucinations in children and adolescents: an updated review and practical recommendations for clinicians	59
Chapter 6	Stronger Than Your Voices: a cognitive behavioral therapy for youth suffering from auditory verbal hallucinations	85
Chapter 7	Summary and general discussion	99
Addendum	References	110
	Nederlandse samenvatting	124
	Curruculum Vitae	130
	Publications and Presentations	132
	Dankwoord	135

Chapter 1

General introduction

AT THE EXTREME END OF THE SPECTRUM…

She was about 14 years of age, referred to our first psychosis ward as she suffered from hallucinations. More specifically, she saw and heard a man that commanded her to commit suicide by throwing herself in front of a train. Although she knew the man was not real, it was almost impossible for her to ignore his comments and assignments, so she often ended up alongside the tracks. The referring psychiatrist and her family asked for our expertise to distinguish whether she suffered from a psychotic disorder or not. Although we had not seen any more signs indicative of psychosis, we were struck by her distress and wanted to understand what was happening to her. However, she claimed to be suffering even more due to intense homesickness and wanted to return home. Although her family and we preferred to continue her admittance, during her stay there were not enough legal grounds to keep her against her will. It was only a few weeks later her psychiatrist informed us that she had committed suicide.

This was my first encounter with an adolescent that primarily suffered from hallucinations. Off course, I understood that this was even a tragic as exceptional case, but it did make me curious to learn more about voice hearing in youth. For example, how often do auditory hallucinations occur in youth, do all children and adolescents suffer from their hallucinations and could we offer not more than merely determining whether they were part of a psychotic disorder or not?

Integrating clinical work with research and vice versa

Auditory hallucinations (AH) are known to occur all over the world and to be experienced from childhood to old age, both males and females. Many researchers are intrigued by this phenomenon and studies regarding auditory hallucinations have been accumulating rapidly. This is in line with the increasing awareness that a symptom-based approach may offer new insights in unraveling psychopathology[1]. Despite all these studies on auditory hallucinations in both adult and young populations, the results have had little impact on the improvement of care, especially for youth[2]. Only few articles provided directions on how to assess children with stressful AH[3-5]. During my residency, it appeared to me that clinicians do not have the tendency to actively ask about hallucinations. Or, when AH are put forward by a patient, clinicians merely screen for the presence of any more symptoms to understand whether they might be part of a psychotic disorder or not. I came to think that this might be due to a lack of knowledge and/or confidence to further address hallucinations[6]. Nevertheless, children and adolescents with distressing hallucinations do engage mental health care facilities and we are obliged to provide them with the best care possible[7].

Therefore, in March 2013, we started an outpatient clinic at the UMC Utrecht Brain Center for youth with auditory hallucinations, specifically hearing voices. We used several forms of media to create awareness of voice hearing in youth and the opportunity to visit the outpatient clinic. Also, we implemented a longitudinal study so that we could follow up on the families that entered the outpatient clinic. We included entire families to learn which factors (e.g. perinatal problems, parenting styles, personality traits, drug abuse or trauma) might have contributed to the development, persistence and/or remission of AH on the one hand and to unravel resilience factors from siblings that would not develop AH on the other. Although the outpatient clinic was well visited and appreciated, only a minority of the families opted to participate in research and to enter the longitudinal study. Unfortunately, after three years, we had to abort the study for lack of power.

In the past years we undertook collaborations with clinicians and researchers in the Netherlands and abroad. With these colleagues we developed assessment and treatment strategies and completed several research projects. The work presented in this thesis aims to contribute to scientific insights on AH in youth and also (and perhaps more importantly) to clinical care for this vulnerable group.

Auditory hallucinations in youth

Definitions

Auditory hallucinations can be defined as auditory perceptions in the absence of identifiable stimuli. Often, an exception is made for perceptions during drowsiness or sleep. While AH includes all kind of auditory perceptions, auditory verbal hallucinations (AVH) specifically refer to hearing one or more voices.

Next to delusions, hallucinations were traditionally considered psychotic symptoms, indicative of psychotic spectrum disorders. However, as in adults, we have come to understand that (auditory) hallucinations and delusions in youth are not restricted to psychotic spectrum disorders, but can also occur in the presence of anxiety, mood and behavioral disorders[8]. Hence the term psychotic(-like) experiences (PE). PE are also found to occur in otherwise healthy individuals. Nevertheless, non-psychotic and psychotic individuals with more frequent AH do share risk factors such as childhood trauma[9] as well as characteristics such as disorganized speech[10], indicative of a shared vulnerability. Moreover, hallucinations and delusions are found not to be restricted to psychotic spectrum disorders, but to be associated with a broad range of psychiatric (and somatic) disorders. Therefore, auditory hallucinations and other PE are increasingly conceptualized to occur on a continuum; from healthy individuals at one end to patients with a broad variety of psychopathology at the other end[4, 11-14].

Epidemiology

Children and adolescents are known to experience auditory hallucinations from young ages[4] and are included in studies from the age of 5[15, 16]. Most epidemiological studies point to a frequent occurrence of AH in youth. However, as in adult studies, prevalence estimates vary widely (2-37.5% [15, 17]).

Auditory hallucinations are presumed to be mostly sporadic and to generally disappear over time spontaneously. AH persistence rates vary from 27% for a 2-year follow-up (from age 13/14 to age 15/16)[18], 24% for a 5-year follow-up (age 7/8 to 12/13 years)[19], 18.9% for a 6-years follow-up (age 12/12 to 18/19 years)[20] and 6.2% for an 11-year follow-up (age 7/8 to 18/19 years)[20]. Overall, auditory hallucinations in youth are transient in up to 95% of cases[20, 21].

Clinical relevance of auditory hallucinations

Although the transient character of auditory hallucinations might point to a possibly typical developmental nature, AH should not be regarded as merely a benign phenomenon.

The presence of hallucinations is associated with greater impairment across a range of functional domains. Young people with hallucinations have been found to demonstrate poorer global functioning than their peers, even when compared with other young people with a mental disorder (but without hallucinations)[22, 23]. Children and adolescents who report persistent hallucinations demonstrate poorer functioning in terms of cognitive performance as they have significantly worse primary school test scores and are at lower secondary school levels compared to peers with remitted AH[19].

Moreover, even in a young (7/8 year olds) and non-clinical setting, 15% of children were found to suffer from their AH and experienced comorbid problem behavior[24]. Also, the presence of AH in childhood increases the risk of developing psychopathology later in life. For example, they have a threefold increased risk to develop a depressive disorder[25] and a 5 to 16 times increased risk to develop a schizophrenia-spectrum disorder, depending on number and severity of psychotic symptoms[26]. Furthermore, persistence of AH is associated with the development of delusional ideation and with the risk of developing more general psychopathology[18], particularly post-traumatic stress disorder (PTSD)[20]. Although rare at young age, AH can be a symptom of childhood onset schizophrenia (first psychotic episode before the age of 12 years), often accompanied by a high rate of hallucinations in all domains[27]. With increasing age, AH are more indicative of present psychopathology[28]. Nevertheless, even at young age, a wide range of other psychiatric disorders such as mood disorder, attention deficit hyperactivity disorder (ADHD) and PTSD are found to accompany AH in both epidemiologic and clinical samples[14, 20, 28, 29].

Also, the presence of AH proved to be a strong marker for the presence of multiple co-occurring Diagnostic and Statistical Manual of Mental Disorders, 4th edition[30] (DSM-IV) diagnoses[28, 31].

Like in adults, AH in youth can also occur in the context of a somatic disorder, ranging from neurological (e.g. migraine, aura's or seizures) to genetic, autoimmune and metabolic disorders[4, 5].

Diagnostic and treatment strategies

Although the few studies providing guidelines for clinicians seem to lack data derived pointers, the overall message with regard to the assessment and treatment of AH seems to be one of 'good clinical practice'. This means that a clinician should thoroughly assess the context in which AH exist, in order to unravel possible underlying causative factors and/or co-occurring health problems. In case of present causative factors and/or other health problems, treatment should target these first. In the absence of pathological signs, caregivers are advised to normalize and destigmatize these phenomena. However, guidance how to specifically assess AH and, subsequently, what educational information should be shared, is lacking and thus depends on the caregivers' experience and knowledge.

Moreover, the 2014 International Consortium on Hallucination Research (ICHR) working group emphasizes the urgent need for psychotherapeutic interventions specifically developed for children[4]. In accordance with the proven effectiveness of tailored Cognitive Behavior Therapy (CBT) for voice hearing adults[32], a similar approach has been suggested to be an effective strategy for the treatment of psychotic symptoms in children and adolescents[33]. However, a targeted treatment protocol had not yet been developed.

When AH are present in the context of a confirmed psychotic disorder, treatment with antipsychotic medication is recommended[34]. Antipsychotics have proven to be highly effective in reducing severity of (positive) psychotic symptoms in youth with schizophrenia-spectrum disorders[35]. Nevertheless, youngsters are also more vulnerable than adults to the adverse effects, such as extrapyramidal signs (specifically Parkinsonism and dystonia), hormonal dysregulation (hyperprolactinemia), somnolence (interfering (social) functioning and cognitive performances at school), and weight gain and consequent metabolic effects[36]. These side effects may also lead to premature (and sometimes undisclosed) discontinuation of medication. Therefore, young patients and their parents should always be actively included in a risk-benefit analysis when choosing an antipsychotic.

Outline

For both research purposes and for clinical and societal educational aims, it is indispensable to have more exact insight in the prevalence of AH. In **chapter 2**, we reviewed youth and adult general population studies on the prevalence of auditory hallucinations. We combined all findings in a meta-analysis to calculate the mean lifetime prevalence and grouped mean prevalence across the lifespan; children, adolescents, adults and the elderly.

Epidemiological and clinical studies on AH in youth so far used active screening methods to identify children and adolescents with AH. These studies do not inform clinicians very well about the features of the children and adolescents needing and/or seeking help for AH. In **chapter 3** we describe the characteristics of children and adolescents seeking help for AH at our outpatient clinic. This was a naturalistic study. We provide both insight in the morbidity of these youngsters and pointers for diagnostic and treatment strategies.

Despite the transient character of AH, a subgroup of children and adolescents with AH do warrant clinical care. To identify these children and adolescents at the earliest stage possible and offer interventions timely[37], it is important to understand the extent of children and adolescents with AH in the general population that might actually be in need of clinical care. In **chapter 4** we estimate which proportion of young adolescents (12/13 year olds) with AH in the general population might be in need for clinical care. To identify this subgroup, we compared characteristics of our help seeking sample (see chapter 3) with the characteristics of a previously described general population sample[19, 20, 24]. Next, we explored whether this 'need for care' subgroup could have been identified at earlier age (at age 7/8 years), and how they functioned retrospectively (again at age 7/8 years) and prospectively (at age 18/19 years).

In 2014, Jardri and colleagues[4] published a review, synthesizing research results on childhood and adolescent hallucinations, as part of the ICHR working group. In 2017, a renewed ICHR working group was brought together, resulting in an updated review in **chapter 5**. In this updated review, the need for consensus definitions regarding the onset and persistence of hallucinations, new insights regarding etiology and clinical relevance, methods to assess hallucinations in children and adolescents and therapeutic strategies are discussed. For clinicians, a more tailored care model, based on the current knowledge, is outlined.

In **chapter 6** we present the feasibility study of the Stronger Than Your Voices (STYV) treatment protocol. STYV is a symptom-based psychotherapy for children and

adolescents suffering from AVH. The intervention was developed at our outpatient clinic in close collaboration with the Dutch 'Gedachten Uitpluizen Foundation' (www.gedachtenuitpluizen.nl). In a second stage, we trained caregivers from different mental health care facilities across the Netherlands to work with this protocol. In return, we received anonymized pre- and post-measures from patients and feedback from both patients and caregivers regarding their experience with the protocol.

Chapter 2

Auditory hallucinations across the lifespan: a systematic review and meta-analysis

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ABSTRACT

Background: Auditory Hallucinations (AH) are nowadays regarded as symptoms following a continuum; from a (transient) phenomenon in healthy individuals on one end to a symptom of (psychiatric) illnesses at the other. An accumulating number of epidemiological studies focused on the prevalence of AH in the general population, but results vary widely. The current meta-analysis aims to synthesize existing evidence on lifetime prevalence of AH across the lifespan.

Methods: We conducted a quantitative review and meta-analysis according to PRISMA guidelines. Studies were combined to calculate a mean lifetime general population AH prevalence rate. Moreover, prevalences were calculated for four age groups: children (5-12 years), adolescents (13-17 years), adults (18-60 years) and elderly (≥60 years).

Results: We retrieved 25 study samples including 84 711 participants. Mean lifetime prevalence rate of AH was 9.6% (95%CI: 6.7%-13.6%). The mean lifetime prevalence was similar in children (12.7%) and adolescents (12.4%), but these two groups differed significantly from the adults (5.8%) and the elderly (4.5%). Significant heterogeneity indicated that there is still dispersion in true prevalence rates between studies, even within the different age categories.

Conclusions: Current meta-analysis shows that AH are quite common (up to one in ten individuals) in the general population during lifetime, with children and adolescents reporting these experiences significantly more often compared to adults and elderly. Large follow-up studies on the longitudinal course of AH are needed to reveal associated risk and resilience factors.

INTRODUCTION

The psychotic experiences that characterize schizophrenia spectrum disorders have previously been described in terms of a psychosis continuum, ranging from benign and/or transient experiences in non-clinical individuals on one end, to psychotic symptoms in patients on the other end[11, 38]. Therefore, the meaning of psychotic experiences goes beyond psychopathology. Research has indeed shown that well-functioning individuals with frequent psychotic experiences share a wide range of risk factors with clinical patients with psychosis, including developmental and environmental factors[9, 39]. In turn, presence of psychotic experiences is suggested to be an important risk marker for early psychopathology, as young people with hallucinatory and/or delusional experiences report higher rates of non-psychotic symptomatology, including symptoms of depression[28], suicide attempts[40] and higher levels of thought disorder[10]. Moreover, well-functioning individuals with frequent non-clinical psychotic experiences also show vulnerability factors including high rates of childhood trauma, reduced brain volume and lower cognitive performance[10, 39, 41, 42] similar to, but to a lesser degree than patients with a psychotic disorder.

Van Os and colleagues conducted a meta-analysis in 2009 to investigate the prevalence of psychotic symptoms in the general population, comprising hallucinations and delusions. They reported a median prevalence of 5.3%, which was mainly based on studies in adults[12]. An update in 2013 by Linscott and van Os[13] included additional studies on children and adolescents, showing a prevalence rate of 7.2%. Importantly, general psychotic experiences were found to be more common among younger individuals. Kelleher and colleagues[43] showed a higher median prevalence of 17% in children (9-12 years) compared with 7.5% in adolescents (13-18 years). A systematic review on the longitudinal course of general hallucinatory experiences during childhood and adolescence reported that discontinuation of hallucinatory experiences occurred in approximately 75% of the cases (person–year discontinuation 3% to 40.7%)[21]. It has therefore been suggested that, while psychotic symptoms may be more commonly experienced during typical development as a child[12], these experiences become less frequent and increasingly indicative of pathology with advancing age[28].

Next to the prevalence of general psychotic experiences, many epidemiological studies have specifically focused on the occurrence of auditory hallucinations (AH). The number of studies evaluating the frequency of AH of young and adult populations has been rapidly accumulating during the past years. However, prevalence rates are found to differ greatly between studies[1, 4, 14]. For example, Beavan et al. (2011) found rates varying between 0.6% to 84%, resulting in a median prevalence of 13.2% of AH in the general adult

population. The authors reported that comparisons between studies were problematic given the different methodologies used. Several factors may be responsible for this high variance, such as the period over which presence of auditory hallucinations is assessed (last week, last month, last year, or lifetime), the type of questionnaire used (e.g. self-rated v. interview-based, phrasing of questions), and age of the population studied. Following the high prevalence of psychotic experiences during childhood and adolescence, and the transient course of AH, it can be hypothesized that the prevalence of AH decreases after childhood.

To provide more insight in the occurrence of AH in the general population, aim of the current meta-analysis is to estimate the prevalence of AH across the lifespan by combining population-based samples, from childhood to old age. As age may be an important factor, the prevalence rates are also separately evaluated for different developmental groups: children, adolescents, adults and elderly.

METHODS

Search strategy

This quantitative review was conducted following the guidelines described in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (www.prisma-statement.org/ statement.htm)[44]. A systematic search for relevant studies published in English peer-reviewed journals was performed in Pubmed, EMBASE, PsychINFO. The search cut-off date was 31st January 2016. The following search terms were used: (prevalence OR prevalences OR prevalent OR epidemiology OR epidemiologic OR epidemiological) AND ("voice hearing" OR "hearing voices" OR "voice hearer" OR "AVH" OR "psychotic symptom" OR "psychotic symptoms" OR "psychotic experience" OR "psychotic experiences" OR "hallucination" OR "psychotic like" OR "psychosis like" OR "hallucinatory" OR "hallucinative" OR "hallucinatic" OR "hallucinoid"). In addition, review articles and eligible studies were examined for cross-references.

Eligibility criteria

To be eligible, the articles had to meet the following criteria:

1. Data were provided on the lifetime prevalence of auditory (verbal) hallucinations, or suggested that this information was available.

2. The included cohort was a general population sample.

Study selection and data collection

Two reviewers (L.C. and E.T.) independently examined titles and abstracts of all retrieved articles to select potential eligible articles. If consensus was not reached, a third reviewer (K.M.) was consulted. For every eligible article, the corresponding author was contacted by email to ask for original or complementary data, so we were able to recalculate prevalence rates for the different developmental age groups when necessary. In case multiple publications were retrieved that described the same cohort, only the sample with largest overall sample size and/or original data was included. When an article reported data on different cohorts, each cohort was regarded as a separate study sample.

Several decisions were made to optimise uniformity between studies:

1. As the majority of studies provided self-report data, this was preferred over interviewer-rated data when both were reported in the article.

2. When prevalence rates were separately reported for 'conscious' v. sleep and/or drug related AH, the first option was used.

3. The answering options 'certainly'/'definite'/'yes' were considered as positive for experiences of AH, while 'possible'/'probable'/'maybe' were considered as negative; this, in line with previous prevalence studies. Similarly, 'sometimes' and 'often/always' were both considered as positive for AH and therefore prevalence rates were summed when an article reported both options were separately.

In five study samples, the authors designed their own questionnaire to evaluate the experience of AH[15, 18, 45-47]. Four out of five screening questions were rather similar, specifically assessing AVH (Have you heard voices that other people cannot hear? Have you ever heard or are you currently hearing somebody's voice that no one around can hear? Have you ever heard voices other people cannot hear?), while the fifth evaluated auditory hallucinations in general (Do you have any noises in your ears or head?). These questionnaires were all grouped into one category termed 'designed by author'.

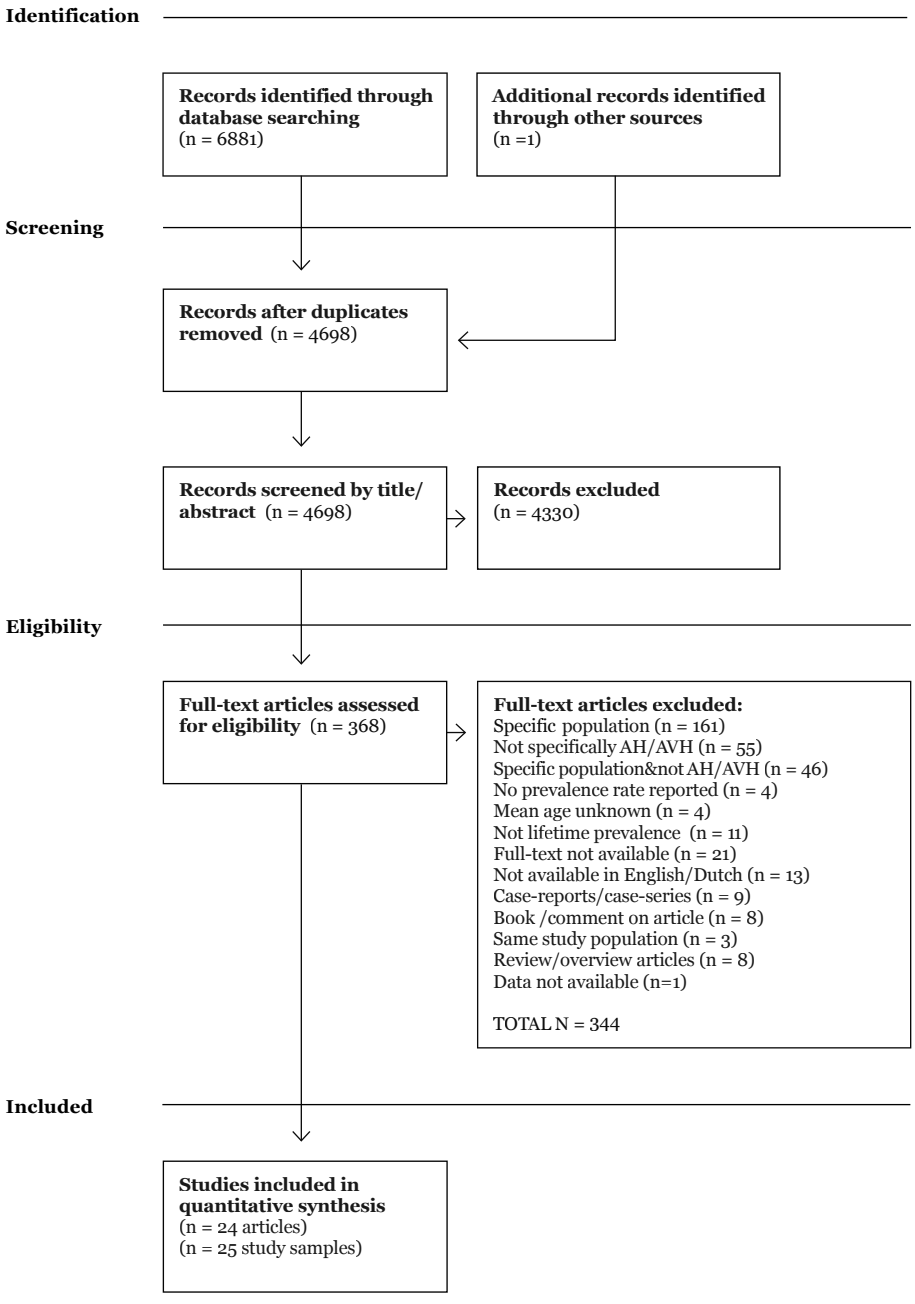
Data analysis

First, our aim was to calculate a weighed mean lifetime prevalence rate of AH in the general population. Therefore, we derived sample size and prevalence rate for each study sample. Second, we evaluated the specific prevalence rates within four different developmental age groups: children (≤12 years), adolescents (13-17 years), adults (18-60

years) and elderly (≥60 years)[28]. When the age range of an included cohort cut across the aforementioned developmental age ranges, original data were used to split the sample accordingly; sample size and prevalence rates were recalculated for each of the proposed age groups.

Studies were combined in meta-analysis to calculate a pooled estimate of general lifetime prevalence of AH in the general population. A random effects model was deemed most appropriate for this research area given the heterogeneity in applied methods[48]. In random-effects meta-analysis, the observed effect size is expected to vary to some extend from study to study. To determine whether the observed variation falls within the range that can be attributed to sampling error or whether the variation reflects differences in true effect sizes, we assessed heterogeneity using the Q-statistic and the I^2-statistic[48]. The Q-statistic tests the null hypothesis, stating that all studies in the analysis share a common effect size. If all studies shared the same effect size, the expected value of Q would be equal to the degrees of freedom (the number of studies minus 1). In addition, I^2 was calculated, which indicates the proportion of the observed variance reflecting differences in true effect sizes rather than sampling error. Moreover, it is important to investigate potential outlier studies, defined as standardized residual z-scores of effect sizes exceeding ± 1.96 (p<0.05). All calculations were executed using Comprehensive Meta-Analysis version 2.0 (www.meta-analysis.com/)[48, 49].

Figure 1. PRISMA Flow diagram of the performed literature search.



RESULTS

In total 27 articles investigating the prevalence of AH in the general population were retrieved from the literature search. Six of these eligible publications described overlapping cohorts of which three articles with the smallest sample size were excluded[50-52]. One article investigated two different study populations[53], which were entered as separate study samples. Therefore, twenty-five study samples were included with a total number of 84 711 participants[15, 17, 18, 45-47, 53-70]. See the PRISMA flowchart (Figure 1) for the study selection process.

Table 1 shows an overview of all 25 included study samples with calculated lifetime prevalence rates. We received original data from 19 of the 25 included study samples. The age range of four study samples without original data exactly fell within the proposed age groups, while two study samples[62, 63] did not. These two samples were designated to one age category based on the mean age of the study sample.

General prevalence of AH

Including the prevalence rates of all 25 study samples, **t**he pooled estimate of prevalence was 9.6%, with the 95% confidence interval (95% CI 6.7-13.6% (n=84 711)). The Q and I^2 statistic both showed heterogeneity, Q(24)=6672.47, $p<0.001$, $I^2=99.64\%$, indicating that the true prevalence varies between studies. Indeed, the prevalence rates of the individual study samples ranged between 2% and 37.5%. No outliers were detected.

Developmental age categories: children, adolescents, adults and elderly

To evaluate whether prevalence rates differed between different age groups, the study samples were divided into four developmental age categories. This resulted in 36 study subsamples: nine subsamples evaluating AH in children 5-12 years; thirteen adolescent subsamples of 13–17 years; nine subsamples evaluating adults aged 18–60 years and five subsamples on individuals aged ≥60 years.

Table 1. Overview of the included studies and calculated lifetime prevalences

Study sample	Prevalence (%)	Sample size	Continent	Mean age	Age range	Questionnaire	A(V)H
Eaton et al. 1991*	5.3	3543	Europe	33.7	18-96	DIS(C)/ - interview	AVH
Verdoux et al. 1998*	19.3	457	Europe	56.8	18-93	Designed by author – self-report	AVH
Yoshizumi et al. 2004	15.8	380	Japan	11.6	11-12	Designed by author – self-report	AVH
Kessler et al. 2005*	8.3	2349	North America	44.3	18-95	CIDI 3.0- interview	A(V)H
Shevlin et al. 2007*	4.8	5907	North America	32.0	15-59	CIDI - interview	A(V)H
Pearson et al. 2008	33.4	500	Europe	14.8	14-15	HQ - self-report	AVH
Scott et al. 2008*	3.5	2534	Australia	19.9	18-23	CIDI - interview	A(V)H
Yung et al. 2009	29.8	875	Australia	15.6	13-18	CAPE - self-report	AVH
Polanczyk et al. 2010	4.2	2127	Europe	12.0	12	Designed by author - self-report	AVH
Barragan et al. 2011	37.5	777	Europe	14.4	13-17	CAPE - self-report	AVH
De Loore et al. 2011	5.3	2100	Europe	14.3	13-16	Designed by author - self-report	AVH
Nakazawa et al. 2011	10.3	4864	Japan	13.8	12-15	DIS(C) - self-report	AVH
Wigman et al. 2011-I	9.0	1643	Europe	10.8	10-12	CAPE - self-report	AVH
Wigman et al. 2011-II*	22.2	4550	North America	13.9	12-16	CAPE - self-report	AVH
Knobel et al. 2012*	2.0	733	South America	9.8	5-16	Designed by author - interview	AH
Laurens et al. 2012	35.1	7780	Europe	9.9	9-11	DIS(C) - self-report	AVH
Mamah et al. 2012	6.9	2627	Africa	18.5	14-29	mPRIME - self-report	A(V)H
Mamah et al. 2013	12.7	1199	Africa	13.0	8-19	CIDI - self-report	A(V)H
Cederlöf et al. 2014	4.3	5343	Europe	15.9	15-18	DIS(C) - interview	AVH
Soares et al. 2014	7.5	1124	South America	70.8	≥ 60	CAMDEX- interview	AH
Adriaanse et al. 2015*	10.3	702	Europe	13.2	8-17	K-SADS - self-report	AVH
Dolphin et al. 2015*	13.7	5867	Europe	15.0	12-19	APSS - self-report	AH
Kompus et al. 2015*	10.6	9646	Europe	16.9	16-19	LSHS - self-report	AVH
Kråkvik et al. 2015*	6.8	2533	Europe	49.6	19-96	LSHS - self-report	AVH
Sharifi et al. 2015*	2.1	14551	North America	49.5	18-92	DIS(C) - interview	AVH

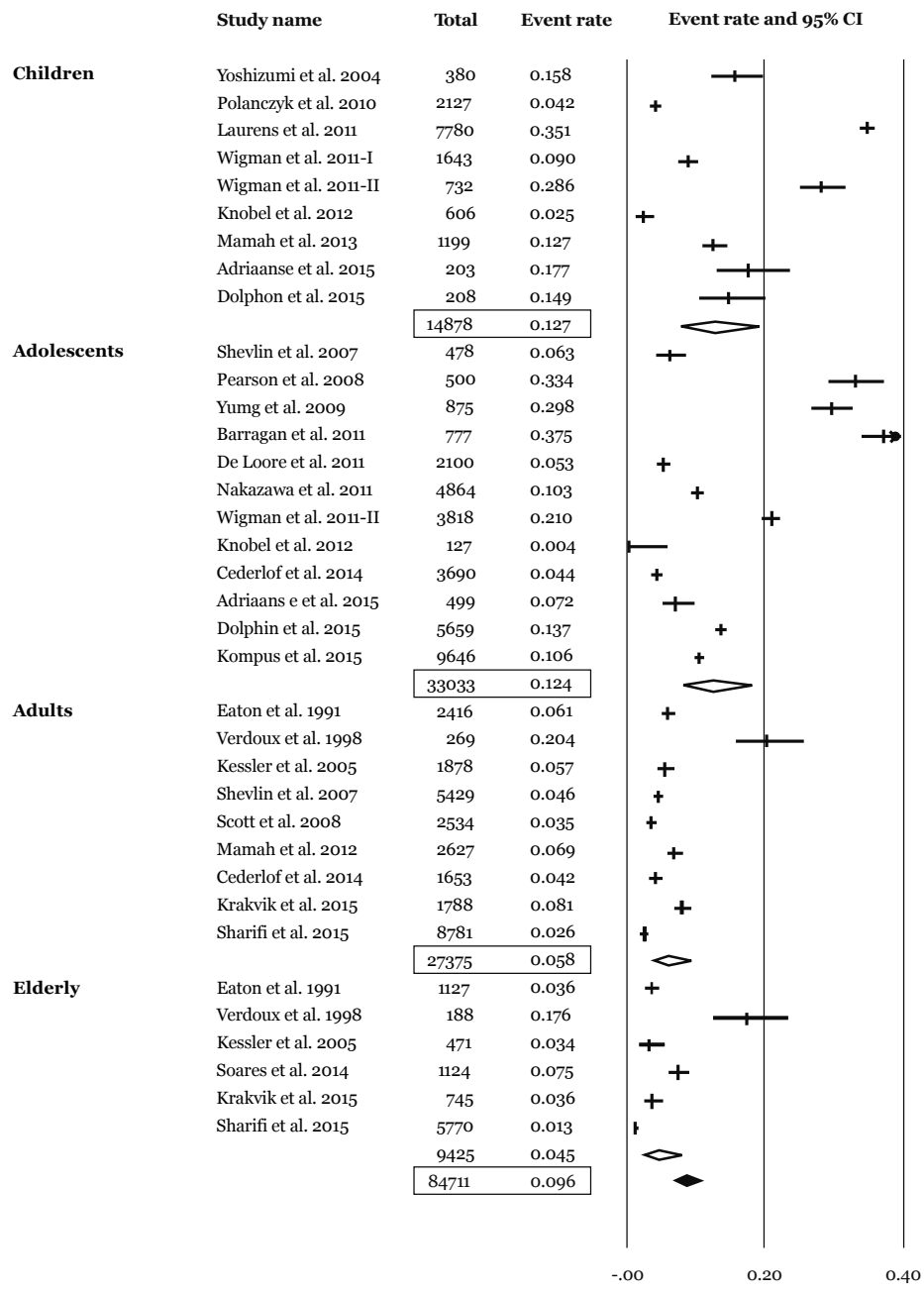
*studies for which prevalence rates were recalculated based on original data

A(V)H=Auditory (verbal) hallucinations; DIS(C)=Diagnostic Interview Schedule (Child); CAPE=Community Assessment of Psychic Experiences; CIDI=Composite International Diagnostic Interview; K-SADS=Kiddie-Schedule for Affective Disorders and Schizophrenia; HQ=Hallucination Questionnaire; LSHS= Launay-Slade Hallucinations Scale; APSS=Adolescent Psychotic-Like Symptom Screener; mPRIME=; CAMDEX=Cambridge Mental Disorders of the Elderly Examination

Prevalence of AH was 12.7% in children (n=14 878; 95% CI 8.1-19.3%; Q(8)=1142.91, p<0.001;I^2=99.30%), 12.4% for adolescents (n=33 033; 95% CI 8.3-18.1%; Q(12)=1333.40, p<0.001, ;I^2=99.18%), 5.8% for adults (n=27 375; 95% CI 3.6- 9.2%; Q(8)=289.91, p<0.001; I^2=97.24%) and 4.5% for the elderly (n=9 425; 95% CI 2.5- 8.1%; Q(5)=204.73 p<0.001; I^2=97.56) (see Figure 2). The high Q- and I^2-values within each age subgroup analysis indicated that there was still evidence of dispersion in true prevalence rates among studies. The significant pooled Q-value (Q(32)=2970.94; p<0.001), evaluating whether this grouping (children v. adolescents v. adults v. elderly) could explain the variance in true effect sizes, also indicated that true variance remained even within the different developmental age subgroups.

When comparing the prevalence rates between the four age categories, prevalence was found to significantly vary with age (Q(3)=13.66, p=0.003). *Post-hoc* analysis showed that the prevalence rate in both children (12.7%) and adolescents (12.4%) was significantly higher compared with the adult prevalence of 5.8% (z=2.39; p=0.017 and z=2.44; p=0.015, respectively). Children and adolescents also experienced more AH compared to the prevalence rate of 4.5% in the elderly (z=2.76; p=0.006 and z=2.81; p=0.005, respectively). The difference in prevalence in children v. adolescents was not significant (z=0.08; p=0.094), nor in adults v. elderly (z=0.66; p=0.512).

Figure 2. Prevalence of A(V)H in the different developmental age groups



DISCUSSION

Current meta-analysis included 25 study samples evaluating the prevalence of AH in the general population across the lifespan, with a total of 84 711 participants. We found a mean prevalence rate of 9.6% (95% CI 6.7-13.6%). When evaluating different age groups, the mean lifetime prevalence of AH was similar in children (12.7%) and adolescents (12.4%), but these two groups differed significantly from adults (5.8%) and elderly (4.5%).

Decreasing trend in lifetime prevalence

Our results suggest that AH are quite prevalent in children and adolescents, with more than 1 in every 10 individuals reporting these experiences. After adolescence, this prevalence rate decreases by half. When assessing lifetime prevalence numbers however, one would expect a general increasing trend with older age as a result of cumulative experiences over the years. Our data did not reflect such a trend. It could well be the case that lifetime prevalence estimates are biased downwards due to underreporting [71], implicating the role of memory or recall bias. We speculate that AH at a younger age tend to be forgotten later in life, when infrequent and/or non-distressing. Indeed, AH are sporadic and simple in most cases as McGrath et al. (2015) showed that 64% of the participants with psychotic experiences only had these once to five times in their lives. Regarding distress, while only 15% of young children report suffering (i.e. fear, distress and/or dysfunction) from AH[24], this percentage increases with age, up to 70% in the elderly[72].

It could also be that the common (and mostly transient) character of AH in childhood reflects typical development[12]. The course of brain maturation starts during fetal development and continues into young adulthood[73]. Gray and white matter studies show that the language areas mature around puberty (11 to 13 years)[74]. We hypothesize that immaturity of these areas might lead to a (transient) vulnerability for spontaneous, aberrant activity resulting in AH. The more advanced 'executive' functions, e.g. inhibition and source- and self-monitoring, mature later during late adolescence [74], and thereby the increasing ability to accurately interpret stimuli and phenomena such as inner speech during adolescence. Accordingly, patients with a psychotic disorder but also healthy individuals with AH show reduced executive functioning[42, 75]. While the common transient and 'benign' AH experiences in childhood (due to aberrant auditory stimuli or limited executive abilities) may decrease with age, the incidence of psychopathology-related AH is known to increase in adolescence[28, 76], which could explain the relatively higher prevalence rates we found in both children and adolescents.

Methodological considerations

The *Q*- and I^2-values showed high heterogeneity within the mean lifetime prevalence estimate. While age was expected to be an explanatory factor, heterogeneity remained high within the different developmental age groups. This indicates that factors other than age are involved. One explanation could be the different questionnaires used in the separate studies. The 25 study samples used 11 different rating scales. When categorized by each of the different questionnaires, the mean prevalence ranged from 3.9 to 33.4%. Retrospectively, we quantitatively compared prevalence rates between scales but found that these differences did not reach significance ($Q(10)=8.850$, $p=0.546$), suggesting that type of questionnaire is not an explanatory factor per se. When qualitatively evaluating the different questions used to screen for AH, almost half of the studies used identical phrasing even though different questionnaires were used (namely the DIS(C), KSADS, APSS and four out of the five 'designed by author' questionnaires). Moreover, the variety in definitions of AH does not seem to result in a specifically high or low prevalence. For example, a broad definition like 'Do you have any noises in your ears or head' as applied by Knobel & Lima (2012) yielded one of the lowest prevalence rates (2.0%), while Pearson et al. (2008) asked for specific forms of auditory hallucinations and found one of the highest prevalence rates (33.4%). Importantly, even when studies did use the same questionnaire, prevalence estimates also showed large variety. For example, three studies used the DIS(C) in a young population – while Cederlöf et al. (2014) found an interview-rated prevalence of 4.3%, self-reported prevalences were 10.3% and even 35.1%[60, 61]. This can partly be due to the observation that although the DIS(C) and CIDI are designed as interviews, these were also applied as self-report questionnaires in some studies. Response rates could therefore be 'confounded' by the incapacity of distinguishing 'true' auditory hallucinations from other aberrant auditory perceptions, especially when using self-report questionnaires instead of interviews. However, self-report does not necessarily lead to higher estimates. A questionnaire such as the CAPE which is solely used as self-report, revealed both relatively low estimates (9.0% for[53] sample I) as well as relatively high estimates (22.2%[53] sample II, 29.8%[59] & 37.5%[17]). This would suggest that neither type of questionnaire nor type of assessment (self-report v. interview) explains the heterogeneity. Other factors than type of questionnaire or type of assessment, for example the setting of testing and the introduction of the test, are more likely to be of influence[1]. A systematic evaluation of these methodological factors was not possible in current meta-analysis, given the large variety of applied methods compared to the relatively low number of studies in each developmental age group.

Future directions and implications for research

Our findings underline previous statements about the relatively common character of AH in the general population and can help in de-stigmatizing and normalizing these experiences in both young, adult and elderly populations[1]. Although there is abundant information on the prevalence of AH, only few studies provide longitudinal data, which is of great clinical relevance to AH experiences. Knowledge on which individuals with AH (eventually) warrant clinical care is needed to further develop prevention and early intervention strategies. Future studies should therefore include large follow-up datasets to allow a more detailed view on the course of AH with age and possible associated developmental risk and resilience factors.

Conclusion

The current meta-analysis shows that AH are quite common in the general population, with one in ten individuals reporting these experiences (mean prevalence 9.6%). Children (12.7%) and adolescents (12.4%) report significantly more AH compared to adults (5.8%) as well as elderly (4.5%). In order to support the development of prevention and intervention strategies, future large follow-up studies are needed to provide more details on the longitudinal course of AH and reveal concurrent risk and resilience factors.

Chapter 3

Children seeking help for auditory verbal hallucinations: who are they?

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ABSTRACT

Background: Auditory Verbal Hallucinations (AVH) in children and adolescents are a relatively common and mostly transient feature in community samples. However, it should not be regarded as a merely benign phenomenon, as childhood AVH are associated with psychopathology. Little is known about the clinical group of children seeking help for AVH. This brings uncertainty on how to assess and treat these children.

Methods: This study describes the characteristics of 95 help-seeking children (aged 6 to 18 years) with AVH attending an outpatient clinic specifically dedicated to help youth with this complaint. We aim to provide pointers regarding diagnostic assessment and interventions.

Results: Children seeking help for AVH suffered from a diversity of co morbid psychiatric diagnoses and consistently experienced high stress from AVH. When the DSM-IV-TR criteria for psychotic disorder NOS were used, all 95 children obtained this diagnosis. However, when a psychotic disorder was defined using the A-criterion of schizophrenia, only a minority of 11 cases (11.6%) was diagnosed as having a psychotic disorder. All children were in need of psycho-education and coping strategies and only the minority (11.6%) fulfilling criteria for a more narrowly defined psychotic disorder was prescribed antipsychotic medication.

Conclusions: Children seeking help for AVH form a heterogeneous group with high stress and reduced functioning. Even though only a minority (11.6%) suffers from a psychotic disorder, all children warrant clinical care due to their burden and multi morbid psychopathology.

INTRODUCTION

Auditory Verbal Hallucinations (AVH) are common in children and adolescents, with prevalence estimates ranging between 1 and 35%[12, 24, 25, 46, 47, 59, 61, 77]. AVH in children are transient in up to 95% of cases[20, 21]. Yet, AVH are not always a benign phenomenon, as even in a non-clinical setting 15% of children experience stress and problem behavior resulting from their AVH[24]. Persistence of AVH through adolescence is associated with more and distressing psychotic experiences, traumatic events and the risk of post-traumatic stress disorder (PTSD)[20]. In addition, the presence of AVH in childhood increases the risk of developing psychopathology later in life: a threefold increased risk to develop a depressive disorder[25] and, a five- to sixteenfold increased risk to develop a schizophrenia-spectrum disorder[26]. Furthermore, even at young age a wide range of psychiatric disorders such as depression, ADHD and PTSD can accompany AVH[28, 29, 78].

Epidemiological studies largely point to the benign course of AVH, but do not inform clinicians very well on the group of children seeking help for AVH. Nor do they lead to the improvement of care[3]. Only few articles have provided some directions on how to help children with stressful AVH[3-5]. Although helpful, these articles did not provide clinical data of children seeking help for AVH to base their directions on. Until recently, the Netherlands had no specific care facility for children with AVH and most clinicians had little knowledge on how to help them. We therefore used (social) media to create awareness, and started an outpatient clinic specifically for children seeking help for AVH in March 2013. Since then, children seeking help for AVH are seen on a weekly basis at the outpatient clinic. The present paper describes the characteristics of these children seeking help for AVH. These findings will help to accurately develop guidelines to improve care for these youngsters.

METHODS

Patients

Clinicians provided the researchers with anonymized data of patients visiting the outpatient clinic between March 2013 and February 2016. As data were anonymized, METC approval and informed consent was not needed, as agreed upon with the local ethical committee.

Measurements

Procedure

At the outpatient clinic, all children were diagnosed upon consensus of a child psychiatry resident and a child psychiatrist, using the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, text revision (DSM-IV-TR)[79]. Children and their parents were interviewed through systematic and detailed exploration of all domains of psychopathology as part of a comprehensive mental status examination. Both their information was weighted and integrated to ensure a most accurate view on children's complaints and functioning. If indicated, additional assessments, such as neuropsychological testing, an autism diagnostic interview (ADI-R) or blood tests were conducted to complete diagnostic evaluation.

The diagnosis of a psychotic disorder not otherwise specified (NOS) can be made on the basis of persistent hallucinations causing distress and dysfunction alone. However, being psychotic is generally viewed as a distortion of reality testing and many children with persistent and stressful AVH have adequate reality testing and lack delusional thinking style or disorganized behavior. We chose not to diagnose all these children with a psychotic disorder, although they matched the psychotic disorder NOS criteria. Rather, we decided to diagnose a psychotic disorder in children only when the A-criterion of the DSM-IV category schizophrenia was met. This requires that, next to hallucinations, these children should also have either delusions, disorganized speech, disorganized or catatonic behavior or negative symptoms. These more strict criteria prevent overdiagnosing psychotic disorders in children and may better select those children that may benefit from antipsychotic medication.

Parents of the children were asked to complete the Child Behavior Checklist (CBCL) as a standard procedure of symptom evaluation at the child- and youth psychiatry department of the UMC Utrecht[80].

Global functioning

Global functioning was measured with the Childhood Global Assessment Scale (CGAS)[81]. CGAS was scored as the level of functioning at the time of assessment at the clinic.

AVH characteristics

Characteristics of the hallucinations were assessed according to the Auditory Vocal Hallucination Rating Scale (AVHRS) previously used and validated by Bartels-Velthuis aet al.[24]. Minor adjustments were made by the doctors at the outpatient clinic to enhance comprehensibility for the children.

Treatment

Previous treatment and provided or recommended treatment at our outpatient clinic is described.

Statistics

To analyze the data, SPSS version 23.0 was used. Descriptives and t-test were used to examine the data.

RESULTS

Patients

We assessed data of 95 children. Mean age was 11.8 years (SD 3.0; range 6 to 18 years). Sixty-six percent were girls. See Table 1 for demographics and descriptives.

Table 1. Demographics and descriptives

Total children	**N = 95**
Age (y), mean (range; SD)	11.8 (6-18; 3.0)
Gender, N girls (%)	63 (66.3%)
CGAS, mean (range; SD)	50.9 (25-85; 11.4)
Total IQ, mean (range; SD)	94.44 (59-135; 19.1)
Borderline mental retardation N (%)*	14 (19.4%)
Mild mental retardation N (%)**	2 (2.8%)
DSM diagnosis, N (%)	
No DSM diagnosis	9 (9.5%)
One DSM diagnosis	36 (37.9%)
Two DSM diagnoses	34 (35.8%)
Three or more DSM diagnoses	16 (16.8%)
Total CBCL score, mean (range; SD)	62.3 (7-121; 28.9)

*IQ level 70-85
**IQ level 50/55-70

Diagnostic heterogeneity

DSM-IV-TR classification

All children met criteria for a psychotic disorder NOS, but only 11 (11.6%) met the schizophrenia A-criterion and were actually diagnosed with a psychotic disorder. Eight children (8.4%) did not receive any psychiatric disorder, 37 (38.9%) received one diagnosis, and 50 (52.6%) received more than one diagnosis (see Table 2). There were no cases of alcohol and/or substance abuse or dependence.

Table 2. Psychiatric disorders

	Number of disorders in 95 children	
	N	**%**
Anxiety Disorder (General, Separation, NAO)	26	27.4
Attention-Deficit Hyperactivity Disorder	18	18.9
(Mild) Mental Retardation	21	22.1
Pervasive Developmental Disorder (Autistic, Asperger, PDD-NOS)	19	20.0
Mood Disorder (Depressive, Bipolar)	15	15.8
Personality Disorders	15	15.8
Psychotic Disorder (Schizophrenia, NOS)	11	11.6
Parent-child relational problem	12	12.6
Obsessive Compulsive Disorder	3	3.2
Attachment Disorder	2	2.1
Oppositional Defiant Disorder/Conduct Disorder	2	2.1
Tic Disorder	1	1.0
Other*	9	9.5

*e.g. Disorder of childhood NOS, reading disorder etc.

CBCL

The CBCL was completed for 67 children (70.5%). Except for mean age (no CBCL 13.6 years; with CBCL 11.1 years; p <0.001), there were no significant differences regarding gender, CGAF or DSM classifications between children with and without completion of the CBCL.

On CBCL total score, 42 children (62.7%) scored within the clinical range of psychopathology: 43.5% scored within the clinical range for anxious/depressed, 30.4% for withdrawn/depressed, 36.2% for somatic complaints, 21.7% for social problems, 75.4%

for thought problems, 29.0% for attention problems, 14.5% for rule-breaking behavior and 14.5% for aggressive behavior.

Cognitive functioning

Data on cognitive functioning in terms of intelligence quotient (IQ) were either available through previous assessment by referring specialists (performed within the last two years) or was done if clinically indicated (for example because of problematic school performances or anxiety and/or problem behavior related to possible cognitive impairment). The WISC-III was used in children under the age of 16 and for children aged 16 years and older the WAIS was used[82].

Global assessment of functioning

Mean CGAS was 50.9 (SD 11.4; range 25-85).

The mean CGAS in the 11 children with the more narrowly defined psychotic disorder (39.6; SD 9.3) was significantly lower than in children without a psychotic disorder (52.4; SD 10.9), $t(93) = 3.7$, $p < 0.001$.

AVH characteristics

The AVHRS interview was conducted with 87 children (91.6%). Mean number of voices was 3.7, ranging from 1 to 30 (SD 5.7). The majority of children experienced AVH for a long time: 13 children (15.9%) for at least 6 months, 14 children (17.1%) for at least 12 months and 46 children (56.1%) for at least 24 months. AVH characteristics are presented in Table 3.

Hallucinations in other modalities

Thirty-nine children (44.8%) also experienced hallucinations in other modalities: 34 (87.2%) of them experienced visual hallucinations, 10 (25.6%) experienced olfactory hallucinations, 9 (23.1%) experienced tactile hallucinations, and 8 (20.5%) experienced gustatory hallucinations.

Table 3. AVH variables

AVH variables	Total group of children (*N* = 87) %
Frequency	
Once a month	2.8
Once a week	25.0
Once a day	34.7
Once an hour	8.3
Continuously	29.2
Duration	
Seconds	9.9
Minutes	32.4
At least one hour	12.7
A couple of hours or non-stop	45.1
Time	
Falling asleep	2.8
Waking up	0
Certain situations	12.9
Random moments	84.3
Location	
Inside head	76.7
Inside and outside head	15.1
Outside head, close to ears	4.1
Outside head, further away	4.1
Loudness	
Whispering	26.5
As loud as own voice	41.2
Louder than own voice	16.2
Screaming	16.2
Individual or not	
Always one voice at a time	57.5
Multiple voices, one voice at a time	9.6
Multiple voices, simultaneously	32.9
Type	
Own voice	24.4
Own and other known voice	1.3
Own and other unknown voice	2.6
Other known and unknown voice	3.8
Other unknown voice	61.5
Other known voice	6.4

Table 3. (Continued)

AVH variables	Total group of children (*N* = 87) %
Content	
Comments	18.1
Assignments	3.6
Comments and assignments	13.3
Dangerous assignments	8.4
Comments and dangerous assignments	48.2
Only noise	8.4
Negativity	
Neutral	13.3
Positive	2.4
Positive and negative	21.7
Negative	62.7
Suffering	
Never	0
Sometimes	11.3
50% of the time	9.9
Most of the time	36.6
Always	42.3
Controllability	
Always	0
Most of the time	7. 0
50% of the time	7. 0
Sometimes	36.6
Never	49.3

Treatment

Previous treatments

Thirty-two (36.8%) children had previously received a form of psychotherapy and/or medication aimed at their voices; one (1.1%) psycho-education, eighteen (19%) any form of psychotherapy, eight (8.4%) medication and five (5.4%) psychotherapy and medication. Of those children, 71.9% had not experienced any effect of the intervention on their voices. Fifteen (15.8%) patients were taking antipsychotic medication, prescribed by the referring specialists at time of assessment at the outpatient clinic.

Treatment provided or recommended at our outpatient clinic

Psycho-education and psychotherapy

All children and parents received information on current knowledge on the etiology of AVH and information on how to cope with AVH[3-5]. Using the knowledge of effective treatment programs for adults with disruptive AVH and our growing experience with children seeking help for AVH, the clinicians involved in the outpatient clinic, developed a psychotherapy, specifically for children with disruptive AVH: *Stronger Than Your Voices* (see supplement). This psychotherapy aims to reduce suffering and related problem behavior resulting from AVH by empowering children's coping strategies through psycho-education and specific cognitive and behavioral strategies. The development of this psychotherapy was completed in January 2016 and is being assessed in a pilot study that started March 2016.

Medication

Of the fifteen patients taking antipsychotic medication at time of assessment at the outpatient clinic, only six of them fulfilled criteria for a psychotic disorder following the A criterion: three were diagnosed with a psychotic disorder additional to an autism spectrum disorder (ASD), one child had bipolar disorder with psychotic symptoms, one psychotic disorder NOS, with more than the symptom of hallucinations and one schizophrenia. The other nine patients receiving antipsychotics were either diagnosed with borderline personality traits (N=8) or ASD (N=1).

Next to the above mentioned six children with a narrowly defined psychotic disorder, another five children met these criteria, resulting in a total of eleven children diagnosed at the outpatient clinic with a narrowly defined psychotic disorder. Of the total of these eleven children, antipsychotic medication was recommended in ten cases. The eleventh patient was a 6-year old girl with brief psychotic episodes, so called Brief Limited Intermittent Psychotic Symptoms (BLIPS). When she visited the outpatient clinic, the psychotic episode was in remission. Therefore we did not start antipsychotics.

DISCUSSION

Children and adolescents seeking help for AVH appeared to be a heterogeneous group, with reduced level of functioning, a broad spectrum of psychiatric disorders and high burden of AVH in terms of frequency, duration, content, negativity and lack of controllability. Previous research suggests AVH in childhood to be more strongly associated with psychopathology with increasing age[28, 76]. We found a trend towards an increasing percentage of AVH associated psychotic disorder and decreasing CGAS with increasing age (see Table 4). However, the subgroup ≥16 was particularly small and so these findings should be interpreted with caution.

Table 4. Age ranges

Age range (y)	<12	12-16	≥16
N Total	45	37	13
N Psychotic disorder (%)	3 (6.7%)	4 (10.8%)	4 (30.7%)
CGAS	53.9	48.5	47.5

Diagnosing a psychotic disorder: using the A-criterion

Despite high levels of suffering and reduced functioning due to AVH in almost 90% of children, a clinical diagnosis of a psychotic disorder was only made in a minority of cases (11.6%). Following the DSM-IV-TR, a psychotic disorder NOS can be diagnosed in case of auditory hallucinations and dysfunction without further co-occurring symptoms[79]. This means that all of the children should have had a diagnosis of psychotic disorder when applying these DSM criteria. In DSM-5, the structure of psychotic disorders is revised under the name "Other Specified Schizophrenia Spectrum and Other Psychotic Disorder"[83]. Psychotic symptoms are considered on a continuum from normal mental states to schizophrenia. For example, in the gradients of psychosis, schizotypal personality disorder is part of the schizophrenia spectrum and recognized in the chapter as below the threshold required for a psychotic disorder[84, 85]. The Psychosis Work Group proposed a new subgroup called "Attenuated Psychosis Syndrome" (APS), which was taken into Section 2. APS refers to the presence of psychotic symptoms in attenuated forms that occur with relatively intact reality testing but with sufficient severity and/or frequency to warrant clinical attention[86]. About 80% of children with distressing AVH and reduced level of functioning fits this diagnosis. Being psychotic is generally viewed as a distortion of reality testing, while most children of the current sample had intact reality testing. The A-criterion from the schizophrenia diagnosis provides a stricter definition of psychosis, demanding at least two of the following symptoms: delusions,

hallucinations, disorganized speech, disorganized or catatonic behavior or negative symptoms. In our sample, these more strict criteria correlated well to distorted reality testing and to the clinical indication to start antipsychotic medication. We therefore suggest that the application of these more strict criteria may provide a better selection of children suffering from AVH as part of a psychotic disorder.

Clinical significance of AVH in a help seeking population

Psychotic experiences such as AVH are a phenomenon occurring across diagnostic boundaries; from healthy non-help seeking individuals at one end to non-psychotic disorders with psychotic experiences in the middle and psychotic disorders at the other end[13, 87]. The results from our help seeking population confirm that AVH -even in a young population- can be a symptom of psychosis, but occur within a variety of other psychiatric disorders. Also, a small group did not meet criteria for any psychiatric disorder. Nonetheless, almost all children experienced high distress and had reduced level of functioning. These findings emphasize that children seeking help for AVH do warrant clinician attention.

Outcome of children seeking help for AVH

There is debate on the clinical significance of attenuated psychotic symptoms such as AVH in children and adolescents as ultra-high risk (UHR) symptoms for the development of psychosis[76]. This is understandable, as AVH in childhood are common and mostly transient. Furthermore, screening for the presence of AVH as an at risk state brings the risk of pathologization a (typical) developmental phenomenon and over-awareness and worries in children and their care givers. On the other hand, to improve outcome of patients that are at risk of developing a psychotic disorder, early detection and preferably prevention are essential[88].

Children seeking help for AVH (without current psychotic diagnosis) fulfill UHR-psychosis criteria (attenuated psychotic symptom and/or Brief Limited Intermittent Psychotic Symptoms (BLIPS)). As the phenomenon of help seeking behavior and transition into psychosis are related to similar factors (severity of AVH (emotional valence, frequency of and lack of control over AVH), poorer general functioning and the presence of other psychopathology), we do expect them to be more vulnerable to psychotic deterioration later in life[21, 89, 90]. However, our results also point out that specific focus on psychotic disorder as 'worst outcome' or end of the continuum is too narrow. As advocated by Fusar-Poli et al.[87], a more general staging model should be applied for youth with

distressing AVH, of which psychosis is one important end of the dimension, but one of several (interacting) psychopathological domains.

Moreover, Armando et al.[91] showed that children (aged 9-17 years) with UHR status all retained their baseline non-psychotic psychiatric diagnosis at one year follow up (including the 25.7% UHR remitters). Following these results, children seeking help for AVH are more vulnerable to persistence of psychopathology in general.

LIMITATIONS

A number of limitations should be addressed. As this was a naturalistic observational study, a control group was not part of the design. Another consequence of this design was that data on IQ was available only from a selected sample of patients, i.e. those with previous IQ data and those with clinical indication for IQ testing. Also, not all questionnaires regarding AVH phenomenology were completed. A structured interview concerning DSM classifications (such as the KSADS) or questionnaires regarding psychosis risk criteria (UHR or BS) were not part of the procedure at the outpatient clinic. Nevertheless, all children were comprehensively assessed by clinicians with wide experience with psychosis and psychotic symptoms in a young population.

We chose the A-criterion instead of the broader defined psychotic disorder NOS to diagnose children with a psychotic disorder. In our opinion it reflects the aim to optimally select those children with distorted reality testing and that might benefit from antipsychotic medication. However, exact selection criteria for children are lacking and this choice can be regarded as arbitrary.

CONCLUSIONS

The majority of children seeking help for AVH suffer from a diversity of underlying psychiatric disorders and have a high burden of suffering. We propose that in children presenting with AVH, a psychotic disorder should only be considered when children meet more strict criteria, for example as those described in the schizophrenia A-criterion. At the outpatient clinic a psycho-education for youth and parents was provided and a psychotherapy *Stronger Than Your Voices* developed, which aims at strengthening coping regarding AVH and related problem behavior for all voice hearing children. Antipsychotic medication was only recommended for the 11.6% of children who met the strict criteria for a psychotic disorder.

Supplement: Stronger Than Your Voices: psychotherapeutic treatment protocol for youth suffering from auditory verbal hallucinations

Tailored Cognitive Behavior Therapy (CBT) for adults with AVH has proven to be effective (van der Gaag et al. 2014). However, as emphasized by Jardri et al (2014), there is an urgent need for psychotherapeutic interventions specifically developed for children. This addendum presents a new psychotherapeutic intervention Stronger Than Your Voices, developed for children and adolescents suffering from AVH. The intervention is developed at the UMC Utrecht Brain Centre in close collaboration with the Dutch 'Gedachten Uitpluizen Foundation' (www.gedachtenuitpluizen.nl), the latter having wide experience with developing CBT protocols for symptoms related to psychotic disorders.

Stronger Than Your Voices can be applied in all youth suffering from AVH irrespective of the underlying (psycho)pathology. However, we do emphasize that in case of a clear 'cause' of AVH (e.g. a psychotic disorder, hearing loss, or non-fitting school level) treatment should preferably and primarily be targeted at those underlying problems. Any therapist with sufficient CBT experience and educated to work with children can use the *Stronger Than Your Voices* protocol.

Treatment protocol

Stronger Than Your Voices consists of four fixed chapters (Strong Understanding, Strong Plan, Strong Tricks and Strong Stopping) and two optional chapters (Feeling Strong and Sleeping & Relaxing Strong). At the end of the therapy a child will have a Strong Scheme, including do's and don'ts to prevent (worsening of) AVH and regain control over AVH. Although the four chapters are fixed, the protocol serves to develop a tailor-made therapy as therapeutical goals are based upon the individual burden. Therapist together with the child choose which techniques they will use to target these goals. This tailor-made approach was previously suggested by Ruffel et al. (2015) as an effective strategy for the treatment of psychotic symptoms in children and adolescents.

Strong Understanding

This chapter is built up in two stages: 1. a pre-measurement using three questionnaires (Voices Interview, Measuring Strong & Kidscreen-52) to understand the phenomenology of the AVH and its impact in terms of distress and dysfunction and 2. psycho-education for children and their parents. In two sessions, this psychoeducation explains how the human brain is vulnerable to hallucinations and normalizes these experiences in the

range of perceptual aberrations. It also provides some basic pointers for child and parents how to deal with AVH.

Strong Plan

In this chapter the therapist and child set concrete goals in terms of the following; what *does* the child *not do* as a consequence of AVH that it would like to do again and/or what *does* the child *do* as a consequence of AVH that it does not want to do anymore? In the second part of this chapter, both the known triggers for AVH and the techniques a child already uses to regain control over voices and their effect are mapped and included in a so called Strong Scheme. The Strong Scheme will be complemented during therapy with newly discovered triggers and effective techniques.

Strong Tricks

Therapist and child run through the different coping techniques ('tricks') of the protocol and choose which ones will be used to work on the set goals. The protocol's tricks are divided into three categories: Do, Think & Ignore. For example, when a child is convinced that other people can hear what his or her voices say and therefore avoids public spaces a 'Do' trick can be applied of trying to catch the voices on tape (during therapy and at home); if they can be heard out loud they can be recorded. Another example is when a child is convinced that the voices have powers to hurt other people, the therapist and child can challenge the child's voices to push him or her from his chair whilst standing upon it. During this phase, the child will keep an AVH diary, *Strong Writing,* in which AVH characteristics when present, possible trigger(s), applied technique and its effect are written down. Therapist and child start every therapy session evaluating the diary; did the child experience AVH and was the chosen technique effective? If so, is the predetermined goal met or what more is needed to do so (e.g. more practice, add another technique)? If not, is the technique adequately applied and/or would a different technique be more appropriate? Newly discovered triggers and effective techniques are included in the child's Strong Scheme.

Strong Stopping

The therapy can be ended when the predetermined goals are met. This will mean that by achieving the goals, the child will have regained control over AVH and the level of suffering because of AVH will be significantly reduced. Throughout therapy, goals may have been added or adjusted depending on circumstances (e.g. change in characteristics of AVH). In our experience, for some children (and parents) comprehensive psycho-education and some basic pointers are already sufficient to meet their needs. When the therapy is completed, the child's Strong Scheme is completed with triggers and effective

techniques. A post-measurement is done with the same three questionnaires that were applied as pre-measurement.

The optional chapters Feeling Strong and Sleeping & Relaxing Strong aim to strengthen self-image, enhance sleeping pattern & reduce stress.

Feeling strong

Hearing voices is associated with low self-image. Low self-image makes a child more vulnerable to the impact of the voices and vice versa, (negative) voices can have direct influence on self-image. In this chapter, self-image is strengthened by keeping a list of Strong Qualities, which may concern physical appearance, personality and actions (e.g. being good at sports or a game). The therapist challenges the child to come up with as much Strong Qualities as he or she can think of and to add two more every week. Besides, a Positive Diary will be kept in which a child writes down three personal 'positive things' (e.g. getting or giving a compliment, trying to do homework even though feeling too tired, helping a family member, being satisfied with a hair do, etc.) on a daily basis. These 'positive things' can help to become aware of more Strong Qualities to add to the list.

Sleeping & Relaxing strong

aims to enhance resilience by optimizing sleep pattern and reducing stress trough different relaxation techniques that can by applied in the therapy session and at home.

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Chapter 4

Clinical significance of auditory hallucinations in youth: comparison between a general population and a help-seeking sample

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Dear editors,

During childhood and adolescence, AVH are mostly transient, pointing towards a possible benign or developmental nature. However, in some children and adolescents, AVH can lead to substantial suffering, are associated with significant behavioral problems, and may last for a longer period, even into adulthood[19, 20, 24]. When children and adolescents actually seek help for AVH, they represent a group with a high level of suffering, a reduced level of functioning and severe and/or comorbid psychopathology. In addition, time to treatment is substantial[92]. The present study aims to identify to what extent adolescents (aged 12-13 years) experiencing AVH in the general population might be in need for clinical care. In addition, we explored whether these adolescents could have been identified at earlier age (7-8 years) and how they function at age 18-19 years.

We compared two independent, previously described samples: a clinical sample of a help-seeking population (HSP) (originating from a naturalistic study with anonymized data of n=207 youngsters, aged 8-18 years)[92] and a general population (GP) sample (originating from a case-control sample, followed in three waves: (i) baseline (T0; n=694 [n=347 with AVH], age 7/8 years); (ii) 5-year follow-up (T1; n=337 [n=55 with AVH], age 12/13 years) and (iii) 11-year follow-up (T2; n=293 [n=15 with AVH], age 18/19 years)[19, 20, 24].

For the HSP-sample and the T0 and T1-GP samples, AVH were assessed with the Auditory Vocal Hallucination Rating Scale (AVHRS)[93]. An AVH severity index was composed conform previous analyses[24]. For the T2-GP sample, AVH was assessed with the AVHRS-Q(uestionnaire)[94]. Parents of both the HSP and GP (T0 and T1) samples completed the Child Behavior Checklist (CBCL)[80] to assess problem behavior. Both total scores and internalizing, externalizing and eight syndrome scales were calculated (scoring normal=0, subclinical=1, clinical=2). Participants of the T2-GP sample completed the Community Assessment of Psychic Experience (CAPE)[95], covering frequency and distress of positive, negative and depressive experiences, and the Depression, Anxiety and Stress Scale (DASS-21)[96] assessing symptoms of anxiety, depression and stress. The T2 GP-sample was also assessed on social functioning with the Groningen Questionnaire about Social Behavior (GSVG-45)[97].

Analyses comprised (1) Comparison of the HSP- and T1 GP-samples, (2) Creating a 'need for care' measure by combining 'AVH-severity' and 'CBCL-total' z-scores, using means and standard deviations of the HSP sample, (3) Identifying adolescents with 'need for care' status in T1 GP-sample using the combined z-score with a threshold of ≥-1 (as adolescents below this threshold did not require clinical care but, for example, only reassurance, see[92]), (4) Comparison 'need for care' and 'no need for care' AVH adolescents

at T1 as well as retrospectively at T0 and prospectively at T2 follow-up. Analyses were performed using IBM SPSS Statistics version 23.0 (descriptives, z-scores, t-tests and chi-square tests).

Mean age and gender of the HSP (12.3 years, SD 2.8, 40.2% males) and GP (12.8 years, SD 0.8, 35.8% males) samples did not differ significantly. The HSP-sample scored significantly higher on both AVH severity (HSP mean 6.86 (SD 2.40); GP mean 2.84; (SD1.98)) and CBCL total score (HSP mean 59.21 (SD 25.60); GP mean 30.34 (SD24.27)) (see Supplementary table 1). Combined z-scores could be calculated for 62 (57.9%) cases of the HSP-sample due to missing data on either AVH-severity (17 missings (15.9%)) and/or CBCL total (37 missings (34.6%)) scores. There were no significant differences in AVH-severity for CBCL completers and non-completers (t(71.991)=71.991, p=0.132) or in CBCL-total between AVH completers and non-completers (t(68) = 0.839, p=0.404). In the HSP-sample, combined z-scores ranged from -2.16 to 1.27. In the T1 GP-sample, the combined z-scores ranged from -2.35 to 0.21.

Thirteen (23.6%) adolescents from the T1 GP-sample met the predefined 'need for care' criterion (see Table 1). Of these 13 adolescents with 'need for care' status at T1, nine already heard voices at T0, indicating that 69.2% of these adolescents had persistent AVH. Retrospectively, children with 'need for care' at T1, scored significantly higher on CBCL total and several subscales, but not on AVH-severity at age 7-8 years (T0) (see Supplementary Table 2). At T2, seven (of the thirteen) young adults with 'need for care' status at T1 could be assessed. Two of these seven young adults with 'need for care' status at T1 had persistent voices. At T2, those with 'need for care' at T1 reported significantly more depressive symptoms and higher distress (CAPE) and had significantly lower social functioning in their education (GSVG-45), compared to those without 'need for care' at T1 (see Supplementary Table 3).

Table Comparison ' Need for Care' versus 'No Need for Care' subgroups within GP T1 sample

	Need for Care & AVH		**No Need for Care & AVH**		**Statistics**		
	N (%)	**Mean (SD)**	**N**	**Mean (SD)**	**T-test (df)**	**Chi-square (df)**	**Sig.**
Age (years)	13	13.00 (0.65)	42	13.00 (0.633)	1.314 (53)		0.194
Gender (male)	6 (46.2)		18 (42.9)		0.206 (53)		0.838
AVH severity index	13	4.00 (2.22)	42	2.00 (1.618)	-3.782 (53)		<.001
CBCL Total score	13	60.00 (23.643)	40	19.00 (14.074)	-7.564 (51)		<.001
CBCL Range (N clinical)[a]							
Total[c]	11 (84.6)	2.00 (0.599)	2 (4.8)	0.00 (0.543)		33.990 (2)	*<.001*
Internalizing[b]	10 (76.9)	2.00 (0.768)	4 (9.5)	0.00 (0.666)		23.270 (2)	*<.001*
Externalizing[c]	7 (53.8)	2.00 (0.768)	2 (4.8)	0.00 (0.463)		30.026 (2)	*<.001*
Social withdrawal[b]	1 (7.7)	0.00 (0.555)	0 (0.0)	0.00 (0.156)		3.499 (2)	0.174
Somatic complaints[b]	6 (46.2)	1.00 (0.954)	2 (4.8)	0.00 (0.495)		15.210 (2)	<.001
Anxious/depressed[b]	4 (30.8)	0.00 (0.927)	1 (2.4)	0.00 (0.400)		10.854 (2)	.004
Social problem[b]	3 (23.1)	1.00 (0.832)	3 (7.1)	0.00 (0.527)		17.444 (2)	<.001
Thought problems[c]	4 (30.8)	0.00 (0.927)	1 (2.4)	0.00 (0.379)		11.479 (2)	*.003*
Attention problems[c]	6 (46.2)	1.00 (0.954)	0 (0.0)	0.00 (0.00)		28.991 (2)	*<.001*
Rule-breaking behavior[b]	3 (23.1)	0.00 (0.877)	2 (4.8)	0.00 (0.436)		3.891 (1)	*0.049*
Aggressive behavior[c]	3 (23.1)	0.00 (0.877)	0 (0.0)	0.00 (0.158)		10.797 (2)	*0.005*

[a]total 'need for care' N= 13 & total 'no need for care' N= 42
[b]total 'no need for care' N= 41
[c]total 'no need for care' N= 40

By comparing a HSP-sample with a GP-sample of adolescents with AVH, we could provide the estimation that nearly a quarter of adolescents with AVH in the general population might actually be in need of clinical care. From as early as 7 and 8 years of age, these children stood out from their peers with regard to problem behavior, but not necessarily to AVH severity. This information is helpful in understanding the clinical significance of AVH in youth in the general population. To specify, clinicians should be aware that approximately one in four adolescent voice hearers might need clinical care. Also, caregivers should always perform a broad clinical assessment when encountering children and adolescents with AVH. Our data suggest that, even from young age, AVH can be regarded as a signal of a vulnerable population, which may be in need of care for a broader spectrum of problems than AVH alone. Future research regarding AVH in youth might profit from explicitly implementing a broader assessment of distress and need for care, to better understand the origin of their suffering, with the aim of developing tailored support.

Supplementary table 1. Comparison General Population (GP) and Help-Seeking Population (HSP) sample

	GP		HSP		Statistics		
	N %	**Mean (SD)**	**N %**	**Mean (SD)**	**T-test (df)**	**Chi-square (df)**	**Sig.**
Age (years)	55 (33.95)	12.82 (0.64)	107 (66.05)	12.31 (2.82)	-1.78		.189
Gender (male)	24 (35.82)		43 (40.19)			0.178 (1)	.673
AVH severity index	55 (37.93)	2.84 (1.98)	90 (62.07)	6.86 (2.40)	10.446 (143)		*<.001*
CBCL Total score		30.34 (24.27)		59.21 (25.60)	6.334 (121)		*<.001*
CBCL Range (N clinical)							
Total	13 (24.53)	0.62 (0.86)	53 (75.71)	1.60 (0.75)		33.612 (2)	*<.001*
Internalizing	14 (27.45)	0.69 (0.87)	50 (71.43)	1.56 (0.75)		28.178 (2)	*<.001*
Externalizing	9 (16.98)	0.43 (0.77)	26 (37.14)	0.83 (0.95)		6.129 (2)	*.047*
Withdrawn/depressed	1 (1.85)	0.06 (0.30)	42 (60.00)	1.30 (0.91)		55.619 (2)	*<.001*
Somatic complaints	8 (14.81)	0.39 (0.74)	22 (31.43)	0.74 (0.91)		5.261 (2)	.072
Anxious/depressed	5 (9.26)	0.28 (0.63)	7 (10.00)	0.23 (0.62)		2.346 (2)	.309
Social problems	6 (11.11)	0.30 (0.66)	32 (45.71)	0.97 (0.98)		17.295 (2)	*<.001*
Thought problems	5 (9.43)	0.26 (0.66)	63 (91.30)	1.88 (0.40)		87.220 (2)	*<.001*
Attention problems	6 (11.32)	0.26 (0.66)	6 (8.57)	0.31 (0.63)		3.876 (2)	.144
Rule-breaking behavior	5 (9.26)	0.19 (0.59)	11 (15.71)	0.43 (0.75)		8.365 (2)	*.015*
Aggressive behavior	3 (5.66)	0.15 (0.50)	8 (11.43)	0.36 (0.68)		4.715 (2)	.095

Supplementary table 2. Comparison of the 'Need for Care at T1' subgroup versus the rest of AVH sample within GP Baseline sample

	Need for care at T1 +AVH		Rest of AVH sample		Statistics		
	N (%)	Mean (SD)	N	Mean (SD)	T-test (df)	Chi-square (df)	Sig.
Age (years)	9	7.8 (0.3)	338	8.0 (0.5)	1.525 (345)		.128
Gender (male)	4 (44.4)		171 (50.6)		-.363 (345)		.717
AVH severity index	9	1.67 (1.12)	338	1.84 (1.51)	.341 (345)		.733
CBCL Total score	6	45.67(25.02)	201	23.96(18.91)	-2.746 (205)		.007
CBCL Range (N clinical)[1]							
Total	3 (50)	1.00 (1.095)	33 (16.7)	0.42 (0.758)		4.807 (2)	.090
Internalizing	3 (50)	1.00 (1.095)	39 (19.4)	0.48 (0.80)		3.61 (2)	.164
Externalizing	3 (50)	1.17 (0.983)	26 (12.9)	0.36 (0.702)		7.373 (2)	*.025*
Withdrawn/depressed	0 (0)	0.00 (0.00)	4 (1.99)	0.08 (0.343)		.414 (2)	.813
Somatic complaints	1 (16.7)	0.50 (0.837)	9 (4.48)	0.15 (0.47)		3.018 (2)	.221
Anxious/depressed[2]	1 (16.7)	0.50 (0.837)	16 (8.0)	0.21 (0.572)		2.294 (2)	.318
Social problem	0 (0)	0.00 (0.0)	3 (1.49)	0.05 (0.278)		.216 (2)	.898
Thought problems[3]	1 (25)	0.50 (1.0)	11 (5.53)	0.15 (0.486)		2.766 (2)	.251
Attention problems	1 (16.7)	0.67 (0.816)	8 (3.98)	0.14 (0.448)		9.658 (2)	*.008*
Rule-breaking behavior	2 (33.3)	0.83 (0.983)	10 (4.97)	0.16 (0.488)		9.969 (2)	*.007*
Aggressive behavior	2 (33.3)	0.83 (0.983)	11 (5.47)	0.14 (0.484)		10.914 (2)	*.004*

[1]: total 'need for care' N= 6 & total 'no need for care' N=201; [2]: total 'no need for care'l N=200; [3]: total 'need for care'N = 4 & total 'no need for care' N=199

Supplementary table 3. Comparison 'Need for Care' versus 'No Need for Care' subgroups within GP T2 sample

	AVH + Need for Care T1 (N=7)		AVH + No Need for Care T1 (N=26)		Statistics		
	N (%)	**Mean (SD)**	**N**	**Mean (SD)**	**Chi-square (df)**	**T-test (df)**	**Sig.**
Age (years)	7	18.78 (0.28)	26	18.92 (0.36)		0.928 (31)	.360
Gender (male)	2 (28.6)		9 (34.6)		0.91 (1)		.100
CAPE frequency							
Positive	7	9.29 (9.98)	25	4.80 (5.03)		-1.149 (6.874)	.289
Negative	7	11.86 (6.57)	25	8.16 (4.31)		-1.785 (30)	.084
Depressive	7	8.43 (4.65)	25	4.76 (3.40)		-2.331 (30)	*.027*
CAPE distress							
Positive	7	7.43 (7.28)	22	3.32 (4.09)		-1.456 (7.248)	.187
Negative	7	12.43 (7.72)	25	7.24 (4.37)		-1.703 (7.111)	.132
Depressive	7	9.29 (5.41)	24	5.42 (4.05)		-2.062 (30)	*.048*
DASS							
Depression	7	10.29 (7.06)	25	6.80 (5.75)		-1.351 (30)	.187
Anxiety	7	10.29 (10.10)	25	6.24 (6.25)		-1.316 (30)	.198
Stress	7	11.14 (7.65)	25	8.56 (5.87)		-0.963 (30)	.343
Social Functioning							
Total Score	7	3.01 (0.49)	25	3.25 (0.42)		1.301 (30)	0.203
Parents	7	3.00 (1.01)	25	3.28 (0.72)		0.684 (7.783)	0.514
Romantic Relations	3	3.00 (0.87)	11	3.67 (0.34)		1.310 (2.167)	0.312
Friends/acquains	7	3.40 (0.61)	25	3.34 (0.52)		-0.243 (30)	0.809
School	7	2.40 (0.60)	22	3.20 (0.45)		3.763 (27)	*0.001*
Work	5	3.12 (0.77)	18	3.22 (0.58)		0.327 (21)	0.747
Household chores	2	3.60 (0.00)	14	3.30 (0.48)		-0.866 (14)	0.401
Hobbies	7	3.00 (0.41)	25	3.12 (0.67)		0.589 (16.041)	0.564

Chapter 5

Hallucinations in children and adolescents: an updated review and practical recommendations for clinicians

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ABSTRACT

Hallucinations in children and adolescents are now known to occur on a continuum from healthy to psychopathology-related phenomena. Although hallucinations in young populations are mostly transient, they can cause substantial distress. Despite hallucinations being widely investigated, research so far has had limited implications for clinical practice. The present paper has three main aims: (1) to review research findings since 2014 (when the last major review of the area was published); (2) to present assessment tools validated to measure hallucinations in children and adolescents; and (3) to discuss therapeutic strategies and clinical issues. We conclude by presenting a tailored care model for clinicians, and outline future challenges for research.

GENERAL INTRODUCTION

Hallucinations ("erroneous percepts in the absence of identifiable stimuli"[4]) have been widely investigated in both adult and younger populations, and new insights continue to emerge, both from studies on hallucinations (especially auditory hallucinations) in particular, as well as from complementary research on broader psychotic experiences (PE). Though hallucinations and related PE were traditionally conceptualized as intrinsic manifestations of psychotic disorders, the increasingly accepted framework is that such phenomena reflect broader trait-like phenotypes occurring on a continuum[11, 12]. The continuum of hallucinatory experiences in children and adolescents can be interpreted as resembling the distribution found in adults, with healthy children and adolescents at one end and those experiencing more clinically significant psychopathological syndromes at the other[4, 13, 14, 24, 92, 98, 99].

Superficial commonalities between hallucinations in adults and young people should not, however, be allowed to obscure significant differences that may obtain between them. One key issue is hallucination prevalence. A previous systematic review on the prevalence of PE revealed higher rates in children (17%, age 9–12 years) than in adolescents (7.5%, age 13–18 years)[43]—although a recent meta-analysis[100] of auditory hallucinations prevalence did not find such an age-group difference (12.7% in children and 12.4% in adolescents). Furthermore, prevalence rates of auditory hallucinations in adults (5.8%) and the elderly (4.5%) were found to be significantly lower than in younger populations[100]. This is consistent with studies showing a mostly transient course of hallucinations in children and adolescents[19-21, 24], suggesting they are frequently self-limiting and can possibly be part of typical development[100].

Another important issue is that hallucinations may have differing significances depending on what state of the life course they are associated with. Several studies have demonstrated that hallucinations occurring in adolescence are more indicative of psychopathology than hallucinations experienced during childhood[28, 76, 92]. However, despite being less indicative, childhood hallucinations can still cause distress and impaired functioning, and may, therefore, warrant clinical attention[24, 92, 101]. Unfortunately, research on hallucinations in children and adolescents has had limited impact on clinical practice, primarily due to the lack of consistent definitions, differences in assessment methods, and phenomenological complexity[2]. For example, in their meta-analysis of auditory hallucinations prevalence, Maijer et al.[100] identified 26 study samples that had used 11 different questionnaires. Such methodological variability is likely to confound the accurate reporting of hallucinations across studies of community populations.

In 2014, Jardri and colleagues[4] synthesized research results on childhood and adolescent hallucinations as part of the *International Consortium on Hallucination Research* (ICHR) working group and provided practical recommendations for future research. The present article has three main aims: (1) to outline new research that has since emerged since 2014; (2) to present assessment tools used to investigate hallucinations in children and adolescents; and (3) to discuss therapeutic strategies and clinical issues.

Before presenting our review, we consider some important issues about definitions. Our working definition of "hallucination" is "a sensory experience in which a person can see, hear, smell, taste, or feel something that is not there".

Hallucinations are reported in children as young as five years old, and the terms "early onset hallucinations" and "very early onset hallucinations" have used to refer to hallucinatory experiences occurring in young children[16, 92]. Although these terms might imply relevance for clinical outcomes, research findings are somewhat contradictory. For example, it is unclear what early or very early age of hallucination onset suggests about clinical course. Childhood hallucinations are reported as mostly transient[21, 24] and become increasingly associated with psychopathology during later adolescence[28, 76, 92]. Additionally, adult voice-hearers without need for care or distress have a significantly younger age of hallucination onset compared to voice-hearers with the need for care[102]. At the same time, hallucinations present at 11 years of age was shown to increase the risk for the development of later schizophreniform disorder[26]. So, although there might be an indication that older adolescents with onset of hallucinations are more likely to experience or develop psychopathology, it is unclear if there is an age threshold above which the presence of hallucinations significantly increases the risk for later psychopathology. Because of the current lack of consistent nosological substantiation of the terms 'very early onset' and 'early onset' hallucinations, we propose to define these terms in correspondence to neurodevelopmental age categories[43, 100]: 'very early' (or 'childhood') for ages <13 years and 'early' (or 'adolescent') for ages 13-18.

A second issue is the extent to which hallucinations are persistent. The 11-year cohort study by Bartels-Velthuis et al.[20] showed an overall 6.2% persistence rate from age 7-8 to age 18-19, with a decreasing persistence trend with increasing age (23.5% from age 7-8 to age 12-13 vs. 18.2% from age 12-13 to age 18-19). Since hallucinatory experiences are by definition state phenomena (in the sense of typically unfolding over a discrete period of time), their temporal persistence is plausibly an index of psychopathological significance. Indeed, the degree of persistence of hallucinations over time may be an important predictor of transition to a clinically significant disorder[4, 18]. For example, persistence of hallucinations was shown to be associated with an increased risk for psychotic and

non-psychotic psychopathology[20, 103, 104], as well as drug abuse and suicide attempts[104], and need for mental health care[105]. Nevertheless, as these studies show, hallucinations and other subthreshold positive symptoms exhibit varying trajectories, and children and adolescents with transient symptoms still have worse outcome measures and reduced quality of life at follow-up than typically developing peers[106]. In addition, studies have measured persistence of hallucinations across a range of durations (eg, 1.6 to 8.4 years[103], 6 years[105], and 11 years[20]), and there is no clear consensus on how long hallucinations should be present for them to be considered "persistent".

We performed a search for relevant studies published from January 2014 (the preparation date of Jardri et al.'s[4] review) until July 12, 2017 in PubMed using the following search terms: ((infant[Title/Abstract] OR infancy[Title/Abstract] OR child*[Title/Abstract] pediatric[Title/Abstract] OR paediatric[Title/Abstract] OR adolescen*[Title/Abstract]) AND hallucinat*[Title/Abstract]). The search retrieved 216 articles. Screening titles, excluding case reports and specific somatic disorder related hallucinations, resulted in 57 eligible articles. These articles were used according to relevance and scope of the present paper. Also, relevant papers published after July 12, 2017 were incorporated. Although we emphasize post-2014 articles in the current article, we also, for the sake of giving the fullest picture of the current state of research, discuss their congruence (or otherwise) with earlier literature.

Research findings since 2014

Since the 2014 publication[4], new research specifically regarding hallucinations in youth has been scarce. There is accumulating evidence suggesting an impaired global functioning of youth with auditory verbal hallucinations (AVHs), even when compared to adolescents with mental disorders (but without hallucinations)[22, 23]. With regard to high and heterogenic (co)morbidity rates, a recent study in help-seeking children and adolescents with auditory hallucinations confirmed that the occurrence of hallucinations is associated with the full range of psychotic, affective, anxiety, autistic, behavioral, personality and trauma disorders as well as cognitive impairments and parent-parent and/or parent-child interaction problems; and the majority of the sample (53%) was classified with two or more DSM diagnoses[92].

Suicidality

Accumulating evidence, from both general population and clinical samples, demonstrates a strong relationship between hallucinations in children and adolescents and comorbid suicidality with increased risk of suicide attempts[107, 108]. Moreover, hallucinations predict incident suicidal behavior in the short term (at 3-month[109] and 12-month[109, 110] follow-

up), in the medium term (when followed from childhood into adolescence[105, 111]) and in the longer term (when followed from childhood and adolescence into adulthood[104, 112, 113]). The relationship between hallucinations and suicidal behavior cannot be simply explained by co-occurring psychopathology. Research has demonstrated that individuals with psychopathology and hallucinations have an increased risk of suicidal behavior over and above that which would be associated with psychopathology alone[31, 109]. A number of factors may contribute to the increased risk of suicidality associated with hallucinations, including direct causation (ie, command hallucinations), but also the distress caused by hallucinatory experiences in general, as well as shared risk factors, such as mental disorders (where hallucinations and suicidality may be regarded as markers of psychopathological severity), substance use and environmental (ie, trauma and stressful life events) and psychological (ie, self-esteem and emotional regulation) factors resulting in indirect pathways[114].

Neuroimaging

We found only one post-2014 study specifically providing some insight in hallucinations in youth through neuroimaging studies. Amico and colleagues[115] studied 20 young people (aged 13-16 years) with AVH and 20 controls; for the AVH group they found anomalies in functional connectivity directly and indirectly involving the Default Mode Network (DMN), the Salience Network and Central Executive Network, as well as neural networks involving both primary and secondary auditory cortical regions. These findings were in line with previous work from Jardri and colleagues[116], showing that hallucinatory experiences emerge from a spontaneous DMN withdrawal.

Psychological factors

Specific psychological models of the mechanisms involved in the onset and maintenance of hallucinations have been examined. However, evidence for these models in children and adolescents is sparse. The cognitive model for positive symptoms of psychosis by Garety and colleagues[117] asserts that higher hallucination severity is associated with higher levels of emotional disturbance, cognitive biases, and negative life events. This has also been found in children and adolescents[118]. Cognitive biases such as jumping to conclusions[119], less positive schematic beliefs about self/others[120], and metacognitive beliefs[121] are all associated with hallucinations in young populations. Metacognitive beliefs[121] were also shown to be associated with unusual perceptions in adolescents from the general population, but more studies are needed to test the metacognitive model for hallucination proneness[122]. More recently, social cognitive mechanisms such as impairments in theory-of-mind or mentalizing have been proposed as potentially key in the emergence of hallucinations in children and adolescents[123, 124]. For example, Clemmensen et al.[123] found paranoid delusions but not hallucinations to be associated

with hyper-theory-of-mind. However, Pignon and colleagues[16] did find deficits in theory-of-mind skills in children with hallucinations. Perhaps the difference in age (and thus developmental stage) between these two studies can explain these different findings. The identification of psychological mechanisms that are associated with the emergence and persistence of hallucinations in children and adolescents may inform indicated preventative strategies in the future[125].

Social and cultural factors

Trauma and negative life events are known to be associated with hallucinations in a bidirectional dose-response relationship[126-128]. Trauma is also associated with the persistence of hallucinations[20]. However, the majority of children and adolescents experiencing maltreatment do not develop hallucinations[126] and not every child or adolescent with hallucinations has experienced negative life events[90]. However, these studies do suggest that children exposed to current or past traumatic event(s) are more vulnerable to the presence and potentially the persistence of voices. Moreover, discontinuation of negative life events predicts discontinuation of hallucinations[127], providing an opportunity for targeted intervention strategies, such as programs against bullying.

Hallucinations are typically understood differently when comparing European and African samples[129]. However, there are sparse studies of cultural factors in hallucinations involving children and adolescents. Adriaanse et al.[66] examined the prevalence and impact of PE in a large community sample of ethnic minority and majority youth in the Netherlands. They found that minority children had a two- to threefold higher prevalence of PE with high impact compared to Dutch peers. In addition, religious beliefs and/or experiences may also influence prevalence estimates. For example, one study found that moderately religious adolescents were more likely to report and develop hallucinations than non-religious adolescents[130]. It was speculated that religious rituals and activities could have been adopted as a method of appraisal of or coping with their hallucinations. These findings point to the need to assess ethnic and cultural context when constructing intervention strategies for young people.

Gene and environment factors

There is limited evidence available from studies of genetic and environmental influences on hallucinations in children and adolescents. Zavos et al.[131] reported that out of all types of PE, heritability was lowest for hallucinations. Nevertheless, in their twin study, both extreme/frequent and milder/less frequent PE in adolescents were influenced by the same genetic and environmental factors. A genomic wide association study from Pain et al.[132]

showed that PLEs show genetic overlap with psychiatric diagnoses. The results of these two studies support the continuum hypothesis.

Assessment tools

The subjective and stigmatized nature of hallucinatory experiences and an expectation of a negative response from others may act as barriers to the disclosure of hallucinations[133]. Furthermore, clinicians may lack confidence in talking about hallucinatory experiences[6]. When disclosure does occur and is appropriately responded to, there are few psychometric tools for hallucinations that are suited to the cognitive and literacy levels of children and adolescents[4]. In addition, assessment tools for hallucinations need to be directed at children and adolescents themselves, as parents are not always aware of their children's experiences, and may report lower levels of symptoms[19, 24, 134]. There are a number of instruments that more broadly assess PEs during childhood and adolescence (see Table 1)[39, 57, 61, 68, 104, 105, 135-163]. However, these measurements commonly assess the presence of hallucinations in the auditory domain only, using just a single item (e.g. "Have you ever heard voices or sounds that no one else can hear")[16, 107]. Merely assessing the presence of hallucinations may be useful, but does not incorporate specific characteristics and qualities of hallucinations. For the purpose of this review, the focus will be on outlining (new) instruments specifically designed to assess the phenomenology of hallucinations in youth.

Table 1. Instruments that assess for the presence of hallucinations in children and adolescents[a]

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
Instruments that comprehensively evaluate for a broad range of psychiatric disorders and/or symptoms in children and adolescents				
CAPA	Angold et al., 1995	Semi-structured diagnostic interview for ages 9-18.	[b]	"Do you ever hear things that other people can't hear? Or see things that other people can't see? Do you ever notice smells or tastes that other people don't?"
DISC	Shaffer et al., 2000	Semi-structured diagnostic interview for ages 6-18.	[b]	YCH56. "In the last year, have you ever seen something or someone that other people who were present could not see, that is had a vision when you were completely awake?" YCH57. "In the last year, have you heard things other people could not hear, such as a voice?"
K-SADS	Kaufman et al., 1997	Semi-structured diagnostic interview for ages 6-18.	[b]	"Has there ever been a time when you heard voices that other people could not hear? ... Did you ever hear music which other people could not?" "Has there ever been a time when you saw things like people or figures that other people could not see?" "Has there ever been a time when you smelled things that other people could not smell or felt things that were not there?"
Instruments that screen for a broad range of psychiatric disorders and/or symptoms in children and adolescents				
BASC	Reynolds & Kamphaus, 2004	Commercially-available (www.pearsonclinical.com) comprehensive screening system for measuring behavioral and emotional strengths and weaknesses in children and adolescents in preschool through high school; system consists of a teacher rating scale and a parent rating scale in addition to a 176-item self-report form; items 1-69 on self-report form are rated true (T) or false (F), while items 70-176 are rated never (N), sometimes (S), often (O), or almost always (A).	The 'atypicality' scale of BASC-2, consisting of 9 items that assess symptoms similar to those identified by psychosis risk screeners (odd behaviors, delusional thoughts, paranoia, and hallucinations), was validated against the SIPS in 70 help-seeking youth ages 12-22; sensitivity 65%, specificity 87%, PPV 80%, NPV 76%(Thompson et al. 2015).	62. "Sometimes, when I'm alone, I hear my name." 122. "I hear voices in my head that no one else can hear." 130. "I see weird things." 160. "I hear things that others cannot hear."

Table 1. (Continued)

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
YSR	Achenbach, 1991	Widely used 112-item self-report questionnaire, derived from the Child Behavior Checklist (CBCL); rated on a 3-point Likert scale ('0=not true,' '1=somewhat or sometimes true,' '2=very true or often true').	In a birth cohort of 3,801 individuals born in Australia between 1981-1984 and enrolled in the Mater-University Study of Pregnancy and its Outcomes (MUSP), higher YSR scores at age 14 were associated with increased risk of screening positive for non-affective psychosis (SP-NAP) on the CIDI (WHO, 1992) at age 21, in males. +AH on the YSR at age 14 showed a 5.1-fold odds (95% CI 2.2-11.8) in males and a 2.3-fold odds (95% CI 1.0-5.1) in females of becoming SP-NAP at 21. +VH on the YSR at age 14 was associated with a 2.9-fold odds (95% CI 1.1-7.5) of becoming SP-NAP at 21(Welham et al. 2009). Individuals from the MUSP birth cohort study (250 who reported YSR hallucinations only at age 14, 83 who reported YSR hallucinations at both 14 and 21 years, and 321 who did not endorse hallucinations at either 14 or 21) were assessed again at age 30-33; hallucinations at age 14 alone not associated with any mental disorder in adulthood vs. hallucinations endorsed at both 14 and 21 years had increased odds of being diagnosed with a psychotic disorder, a substance use disorder, and lifetime suicide attempts(Connell et al. 2016). The "thought problems" subscale of the YSR (9 items, including AH and VH) was also used to prospectively track different trajectories of subclinical psychotic experiences among adolescents in the general Dutch population participating in the TRacking Adolescents' Individual Lives Survey (TRAILS)(Wigman et al. 2011).	40. "I hear sounds or voices that other people think aren't there." 70. "I see things that other people think aren't there."

Table 1. (Continued)

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
Instruments that comprehensively evaluate for psychosis or psychosis-like experiences in children and adolescents				
CAARMS	Yung et al., 2005	Comprehensive diagnostic interview and rating system to assess psychosis risk.	[b]	"Do you have visions, or see things that may not really be there? Do you ever see things that others can't, or don't seem to?..." "Do you ever hear things that may not really be there? Do you ever hear things that other people seem not to (such as sounds or voices)?..." "Do you ever smell things that other people don't notice?..." "Do you ever get any odd tastes in your mouth?..." "Do you ever get strange feelings on, or just beneath, your skin?..." "Have you noticed any change in your bodily sensations, such as increased, or reduced intensity? Or unusual bodily sensations such as pulling feelings, aches, burning, numbness, vibrations?"
SIPS	Miller et al., 2003	Structured interview to diagnose the psychosis prodrome; consists of the Scale of Prodromal Symptoms (SOPS), Schizotypal Personality Disorder Checklist, family history questionnaire, and global assessment of functioning (GAF).	[b]	*Auditory:* 3. "Do you ever hear unusual sounds like banging, clicking, hissing, clapping, or ringing in your ears?" 4. "Do you ever think you hear sounds and then realize that there is probably nothing there?" 5. "Do you ever hear your own thoughts as if they are being spoken outside your head?" 6. "Do you ever hear a voice that others don't seem to or can't hear?" *Visual:* 3. "Have you ever seen unusual things like flashes, flames, vague figures or shadows out of the corner of your eye?" 4. "Do you ever think you see people, animals, or things, but then realize they may not really be there?" 5. "Do you ever see things that others can't or don't seem to see?" *Somatic:* 1. "Have you noticed any unusual bodily sensations such as tingling, pulling, pressure, aches, burning, cold, numbness, vibrations, electricity, or pain?" *Olfactory and Gustatory:* 1. "Do you ever small or taste things that other people don't notice?"

Table 1. (Continued)

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
Instruments that screen for psychosis or psychosis-like experiences in children and adolescents				
APSS	Kelleher & Cannon, 2011	7-item self-report questionnaire (4 items from DISC(Shaffer et al. 2000) plus additional questions on visual hallucinations, delusions of control, and grandiosity); includes 3-choice response ('Yes, definitely'=1 point, 'Maybe'=0.5 point, 'No, never'=0 point).	Validated against the K-SADS in 334 adolescents ages 11-13 in the school setting in Dublin, Ireland; PPV 100% and NPV 88.4% for any psychotic-like experiences (PPV 71.4%, NPV 90.4% for AH) (Kelleher & Cannon, 2011).	4. "Have you ever heard voices or sounds that no one else can hear?" 6. "Have you ever seen things that others cannot see?"
CAPE-42	Stefanis et al., 2002	42-item self-report questionnaire modified from PDI-16(Peters et al. 2004); includes 4-choice response ('never,' 'sometimes,' 'often,' 'nearly always'); for any response other than 'never,' respondent is instructed to indicate degree of distress caused by the experience.	Validated against the CAARMS in 165 help-seeking youth ages 13-24; PPV 65%, NPV 63% for full questionnaire (cut-off of 3.2 in the positive dimension subscale showed sensitivity 67%, specificity 73%, PPV 72%, NPV 68%; cut-off of 2.8 showed sensitivity 83%, specificity 49%, PPV 63%, NPV 74%)(Mossaheb et al. 2012).	30. "Do you ever hear your own thoughts being echoed back to you?" 33. "Do you ever hear voices when you are alone?" 34. "Do you ever hear voices talking to each other when you are alone?" 42. "Do you ever see objects, people, or animals that other people cannot see?"
DAWBA-PE-S	Gundersen et al., 2018	10 self-report items on psychotic experiences (PE), or 'strange experiences that are surprisingly common'; PE section is embedded within the DAWBA, a comprehensive online questionnaire administered to parents, children (ages 11+), and teachers (PE items answered only by the child); rated on a 3-point Likert scale ('0=no,' '1=a little,' '2=a lot').	Validated against 22 K-SADS psychosis items in 1,571 children ages 11-12 participating in a longitudinal birth cohort study in Copenhagen, Denmark (Copenhagen Child Cohort 2000); sensitivity 74%, specificity 77%, PPV 27%, NPV 96%(Gundersen et al. 2018).	T1. "Anthony sees visions. He sees people, animals or other things that seem unreal to him but that can't be seen by other people even if they are there at the time. Do you ever see visions?" T2. "Bill hears special voices inside his head. For example, he hears strange voices talking to him or about him. Do you ever hear special voices inside your head?" T3. "Charles hears special voices coming out of the air when there is definitely no one around. This is not just him imagining that he has heard someone calling his name (which is extremely common). He hears much more than this: conversations about himself or people talking a lot to him. Do you ever hear special voices from outside yourself?"

Table 1. (Continued)

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
HQ[c]	Posey & Losch, 1983; Pearson et al., 2008	14-item self-report questionnaire (version modified for adolescents by Pearson et al(Pearson et al. 2008) contains 12 items - voice of God and driving-related items excluded); binary response (yes/no).	Modified version was used to assess hallucinatory experiences in a non-clinical sample of 250 adolescents in the UK ages 14-15 (compared to a non-clinical adult sample)(Pearson et al. 2008).	1. "Sometimes I have thought I heard people say my name…like in a store when you walk past some people you don't know…Has something like this ever happened to you?" 5. "When I was little, I had an imaginary playmate, I remember that I really thought I heard her voice when we talked… a) Did you have an imaginary playmate? b) Did you hear his/her voice aloud?" 6. "Every now and then—not real often—I think I hear my name on the radio. Happened to you?" 7. "Sometimes when I'm in the house all alone, I hear a voice call my name…I guess I kind of know that it really isn't somebody and it's really me…but it does sound like a real voice. Happened to you?" 8. "Last summer I was hanging up clothes in the backyard. Suddenly I heard my [husband] call my name from inside the house. He sounded like something was wrong and was loud and clear. I ran in…but he was out in the garage and hadn't called at all….This or something similar happen to you?" 9. "I've heard the doorbell or the phone ring when it didn't. Happen to you?" 10. "I hear my thoughts aloud. Happen to you?" 11. "I have heard God's voice…not that he made me know in my heart…but as a real voice. Happen to you?" 12. "When I am driving in my car…particularly when I'm tired or worried…I hear my own voice from the backseat… usually soothing… Similar things happen to you?" 13. "I drive a lot at night…. Sometimes late at night, when I'm tired, I hear sounds in the backseat like people talking… just a word here and there… Anything similar happen to you?" 14. "Almost every morning…I have a pleasant conversation with my dead grandmother. I talk to her and quite regularly hear her voice actually aloud. Anything similar happen to you?"

Table 1. (Continued)

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
LHSH-R	Launay & Slade 1981; Bentall & Slade, 1985	12-item self-report questionnaire; revised version by Bentall & Slade[20] rated on a 5-point Likert scale ('0=certainly does not apply to you,' '1=possibly does not apply to you,' '2=you're unsure,' '3=possibly applies to you,' '4=certainly applies to you').	Items #7 and 12 were used to assess for AVH in a population-based sample of 9,646 Norwegian adolescents ages 16-19(Kompus et al. 2015).	2. "In my daydreams I can hear the sound of a tune almost as clearly as if I were actually listening to it." 5. "The sounds I hear in my daydreams are usually clear and distinct." 7. "I often hear a voice speaking my thoughts aloud." 8. "In the past I have had the experience of hearing a person's voice and then found that no one was there." 9. "On occasions I have seen a person's face in front of me when no one was in fact there." 10. "I have heard the voice of the devil." 11. "In the past I have heard the voice of God speaking to me." 12. "I have been troubled by hearing voices in my head."
PLEQ-C	Laurens et al., 2012	9-item self-report questionnaire (5 items adapted from DISC(Shaffer et al. 2000) plus 4 additional items); includes 3-choice response ('0=not true,' '1=somewhat true,' '2=certainly true').	Factor analytic methods were used to determine the latent structure of psychosis-like experiences in 7,966 children ages 9-11 recruited from 73 primary schools in the greater London area; the two hallucination items were most able to discriminate a latent psychotic-like construct from dimensions representing internalizing and externalizing problems(Laurens et al. 2012).	4. "Have you ever heard voices that other people could not hear?" 9. "Have you ever seen something or someone that other people could not see?"

Table 1. (Continued)

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
PLIKSi	Horwood et al., 2008	Semi-structured interview with 12 'core' items [7 items from DISC(Shaffer et al. 2000) + 5 items from SCAN(Wing et al. 1990)] covering 3 domains of positive psychotic symptoms (hallucinations, delusions, bizarre symptoms); includes 3-choice response ['yes' (Y), 'no' (N), 'maybe' (M)] and additional options for 'refused' (R) and 'don't know' (DK); if child answers 'yes' or 'maybe,' interviewer uses supplementary questions to probe (e.g., items H2-H11, H18-H19). Interviewer is also prompted to ask if the specific item in question only ever happened when falling asleep or waking up, when ill with a high temperature, when drinking alcohol, or while using drugs (cannabis, amphetamines/speed, glue, others, or not applicable).	In 6,455 children, mean age 12.9 years (range 11.4-14.3), from the Avon Longitudinal Study of Parents and Children (ALSPAC) birth cohort in the UK, PPV's when comparing self-report with the final interviewer ratings, were poor (3-50%) for all items except AH (71%)(Horwood et al. 2008).	*Auditory:* H1. "Since your 12th birthday have you ever heard voices that other people can't hear?" H2. "What did you hear? What kinds of things did you hear? What did you think it was? Did you think it was your imagination or real? Was it like a thought or more like a voice?" H3. "How often have these voices happened to you since your 12th birthday?" H4. "The voices that you have heard, where did they come from? From inside your head? Was it your thoughts you heard? Could other people hear the voices?" H5. "From outside your head, through your ears? Did it sound as clear as my voice does talking to you right now?" H6. "Do the voices talk directly to you or tell you things?" H7. "Do these voices tell you anything? (what?) (Good or bad?) Have they ever told you to hurt yourself or kill yourself? Have they ever told you to hurt or kill someone else? Who? How?" H8. "Do you hear voices that talk about what you're doing? Or feeling? Or thinking?" H9. "Do you ever hear 2 or more voices (that others couldn't hear) talking to each other? Or about you? H10. "Have there been other noises or voices you have heard that you have not told me about? [Rate here sporadic (single word) hallucinations.]" H11. "Or elementary hallucinations (noises such as bangs or bells)?" *Visual:* H17. "Since your 12th birthday have you ever seen something or someone that other people couldn't see?" H18. "Did it see real? Can you give me an example?" H19. "How often has this occurred since your 12th birthday?"

Table 1. (Continued)

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
PRIME-R	Miller et al., 2004	12-item self-report questionnaire developed by the authors of the SIPS; asks about experiences within the year; rated on a 7-point Likert scale ('0=definitely disagree,' '1=somewhat disagree,' '2=slightly disagree,' '3=not sure,' '4=slightly agree,' '5=somewhat agree,' '6=definitely agree').	Validity of Japanese version tested in 528 psychiatric outpatients ages 16-30; in the 115 patients who completed both PRIME-R and SIPS, sensitivity was 100%, specificity 74%, PPV 43%, NPV 100%(Kobayashi et al. 2008). Validity also tested using the SIPS in 49 individuals ages 12-22 accessing mental health services in the US; using a cutoff of ≥2, sensitivity 80%, specificity 48%, PPV 52%, NPV 78%)(Kline et al. 2012). A culturally modified (mPRIME) version showed less robust validity measures in a non-clinical sample of 2,758 Kenyan youth ages 14-29; in the 182 individuals who completed both the mPRIME and SIPS, sensitivity was 40%, specificity 65%, PPV 12%, NPV 90%(Owoso et al. 2014).	10. "I have had the experience of hearing faint or clear sounds of people or a person mumbling or talking when there is no one near me." 11. "I think that I may hear my own thoughts being said out loud."
PQ-B	Loewy et al., 2008	21-item (brief version) self-report questionnaire; asks about experiences within the past month; binary response (yes/no); if answer is 'yes,' respondent is asked to indicate how problematic the experience is.	Validated against the SIPS in 141 individuals ages 12-35 referred to one of two prodromal research clinics in the US (Calif.); cutoff of ≥3 demonstrated sensitivity 89%, specificity 58%, PPV 93%, NPV 46%(Loewy et al. 2011). Validity also tested using the SIPS as gold standard in 49 individuals ages 12-22 accessing mental health services in the US (Maryland); cutoff of ≥6 showed sensitivity 95%, specificity 28%, PPV 48%, NPV 89%[a](Kline et al. 2012).	2. "Have you heard unusual sounds like banging, clicking, hissing, clapping or ringing in your ears?" 9. "Do you sometimes get strange feelings on or just beneath your skin, like bugs crawling?" 17. "Are your thoughts sometimes so strong that you can almost hear them?" 19. "Have you seen unusual things likes flashes, flames, blinding light, or geometric forms?" 20. "Have you seen things that other people can't see or don't seem to see?"

Table 1. (Continued)

Instrument	Authors	Properties	Validity in children/adolescents[b]	Hallucination item(s)
PQ-16	Ising et al., 2012	16-item self-report questionnaire; binary response (true/false); if answer is 'true,' respondent is asked to indicate how much distress he/she experiences on a 4-point scale ('0=No,' '1=Mild,' '2=Moderate,' '3=Severe').	Validated in 3,671 help-seeking Dutch adults ages 18-35[31]; Italian version (iPQ-16) validated against the CAARMS in 72 help-seeking adolescents ages 13-17 referred to child and adolescent neuropsychiatry services; sensitivity 77%, specificity 54%, PPV 72%, NPV 60%[32].	3. "I sometimes smell or taste things that other people can't smell or taste." 4. "I often hear unusual sounds like banging, clicking, hissing, clapping, or ringing in my ears." 6. "When I look at a person, or look at myself in a mirror, I have seen the face change right before my eyes." 8. "I have seen things that other people apparently can't see." 9. "My thoughts are sometimes so strong that I can almost hear them." 13. "I have heard things other people can't hear like voices of people whispering or talking."
SPEQ	Ronald et al., 2014	63-item self- and parent-report questionnaire comprised of six psychosis subscales; the 9 items in the hallucination subscale were selected from the CAPS[34] and rated on a 6-point Likert scale ('0=not at all,' '1=rarely,' '2=once a month,' '3=once a week,' '4=several times a week,' '5=daily').	Validity assessed via agreement with the PLIKSi in approx. 5,000 16-year-old twins born in the UK (and their parents); correlation between SPEQ and PLIKSi for hallucinations was r=0.60, p < 0.001(Ronald et al. 2014).	"Hear sounds or music that people near you don't hear?" "See things that other people cannot?" "Feel that someone is touching you, but when you look nobody is there?" "Hear noises or sounds when there is nothing about to explain them?" "Detect smells which don't seem to come from your surroundings?" "See shapes, lights, or colors even though there is nothing really there?" "Notice smells or odors that people next to you seem unaware of?" "Experience unusual burning sensations or other strange feelings in or on your body that can't be explained?" "Hear voices commenting on what you're thinking or doing?"
Y-PARQ-B	Ord et al., 2004	28-item (brief version) self-report questionnaire, based on the CAARMS; includes 3-choice response ('Y'=yes, 'N'=no, 'U'=undecided).	Validated against the SIPS in 49 individuals ages 12-22 accessing mental health services in the US; using a cutoff of ≥ 11, sensitivity was 65%, specificity 76%, PPV 65%, NPV 76%(Kline et al. 2012).	12. "Do you ever hear the voice of someone talking that other people cannot hear?" 15. "Have you noticed any unusual bodily sensations such as tingling, pulling, pressure, burning, cold, vibrations, drilling, tearing, or electricity?" 19. "Do you ever hear sounds that are not there?" 22. "Do you see things that others can't or don't see?" 24. "Do you get strange feelings on or just beneath your skin?"

Table 1. (Continued)

Note: AH, auditory hallucinations; AVH, auditory verbal hallucinations; APSS, Adolescent Psychotic Symptom Screener; BASC, Behavior Assessment System for Children; CAARMS, Comprehensive Assessment of the At-Risk Mental State; CAPA, Child and Adolescent Psychiatric Assessment; CAPE, Community Assessment of Psychic Experiences; CAPS, Cardiff Anomalous Perceptions Scale; CIDI, Composite International Diagnostic Interview; DAWBA-PE-S, The Development and Well Being Assessment, Self-Reported Psychotic Experiences; DISC, Diagnostic Interview Schedule for Children; K-SADS, Kiddie Schedule for Affective Disorders and Schizophrenia for School Aged Children; HQ, Hallucination Questionnaire; LHSH-R, Launay-Slade Hallucination Scale, Revised; NPV, negative predictive power; PDI-16, Peters Delusions Inventory, 16 Item; PPV, positive predictive value; PLEQ-C, Psychotic-Like Experiences Questionnaire for Children; PLIKSi, Interview for Psychosis-Like Symptoms; PQ-16, Prodromal Questionnaire, 16 Item; PQ-B, Prodromal Questionnaire, Brief; PRIME-R, PRIME Screen, Revised; SCAN, Schedules for Clinical Assessment in Neuropsychiatry; SIPS, Structured Interview for Psychosis Risk Syndromes; SPEQ, Specific Psychotic Experiences Questionnaire; Y-PARQ-B, Youth Psychosis At-Risk Questionnaire, Brief; YSR, Youth Self Report.

[a]Only instruments available in English are listed, all references can be found in the reference list of the thesis.
[b]Validation measures in children and adolescents are described only for screening instruments.
[c]Hypnagogic and hypnopompic hallucination items in the Hallucination Questionnaire (items 2-4) not listed.

Since the 2014 paper[4], two themes relating to the assessment of hallucinations have emerged. First, the introduction of developmentally appropriate methods of assessment that are suitable and comfortable for a younger generation. Second, the use of a structured, systematic and comprehensive approach to the assessment of hallucinations in youth. See Table 2 for an overview of the most recently developed instruments, in line with these themes.

Regarding theme 1, it is important to acknowledge that the current generation of children and adolescents are increasingly using digital platforms. The MHASC[164] (Multisensory Hallucinations Scale for Children) was specifically developed with this in mind and assesses quantitative and phenomenological features of hallucinations in all modalities. This app utilizes common game-based aesthetics and codes to increase engagement and motivation of children and adolescents during the assessment, using a simple, intuitive and playful interface with developmentally appropriate language[165]. The MHASC app was designed for use in community populations of children and adolescents. Recognizing that potential harm can come from labeling the experienced phenomena as mental illness, the developers emphasize that MHASC is not a diagnostic tool but more a quantitative and phenomenological measure. The MHASC app is currently being validated and will be made freely available on common App Stores in multiple languages.

Table 2. Instruments that assess for phenomenological features of hallucinations in youth

Instrument	Age group	Modalities	Benefits	Drawbacks
MHASC	Very early & early onset	5 sensory modalities explored + cross modal experiences (auditory, visual, somatosensory, gustatory, olfactory)	Attractive layout (game-based app) Systematic and comprehensive	Validation ongoing
SOCRATES	Very early & early onset	1 sensory modality explored (auditory)	Systematic and comprehensive	Requires clinical skills and presence of interviewer Not validated
AVHRS-Q	Early onset	1 sensory modality explored (auditory)	Quick assessment Systematic and comprehensive Validated	Not suitable for very early onset hallucinations

Note: MHASC, Multisensory Hallucinations Scale for Children; AVHRS-Q, Auditory Vocal Hallucination Rating Scale Questionnaire; SOCRATES, Assessment of Perceptual Abnormalities and Unusual Thought Content.

The SOCRATES assessment of perceptual abnormalities and unusual thought content, similarly, provides a structured and comprehensive approach to assess specific characteristics of hallucinations (auditory and others), for use in children and adolescents in both clinical and research environments[166]. It has been developed with the aim of providing a method that is standardized, systematic and comprehensive, facilitating the assessment of changes over time and the comparison of phenomena across studies and centers.

For the assessment of specific characteristics and severity of AVH in pediatric populations, the Auditory Vocal Hallucination Rating Scale[93, 167] (AVHRS) can be used.

In adolescent (and adult) populations (aged from 12 years), the AVHRS-Q(uestionnaire) has been developed as a self-report version of the AVHRS[94]. The AVHRS-Q can be delivered online, providing a brief (on average taking 6 min) and comprehensive assessment of AVH. The AVHRS-Q has been used in the second follow-up of a large Dutch cohort study on auditory verbal hallucinations in 18-19 year old adolescents[20], and is currently being validated.

To conclude, the MHASC, the SOCRATES and the AVHRS-Q assessment are all suitable for the assessment of characteristics and phenomenology of AVH in youth and are outlined in Table 2. All of these instruments are primarily developed for research purposes, although they can also be applied in clinical practice to help clinicians to standardize their assessment of hallucinations. New digital technologies and other methods have presented new opportunities for both research and clinical practice, in order to better reach, study, assess and if necessary treat children and adolescents with hallucinations.

Therapeutic strategies and clinical issues

Children and adolescents may seek help for hallucinations, presenting themselves to community health services, general practitioners, outpatient clinics and emergency services[7, 92, 168, 169], and a number of treatment options are available.

Targeted psychoeducation and psychotherapy

Kapur and colleagues[7] investigated the experience of children and adolescents with hallucinations and their parents when engaging in mental health services. These young voice hearers reported feeling lost, not listened to, and found it difficult to obtain useful information. Parents sought a holistic approach (including counselling, peer groups, meditation, drug information sharing and alternative educational opportunities), whereas the children and adolescents preferred a more normalizing and destigmatizing approach. In line with the need for a more holistic approach, psychological interventions with a transdiagnostic and symptom-specific focus are deemed more acceptable by both clinicians and children and adolescents[3, 7]. Also, Jardri and colleagues[4] emphasized an urgent need for psychotherapeutic interventions specifically developed for children and adolescents. Furthermore, Ruffell and colleagues[33] conclude that targeted cognitive behavioral therapy (CBT) for PE in children and adolescents is recommended to improve clinical outcome. Currently, such tailored interventions are being developed. In the UK, hallucinations are one target of the Coping with Unusual ExperienceS for children (age <12 years) (CUES) (ISRCTN 13766770) and Coping with Unusual ExperienceS for 12-18 year olds (CUES+)[170] (ISRCTN 21802136) studies that are evaluating CBT-informed interventions for children and adolescents with PE. In the Netherlands, Maijer and colleagues[92] (see their supplementary material for more information) developed Stronger Than Your Voices (STYV), which is a form of CBT developed at an outpatient clinic for children and adolescents suffering from hallucinations that can be applied regardless of age or possible underlying (psychiatric) disorder. STYV is currently being assessed within a feasibility study.

The relation-based therapies for hallucinations that are being developed for adults might also be useful for young people (eg, relating therapy[171]), given their emphasis on responding in more adaptive ways to difficult relationships (irrespective of the seen [social] or unseen [auditory hallucination] nature of the relational other). This focus on relationships addresses the aforementioned need for therapy to incorporate holistic and normalizing approaches.

Medication

Medication does not play a primary role in the treatment of hallucinations. When hallucinations are present in children and adolescents in the context of an established psychotic disorder, treatment with antipsychotic medication can be considered, following treatment guidelines[34]. However, the presence of distressing hallucinations does not always justify the diagnosis of a psychotic disorder and thus warrants restraint in prescribing antipsychotic medication[92, 172]. Incidentally, for example when hallucinations are a symptom or signal of decompensation of underlying conditions (such as an autism spectrum disorder or borderline personality disorder), antipsychotic medication can be considered as a (temporary and supplementary) intervention, according to related (inter) national guidelines and treatment protocols.

Other interventions

Other hallucination-focused interventions for children and adolescents include repeated transcranial magnetic stimulation (rTMS) as an add-on to therapy for persistent hallucinations. Although no new research on rTMS specifically for hallucinations in children and adolescents has emerged since 2014[4], earlier findings highlight the potential beneficial effects of low-frequency rTMS on reducing early-onset treatment-resistant hallucinations. There remains a need for large controlled trials to test its efficacy, which may aid in determining optimized stimulation parameters and evaluate its long-term therapeutic effect.

The use of virtual reality and avatars in the treatment of several dimensions of psychotic symptoms is promising[173, 174], although there is still limited research, which is only restricted to adults at this time. In addition to digital assessment tools, online and virtual treatment strategies might be specifically appealing to children and adolescents and should be explored in future research.

Clinical application

When screening for hallucinations, it is important to note the potential barriers to disclosure[133] and the possibility that parents may not always be aware of the presence and/or significance of children's hallucinations[19, 24, 134]. Moreover, children from young

ages have the capacity to report on their hallucinatory experiences[16, 24, 92, 100] and the age-appropriate questionnaires (albeit mostly regarding auditory hallucinations) described above can be used to facilitate these conversations in both community and clinical settings.

Attention has been drawn to the needs of children and adolescents actually seeking help for hallucinations, as the duration and severity of their complaints are often substantial, and there can be a variety of (severe) comorbid psychopathology[92]. Help-seeking children and adolescents and their parents are in need of information and targeted help to address hallucinations, preferably through a holistic and de-stigmatizing approach[7, 92]. The rise of easily accessible community services (such as Headspace in Australia, Heads Together in the United Kingdom, and @Ease in the Netherlands) might support such an approach and perhaps diminish the gap between the duration of complaints and referral to appropriate care. These community services could fulfill the need for easily accessible ways to gain information and/or to screen whether there is an indication for referring to mental health care facilities.

When encountering children and adolescents seeking help for hallucinations, clinicians should initially adopt a "curious-but-cautious" attitude, seeking to learn more about the hallucinatory experience and its psychosocial and psychopathological context. A holistic perspective can maximize engagement at this stage and the provision of psychoeducation about hallucinations, especially within the framework of the continuum model, may be helpful. If the clinician identifies that hallucinations are present, underlying causative factors and/or (psycho)pathology should first be targeted before considering hallucination-specific interventions. The experience of the clinicians working at the specialized outpatient clinic for youth with AVH at the UMC Utrecht suggests that in many cases, hallucinations subsequently decrease or even diminish when underlying causative factors (such as psychiatric [co-]morbidity) can be adequately targeted[92]. However, if (still) indicated and/or requested, the age-appropriate psychotherapeutic interventions described above are being developed to target the hallucinations. To provide knowledge and information on hallucinations, the psychoeducation section of such treatment protocols might be used for children and their parents before (or without) applying a whole treatment protocol. When hallucinations are present in the context of a psychotic disorder and/or previous steps were not sufficient, antipsychotic medication can be considered. A stepwise guide for clinicians is given in figure 1. In addition, as hallucinations are strongly associated with suicidal behavior, it is critical to perform suicide risk assessment in young people reporting hallucinations.

Figure 1. Guide for clinicians: stepwise approach to hallucinations in youth

1. Manage expectations
   Explain that although hallucinations are the primary reason to seek help, a broad view on the child's/adolescent's development and possible (mental health) difficulties is needed to understand the clinical impact and relevance of the hallucinations
2. Assessment of general health
   a. Perform a comprehensive mental health assessment including all DSM domains and possible problems on the domains of family (e.g. issues regarding interpersonal relations and/or (mental) health), social relations (e.g. bullying) and education (e.g. impairment of cognitive performances) while involving important caregiver(s) for hetero-anamnestic information
   b. Explore possible somatic complaints
   c. Use additional assessment(s) if indicated, such as neuropsychological testing, specific diagnostic interviews and/or somatic investigations such as a blood test (e.g. when a genetic syndrome is suspected)
3. Assessment of hallucination characteristics
   The use of a questionnaire such as the AVHRS or SOCRATES is not only helpful to structurally explore the characteristics of (auditory) hallucinations and to better understand their burden, but also to relieve anxiety and de-stigmatize talking about these experiences.
4. Place the hallucinatory experiences in an explanatory model
   With the information gathered in step 2 and 3, work out whether the hallucinations should be understood as a possibly benign, developmental phenomenon or that they may be a symptom of (developing) (mental) health issues
5. Provide psycho-education to child/adolescent and caregiver(s)
   Regardless of a possible benign and/or developmental origin, all children/adolescents and their caregiver(s) should receive and understand both up-to-date information on hallucinations in general (possibly using psycho-education sections of specific psychotherapeutic interventions) and a personalized explanatory model on their experience of hallucinations
6. Interventions
   a. In case of (expected) benign and/or developmental hallucinations, step 5 is often sufficient
   b. Hallucinations as a signal or symptom of (mental) health issues
      Interventions should primarily and firstly focus on these underlying conditions following their specific guidelines/treatment protocol. For example, in case of ADHD or depression first treat these disorders or in case of cognitive impairment first adjust school level
   c. Hallucinations that persist in causing distress (despite step 6b) or when underlying conditions are unclear (or for any reason cannot be treated)
      Use age-appropriate psychotherapeutic interventions such as CUES or STYV
7. Antipsychotic medication
   Hallucinations per se are not an indication for the use of antipsychotic medication. When hallucinations are a symptom of psychotic disorder, but also when hallucinations are a symptom or signal of decompensation of underlying conditions (such as an autism spectrum disorder or borderline personality disorder) antipsychotic medication can be considered according to related guidelines/treatment protocol (e.g. see NICE).

Note: AVHRS = Auditory Vocal Hallucination Rating Scale; CUES = Coping with Unusual ExperienceS; STYV =Stronger Than Your Voices; NICE = National Institute for health and Care Excellence.

Direction for future research

We implicitly adopted the mainstream definition of a hallucination, as "an erroneous percept in the absence of identifiable stimuli"[4]. However, to better understand hallucinations in children and adolescents, it seems essential to reach a more specific consensus on how to conceptualize and define hallucinatory experiences. For example, does this definition include auditory illusions and forms of inner speech (often a silent monologue without intrinsic sound or vocal quality)? Is hearing noise or music as much a hallucinatory experience as hearing voices? Are "sonorized thoughts" (thoughts with pathologically enhanced acoustic qualities) part of the hallucinatory spectrum[175, 176]? Similarly, a critical point is the consensus on suitable assessment tools (ie, consensus on the consequent use of one or more questions/questionnaires) for hallucinations, which presupposes some preliminary agreement on their core phenomenal features. Research in both youth and adult populations might benefit from stepping away from the use of single-item screening to identify individuals with hallucinations that are then regarded as a "homogeneous" study population, and rather implement the exploration of the hallucinatory experience (not only in terms of duration, distress and frequency, but also in terms of being (in)voluntary experiences, regarded as external and/or internal (and if internal, experienced as inner thoughts or speech), whether the sound is from own and/or (un)known voice(s) etc.). Also, large-scale cohort studies including young age ranges are still needed to unravel factors (biological, psychological and social) that influence age of onset, persistence and differential outcome.

To better understand the clinical relevance of hallucinations in children and adolescents and possible gaps in current health care, research assessment tools could structurally implement questions regarding the child's need for care or current receipt of care, as research so far lacked to assess these aspects. Also, following findings of Kapur et al.[7] regarding difficulties when encountering mental health care for distressing hallucinations, it might be beneficial to also address clinician's perspectives on their (un)certainties and needs when encountering distressing hallucinations, as this could contribute to the improvement of health care for children and adolescents. More uniformity in assessing the hallucinations should be strived for, whereas research could also focus on debating how it is possible that - giving the fact that they mostly ask more or less the same questions - that prevalence numbers vary so widely[11].

SUMMARY

Despite the often transient nature of hallucinations in children and adolescents, these experiences, even at a young age: (1) can cause severe distress and reduced functioning; (2) can occur across diagnostic boundaries; (3) often go together with comorbid psychopathology; and (4) may cause or coincide with increased risk of suicidality. This profile is somewhat contrary to the working group's proposition in 2014 to distinguish two types of hallucinations, those that occur in the presence of childhood psychosis and those that do not. Current insight suggests the application of a more general staging model, in which hallucinations can occur from a benign and transient phenomenon at one end to a symptom of severe psychopathology of several (interacting) domains at the other. Research since 2014 has not significantly advanced understandings of the etiology of hallucinations in youth, possibly attributable to: (1) the sparse amount of studies actually exploring the etiology and course of specifically hallucinations in youth (rather than UHR or psychosis' first episode samples), (2) the lack of data-driven narrowing of definitions regarding hallucinations, and (3) given that hallucinations can be related to (the development of) different psychiatric disorders, findings regarding etiology may be expected to be closely aligned to actual (underlying) psychiatric co-morbidity. As a consequence, hallucinations in both child and adult studies still represent a broad phenotype. Nevertheless, although hallucinations in youth are often transient and possibly a benign phenomenon, children and adolescents seeking help for hallucinations often suffer prolonged from their hallucinations and encounter difficulties in receiving the appropriate care. Since 2014, clinical care has improved with the recent knowledge and development of youth-specific questionnaires and intervention strategies. Finally, although the implementation of large hallucination detection programs in the general population is unnecessary, further knowledge is required on the extent and (early) identification of children and adolescents with hallucinations that might be in need for care.

Chapter 6

Stronger Than Your Voices: a cognitive behavioral therapy for youth suffering from auditory verbal hallucinations

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ABSTRACT

Objective: Auditory verbal hallucinations (AVH) are a common feature in youth and mostly transient. Nevertheless, while present, AVH can cause considerable distress from a young age. Children and adolescents seeking help for distressing AVH represent a heterogeneous group in terms of underlying factors, yet they consistently suffer from their AVH. Until now, a youth-specific psychotherapeutic intervention for AVH was lacking. Experts in the field of treating AVH in both adults and youngsters collaborated with service users to develop the cognitive behavioral therapy 'Stronger Than Your Voices' (STYV) for youth (aged 8-18 years) with distressing AVH, irrespective of underlying (mental) health issues. We investigated feasibility and clinical outcomes of the STYV therapy.

Methods: A convenience sample of eight children and adolescents, aged 10-16 years and all suffering from comorbid psychopathology, and their therapists participated in a naturalistic pilot study, assessing feasibility, tolerability and clinical change when applying the STYV therapy.

Results: Seven children provided pre and post measures, all completing STYV therapy without experiencing an aggravation of symptoms. Mean AVH total impact score decreased significantly (-37.8, SD 26,27, *p*.009) with Cohen's d effect size (1.44) suggesting clinically meaningful change. Therapists were positive about the STYV manual.

Conclusions: The STYV therapy is feasible for youth with distressing AVH. Also, the first results indicate that STYV may be clinically effective. A trial to further test effectiveness in a larger sample is needed.

INTRODUCTION

Auditory verbal hallucinations (AVH) are common in youth, occurring in over one in seven children and adolescents[100]. Although often transient[20, 21], AVH can cause considerable distress from a young age[24, 90] and thus lead to help seeking behavior[7, 92]. While exact numbers of children and adolescents seeking help for AVH are missing, one in four voice-hearing adolescents in the general population is estimated to be in need for clinical care due to AVH characteristics and/or co-occurring mental health issues[177]. In March 2013, the UMC Utrecht started an outpatient clinic for youth hearing voices. When seeking help for AVH at the outpatient clinic, these youngsters represented a heterogeneous group: from being rather healthy and well-functioning at the one end, to highly suffering and urgently needing clinical care at the other[92]. This is in line with the current understanding of AVH (and other psychotic symptoms) lying on a continuum, from occurring as a rather benign phenomenon in otherwise healthy individuals at one end to a highly distressing symptom in patients suffering from a wide range of severe psychopathology at the other[4, 11-14, 20, 28, 29]. Children and adolescents seeking help for AVH were in need for care due to both their AVH severity and the presence of a wide range of psychopathology[92]. In line with findings from Kapur and colleagues[7], regardless of their levels of suffering, all youngsters and their parents visiting the UMC Utrecht outpatient clinic shared expectancies of finding more information on AVH, a better understanding why they heard voices and - where possible - reassurance. Also, they were relieved to encounter a thorough, though normalizing and de-stigmatizing approach of this phenomenon. Experiences at the outpatient clinic revealed that two targets had to be addressed right from the start: (1) To understand possible underlying causes of AVH, such as psychopathology (e.g. posttraumatic stress, autism spectrum, mood and anxiety disorders) and/or stress due to circumstantial factors, such as being bullied or family issues. Finding underlying factor(s) associated to hallucinations will provide an opportunity to target these causative factors, and (2) To provide psychoeducation regarding AVH, as most youngsters (and their parents) are scared of their voices and have dysfunctional beliefs about them (e.g. presume them to be almighty entities). Tailored psychoeducation about hallucinations and perception may provide relief and reduce fear of AVH. In most cases, the approach of understanding and targeting possible causative factors combined with psychoeducation was sufficient to meet youngsters' (and their parents') need for care. However, some children and adolescents kept suffering from their voices and were in need for symptom specific care to enhance their appraisals regarding AVH and reduce the impact of voice hearing such as compliance with command hallucinations. However, despite increasing research on AVH in youth, age - and symptom specific psychotherapy was lacking until now[2, 4]. In adults, tailored Cognitive Behavioral Therapy (CBT) has already proven to be effective for treating distressing voices[32]. Also, applying therapy such as Competitive Memory Training

(COMET; specifically targeting low self-esteem) next to CBT, constitutes additive value regarding AVH appraisals and emotional impact of voices[178]. In youth, targeted CBT for psychotic experiences is also expected to be effective[33]. Therefore, more thorough and symptom specific psychotherapeutic interventions for youth with distressing voices are urgently needed.

Considering the above contributed to the rationale of the clinicians working at the outpatient clinic to develop the youth- and AVH-specific therapy manual 'Stronger Than Your Voices' (STYV).

The STYV manual is designed for all youth, aged 8 to 18 years, suffering from AVH, irrespective of possible underlying causative factors or psychopathology. In the STYV therapy, psychoeducation is combined with CBT techniques, aiming to provide more adaptive appraisals and enhance coping regarding AVH and resilience in general. Consequently, AVH should become less distressing and dominant and may even diminish or possibly disappear.

This study presents the findings regarding the feasibility and clinical effectiveness of the STYV therapy in a convenience sample of voice-hearing children and adolescents seeking help at the UMC Utrecht.

MATERIALS AND METHODS

The STYV therapy

STYV results from a collaboration of experienced clinicians from the outpatient clinics for youth and adults at the UMC Utrecht (among whom the authors KM, SP, IS) and Tonnie Staring from the Dutch foundation for CBT in psychosis (see www.gedachtenuitpluizen.nl), the latter having wide experience with developing CBT manuals for symptoms related to psychotic disorders in adults. During the development, the STYV manual was used in the treatment of nine voice-hearing patients (5 boys and 4 girls, age ranging from 10-17 years and underlying psychopathology, varying from mood, anxiety, autism spectrum, attention deficit hyperactivity, and borderline personality disorders). The feedback of these patients and their therapists was used to refine the manual.

The current STYV therapy manual is intended as a guideline for customised training of young people aged 8 to 18 years who suffer from AVH. In line with a recent review, providing a stepwise approach for clinicians encountering youth with AVH[179], the STYV manual provides clear guidance when and how to use the therapy: basically serving as

an add-on therapy for those children and adolescents who, despite psychoeducation and interventions targeting possible causative factors, remain to suffer from their AVH such that they warrant symptom specific care.

We expect STYV to reduce suffering by increasing perceived control over AVH. Consequently, the voice hearing might decrease or even disappear, but this is not the primary goal. The core idea is that young people become 'stronger than their voices'. The attitude is one of normalisation. We assume that 'voices' are products of your own psyche. Most young people who have problems with hearing voices do not experience it as something coming from themselves. Rather, the voices appear to be something powerful over which they experience very little control. Also, they feel like having very little control over their responses (both emotionally and behaviourally), such as listening to the voices, performing commands or withdrawing socially. Knowledge about what hearing voices is (to put it simplified: aberrant activity of your own brain) and experiencing control by means of the *Strong Tricks* step (cognitive and behavioural techniques) in the manual brings back a feeling of control to young people; they can choose how to respond to hearing voices.

STYV combines psychoeducation with cognitive-behavioural techniques. Therefore, clinicians who intend to work with this therapy should have at least some experience in applying CBT. The manual is structured in four phases: *A Strong Understanding, A Strong Plan, Strong Tricks and Strong Finish*. The chapters *Feeling Strong* and *Strong Sleep & Relaxation* can be added, tailored to individual needs. These last two chapters are suitable for those patients in whom low self-esteem, a lack of sleep and an elevated level of stress are frequently contributing elements to their voice-hearing experiences. The number of sessions is not limited in advance; the duration of the treatment will depend on individual needs and progress made during therapy.

At the end of the therapy the patient will have a *Strong Scheme*, including do's and don'ts to prevent (worsening of) AVH and regain control over AVH. Although the four phases are fixed, the manual serves to develop a tailor-made therapy as therapeutic goals are based upon individual case formulations. Therapist and patient together choose which techniques they will use to reach these goals. The manual provides various supporting forms to complete or to follow for each chapter. The content of the chapters is outlined in Table 1.

Table 1. Stronger Than Your Voices protocol

Session	Objective	Steps	Practical aids
Fixed chapters			
Strong Understanding Sessions: 2 to 3	1. The therapist and the young person get to know each other and together make sense of the characteristics and impact of the auditory hallucinations 2. The young person and his/her environment understand what hearing voices is	1. *Introductory meeting and overall explanation of the treatment procedures. *Listing of characteristics and impact of the auditory hallucinations *Registering of the auditory hallucinations for one or two weeks 2. Psycho-education (either with young person and parents/important relatives together or (partly) separated	1. - *Voices interview, Strong Measurement Form, a start with Strong Start Form *Strong Start Form 2. Strong Understanding Form
Strong Plan Sessions: 1 or 2	A Strong Plan is developed in this chapter; a treatment plan with objectives and a summary of triggers and previous used tricks with their effects. A Strong Scheme is compiled based on the Strong Plan and finalized during therapy.	1. Set concrete objectives: what the young person no longer wants to do and/or what the young person wants to do again after regaining control over the voices. 2. Make a summary of the tricks and techniques that the young person has already tried and their effects. Also, determine the influence of the circumstances; record situations that could be possible triggers. 3. Other tips and tricks available are then explained. 4. A plan of the tricks (strategies) that the young person is going to try out is then drawn up. Also decide and draw up whether the optional chapters Feeling Strong and Strong Sleep & Relaxation will be used.	1. Strong Plan Form, Strong Scheme Form 2. Strong Plan Form, Strong Scheme Form (known triggers and previous effective tricks) 3. Strong Tricks Form 4. Strong Plan Form
Strong Tricks Sessions: up to 10	Discovering effective Think, Do and Ignore Tricks by weekly choosing one or two 'tricks'(meaning various AVH-specific CBT-techniques, sometimes behavioural experiments, sometimes exposure work, and sometimes coping strategies) to try out and register auditory hallucinations and the effect of the tricks during the week. Effective tricks and newly discovered triggers are then drawn up in the Strong Scheme Form	1. Weekly choose one or two tricks to try out 2. Register auditory hallucinations and the effect of the tricks during the week , on either the hallucinations themselves or on thoughts, feelings and behaviour. 3. Draw up effective tricks and newly discovered triggers in the Strong Scheme Form	1. Strong Plan Form, Strong Tricks Form, 2. Strong Writing Form, optional Strong Evidence Form 3. Strong Scheme Form
A Strong Finish Sessions: 1 or 2	Ending the therapy with a Strong Scheme, to fall back on when necessary, and post measurements	1. Finalise Strong Scheme Form 2. Perform post-measurement	1. Strong Writing Form, Strong Scheme Form 2. Strong Measurement Form,
Optional Chapters			
Feeling Strong Sessions: up to 10 (during the fixed chapters of STYV)	This chapter deals with the self-image so that the young person can again feel strong.	1. A Strong Qualities list is drawn up and the aim is to add two new positive characteristics every week by 2. using the Positive Diary to record three Positive Points about oneself every day	1. Strong Qualities Form 2. Strong Diary Form
Strong Sleep & Relaxation Sessions: up to 10 (during the fixed chapters of STYV)	Increase resilience by promoting sleep and relaxation	1. Explore current lifestyle and sleeping pattern to understand where sleeping hygiene can be optimized 2. Keep a sleeping diary 3. Run through possible relaxation exercises and try one ore several during therapy session, choose one or two to daily practise at home	1. Strong Sleep Form 1 2. Strong Sleep Form 2 3. Strong Relaxation Form

AVH; auditory verbal hallucinations; CBT = cognitive behavioral therapy; STYV = stronger than your voices

Involving parents/caregivers

When treating children or adolescents with distressing AVH, it is important to always include parents and/or caregivers (and sometimes even other close relatives such as siblings, teachers or peers) in psychoeducation. In most cases, not only the help seeking youngsters, but also their parents feel desperate about how to understand and engage with this phenomenon. Therefore, we advise to at least inform parents/caregivers (preferably in the presence of their child) on the steps and progress of the therapy or invite them during or at the end of therapy sessions. The aim is that parents will gain a better understanding how to adequately support their child. This can be reached if parents/caregivers have the same information as their child and discuss their ideas about voices together with the therapist.

Participants

Participants were a convenience sample of children and adolescents seeking help for AVH at the UMC Utrecht outpatient clinic with an indication for treatment with STYV. There were no specific inclusion or exclusion criteria as STYV aims to provide psychotherapeutic therapy for all youth aged 8-18 years and regardless of underlying (mental) health issues. Medical ethical approval and informed consent was not needed, as agreed upon with the local medical ethical committee (March 3rd 2016, research proposal 16/129).

Training and supervision of therapists

Therapists were one child and adolescent psychiatrist, one general remedial educationalist, one mental health psychologist and three general psychologists (in training (i.t.) to become mental health psychologists) from four different mental health care facilities in the Netherlands (Apanta, GGNet, Eleos and the UMC Utrecht). Two of the psychologists i.t. at the UMC Utrecht both performed two therapies. None of the therapists was fully trained and registered with the Dutch Association of CBT. The psychiatrist had had some CBT training within the psychotherapy training of her regular educational program to become a psychiatrist. The mental health psychologist and the general remedial educationalist were at the level of 100 hours basic CBT training and the other psychologists were underway with the same 100 hours basic CBT training. All of them had achieved their CBT skills under supervision of a more experienced CBT therapist. Only the general remedial educationalist made use of supervision by KM. Two general psychologists i.t. from the UMC Utrecht received supervision during STYV treatment from their educational supervisor.

Before starting therapy, one of the developing clinicians (KM) contacted the therapist by telephone to explain the principles, aims and steps of the STYV therapy and to discuss possible questions regarding the manual and/or a specific patient. Supervision opportunities during therapy were available (by KM and TS).

Measures

Baseline demographic, clinical and AVH characteristics

Basic demographic data (age, gender), primary psychiatric diagnosis and AVH characteristics were assessed at baseline using the Voices Interview, an adjusted version[92] of the Auditory Vocal Hallucination Rating Scale (AVHRS)[93].

Clinical outcome by impact of AVH

The impact of and perceived control over AVH were assessed at baseline and at the end of therapy, using the 16 questions from the STYV Strong Measurement form, rated on a 10-point scale (0 = not/never/nothing – 10 = completely/always/everything): how often do you hear negative voices; how often do you hear positive/neutral voices; when hearing voices, how often do you suffer from them; when hearing voices, how much do you suffer from them; how strongly do you believe your negative voices; how strongly do you believe your positive voices; how strongly do you agree with your negative voices; how strongly do you agree with your positive voices; how strongly do you perceive control over your voices; how often can you ignore your voices; how often do you follow up on your voices' commands; how often do your voices make you feel happy/frightened/angry/sad/shameful/(and in case of other emotions these can be added). Impact of AVH was calculated by adding the scores per item (with inversed scores regarding the items 'how strongly do you perceive control over your voices' and 'how often do you follow up on your voices' commands'), resulting in a lowest impact score of 0 and a highest impact score of 160. Treatment effect is estimated with these pre- and post-measures.

Therapist feedback questionnaire

Items regarding engagement and clarity, completeness and perceived usefulness of the STYV treatment were assessed using open-answer questions after ending the therapy.

Design and statistics

The design was a naturalistic pilot study. Outcome measures were completed pre and post therapy. Therapists' feedback forms were completed post therapy.

Statistics were performed using IBM SPSS Statistics version 23.0. Descriptives and t-tests were used to analyze the data and calculate Cohen's d.

RESULTS

Eight children and adolescents and six therapists participated in the pilot study.

From the eight youngsters entering the study, one 11-year-old girl, suffering from severe psychotic disorder, aborted STYV treatment preliminary after 10 therapy sessions as it became clear during treatment that the severity of her psychotic condition prohibited her from effectively engaging psychotherapy. Thus, data from seven youngsters could be analyzed. Table 2 displays their demographic data and AVH characteristics.

Table 2. Demographics and descriptives

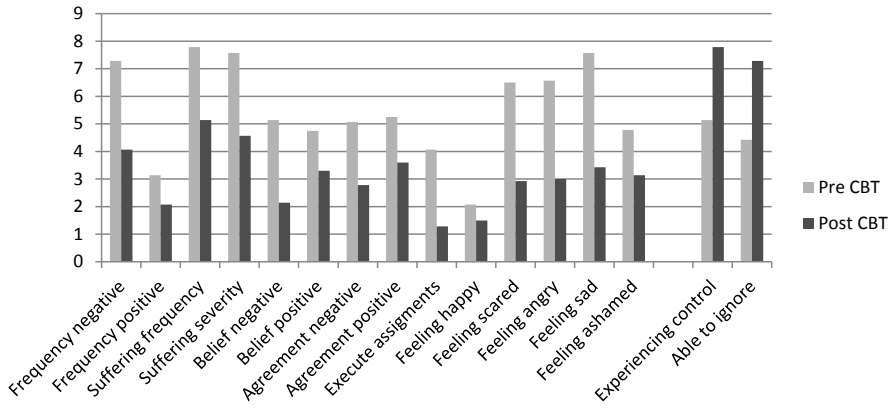
Case	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Age (years)	15	12	13	10	14	16	10
Gender	Female	Female	Male	Male	Female	Female	Female
Primary diagnosis	Depression	General anxiety disorder	Autism spectrum	General anxiety disorder	Autism spectrum	Depression	Autism spectrum disorder
Duration of AH	3 years	7 years	1 month	4 years	8 years	6 months	4 years
Other modalities	Visual	Visual	None	Visual	Olfactory	None	Visual, gustatory, tactile
AH characteristics							
Frequency	Continuously	Once a day	Continuously	n.p.	Once a day	Once a week	Once an hour
Duration	Seconds	n.p.	Hours to continuously	n.p.	Minutes	Minutes	Minutes
Time	Certain situations*	n.p.	Random moments	n.p.	Certain situations	Certain situations	Random moments
Loudness	n.p.	n.p.	As own voice		Whispering	As own voice	Screaming
Individual or not	Multiple voices, simultaneously	One voice	Multiple voices, simultaneously	Multiple voices	Multiple voices, simultaneously	Multiple voices, one voice at a time	Multiple voices, simultaneously
Type	Known & unknown	Unknown	Unknown	n.p.	Unknown	Known & unknown	Unknown
Content	Comments and dangerous assignments	Comments	Dangerous assignments	Comments	Comments and dangerous assignments	Comments and assignments	Comments and dangerous assignments
Negativity	Negative and neutral	Negative	Negative and neutral	Negative	Negative	Negative	Positive and negative
Suffering	Always	n.p.	Most of the time	Always	Most of the time	Sometimes	50% of the time
Controllability	None	n.p.	50% of the time	None	50% of the time	50% of the time	Sometimes
No of sessions	6	12	14	13	8	6	9

* Certain situations: e.g. when feeling stressed or tired, when being at school; n.p. = information not provided* Certain situations: e.g. when feeling stressed or tired, when being at school; n.p. = information notprovided; no = number

All seven children worked through the chapters *Strong Understanding*, *Strong Plan* and *Strong Tricks*. One child did not finish the *Strong Finish* chapter due to disengagement from therapy and contact with the clinic all together. However, her hallucinations had already completely disappeared at her last session and therefore the Strong Measurement form could be filled out accordingly by her therapist.

Figure 1 shows the Strong Measurement pre and post CBT mean scores for each item. A decrease of all distress items and increase in perceived control and ability to ignore AVH over time can be seen.

Figure 1. Strong Measurement pre & post CBT outcomes



Mean AVH total impact decreased significantly (-37.79, SD 26.2, t(6)-3.81, p.009) following pre (83.71, SD 17.2) and post (45.93, SD 12.75) measures with Cohen's d effect size of 1.44.

Therapists were positive about using STYV regarding clarity of the manual, completeness and perceived usefulness. None of the therapists needed further supervision to be able to work with the STYV manual.

DISCUSSION

Summary of main findings

We assessed feasibility, tolerability and possible clinical impact of a manualized, symptom specific CBT intervention for children and adolescents aged 8-18 years suffering from AVH, regardless underlying causes and/or psychopathology. Clinical change was favorable, with a significant decrease of mean total impact of AVH after applying STYV therapy and an estimated high within-group effect size (Cohen's d 1.44), pointing at a good clinical significance. Also, therapists' feedback was positive regarding STYV therapy, while working through the manual was found to need no further supervision.

Currently, in the UK, the CBT-informed treatment protocols 'Coping with Unusual ExperienceS' (CUES and CUES+) for youth are being developed and evaluated[170, 180]. CUES also draws on previous pilot work by Maddox and colleagues[181], also showing positive results in a case series of CBT for children suffering from psychotic like experiences. While the main approach (both combining psychoeducation and CBT-techniques) and duration (up to 14 sessions) of STYV and CUES(+)[170, 180] are comparable, the core difference is that STYV provides a single symptom targeted psychotherapy where CUES(+) is designed for youth with various forms of unusual (or psychotic-like) experiences (UE). Interestingly, the findings of the CUES study pointed out that UE-CBT is most promising to improve UE-specific outcomes rather than psychopathology in general[180]. This is in line with the aim and view of STYV to provide an add-on therapy, specifically targeting the impact of AVH, but only after (or next to) interventions primarily focusing on possible causative factors.

Limitations

The current study examined feasibility and clinical impact of a newly developed CBT protocol. Due to the small sample size, the results cannot be generalized to all youth with distressing AVH. As this was a naturalistic study, a comparison group was not included and assessments were not blind. Moreover, the Strong Measurement form is a newly developed questionnaire to assess impact of AVH, which has not yet been validated. Also, treatment goals were individually set, based on AVH consequent burden and behavior. Therefore, the STYV Strong Measurement outcome only roughly represents the effectiveness of the therapy.

Strengths and clinical considerations

Our results suggest that a symptom specific intervention for youth with distressing AVH is both feasible and beneficial to reduce AVH impact, irrespective of age and the presence of underlying (mental) health issues. STYV corresponds to youth' and parents' need to better understand, normalize and de-stigmatize this phenomenon and to diminish AVH intrusiveness and consequent emotions and behavior[7, 92]. Therapists reported to feel more confident to address and treat youngsters with distressing AVH when using STYV and they needed no further supervision to be able to work with the manual. This is in line with our aim to develop a therapy protocol that is easily applicable and can be used by any clinician with at least some minimal CBT training. Consequently, youth suffering from AVH would not necessarily need to be referred to the sparse specialized clinicians to receive adequate treatment.

Conclusion

The findings of this study suggest that STYV therapy is both feasible and clinically effective for youth aged 8-18 years suffering from AVH, independent from the presence of underlying causes such as psychopathology. Therapists can easily use STYV manual. Patients who start the STYV therapy tend to finish it. A trial in a larger sample is needed to more robustly examine therapy effectiveness, preferably with the inclusion of a control group.

The Dutch version of the STYV manual can be downloaded free of charge at www.gedachtenuitpluizen.nl. A preliminary English version of the manual can be obtained from the first author (KM).

Chapter 7

Summary and general discussion

The aim of this thesis was to contribute to knowledge and clinical care for youth with auditory hallucinations. Research insights were provided by exploring the prevalence of auditory hallucinations across the lifespan, reporting on the characteristics of youth seeking help for auditory hallucinations, estimating which proportion of youth with auditory hallucinations in the general population might be in need of clinical care and updating research findings on youth with auditory hallucinations in a review. We hoped to improve clinical care by providing a clinical care model regarding the assessment and treatment of auditory hallucinations in youth and developing a cognitive behavioral therapy 'Stronger Than Your Voices' specifically for youth with auditory hallucinations. The current chapter summarizes the main findings and discusses the implications of these findings.

Summary

The study presented in **chapter 2** described that almost 10% of the general population reports to have experienced auditory hallucinations during lifetime. Interestingly, prevalence rates were higher in children (12.7%) and adolescents (12.3%) than adults (5.8%) and the elderly (4.5%).

The study presented in **chapter 3** found that children and adolescents seeking help for auditory hallucinations are a heterogeneous group in terms of the diversity of comorbid psychiatric diagnoses, but consistently suffer from (often multi-morbid) psychopathology and high distress from their auditory hallucinations. Next to primarily assessing and treating the comorbid pathology, all patients (and their parents) were provided psychoeducation and, when needed, enhancement of coping strategies regarding auditory hallucinations. Only the minority of youth with a narrowly defined psychotic disorder (using the Schizophrenia A-criterion) was prescribed antipsychotic medication.

The study presented in **chapter 4** estimated that almost one in four young adolescents with auditory hallucinations in the general population was in need of clinical care (the 'need for care' subgroup). The majority (69.7%) of these children experienced persistent voices. Although these adolescents could not have been identified based on severity of auditory hallucinations five years earlier, they did already stand out with regard to comorbid problem behavior. As young adults, the need for care subgroup still reported symptoms of psychopathology and impaired social functioning.

Based on research findings and the clinical experience of the International Consortium on Hallucination Research (ICHR) working group members, the updated review presented in **chapter 5** provided not only a synthesis of research results, but also a tailored care

model for clinicians encountering youngsters with auditory hallucinations. This model addressed diagnostic and treatment strategies, including youth-specific assessment tools and interventions.

In **chapter 6** an overview of the Stronger Than Your Voices (STYV) protocol, a cognitive behavioral therapy specifically developed for youth (aged 8-18 years) with distressing auditory hallucinations, was presented. Clinicians trained to work with STYV were all very enthusiastic and provided positive feedback regarding the clear, practical and helpful procedures and content. There was a significant and clinical relevant decrease of total AVH impact, although a larger study is needed to replicate these findings.

Discussion and clinical implications

The studies described in this thesis highlight several important aspects of auditory hallucinations (AH) in youth. The clinical implications of these findings and recommendations for future research will be discussed below.

Clinical relevance of AH in the youth general population

The finding that over one in ten children and adolescents in the general population ever experienced auditory hallucinations underscores the relatively common nature of auditory hallucinations in youth[43].

This also highlights the importance to better understand the clinical significance of auditory hallucinations in children and adolescents, especially in the general population. In contrast to mentioning the overall transient and possible benign course of auditory hallucinations, epidemiological studies also point out high levels of comorbidity in youth with auditory hallucinations. For example, from higher rates of problem behavior at young age[24], to comorbidity of at least one diagnosable DSM disorder in up to 80% of older adolescents[28]. However, none of these studies assessed whether these youngsters actually needed or received clinical care. To better apply screening and treatment strategies for youth with auditory hallucinations in the general population, it is important to understand the proportion of youth with auditory hallucinations that might be in need for clinical care. We found that almost one in four young adolescents with auditory hallucinations in the general population resembles a clinical help-seeking population and thus might warrant clinical care. It is likely that even a higher number of youngsters with auditory hallucinations in the general population should receive clinical attention, as they might not suffer as extremely as the help-seeking population, but nonetheless are in need for clinical care.

Optimize outcome for youth with AH; identifying those in need for care at earlier stages

By establishing the outpatient clinic for youth with auditory hallucinations, we also created awareness through several media (such as newspapers and a television news show for youth 'Het Jeugdjournaal') and an online 'explanimation' (a short explanatory animation, see https://www.gedachtenuitpluizen.nl/explanimations/), providing education and pointing out the possibility to receive clinical care for this phenomenon. Children and adolescents visiting our outpatient clinic often told that they had not spoken about their hallucinations until they had seen one of our media items on auditory hallucinations in youth. Notably, almost sixty percent of the help-seeking population had been experiencing auditory hallucinations for at least two years. Before, as these help-seeking youngsters explained to us, they thought to be the only ones experiencing hallucinations and feared to be held crazy by their caregivers and/or peers. After seeing one of the media items, they were relieved to understand not to be the only one experiencing auditory hallucinations and that help could be provided. Previous research also showed that parents are often unaware of their children's experiences of hallucinations[134]. Therefore, a public understanding of the common but sometimes distressing nature of hallucinations in youth can help de-stigmatizing these phenomena and make it easier for youth with auditory hallucinations to step forward and seek help when needed.

Following our results, when youngsters do seek help for auditory hallucinations, they already suffer severely. Moreover, our comparison study showed that the adolescent 'need for care' subgroup (12/13 years) already experienced significantly higher levels of comorbid problem behavior at younger age (7/8 years). Additionally, this 'need for care' subgroup still reported symptoms of psychopathology and impaired functioning at young adulthood. This is in line with previous cohort findings, showing that regardless of having transient or persistent hallucinations, outcome for youth with auditory hallucinations is worse than typically developing peers[106]. To improve the prognosis of children and adolescents with auditory hallucinations, health care should aim at identifying youth with distressing auditory hallucinations at earlier stages. Early identification enables early assessment, follow-up and - when indicated - timely interventions. Not only would this prevent deterioration due to treatment delay[182], but also paves a way for improving resilience[37]. Research findings discourage large scale general population screening for auditory hallucinations alone[20]. Such a strategy could also bring the risk of over-awareness and over-pathologizing a relatively common phenomenon. However, we did find that young children with auditory hallucinations at risk to develop psychopathology may not be identified based on the severity of their hallucinations, but did already stand out with regard to comorbid problem behavior. Therefore, screening for psychiatric symptoms like auditory hallucinations during routine pediatric community health

service visits could be a suitable strategy. This way, a broader spectrum of psychiatric symptoms can be screened and weighed in the context of possible other (mental health) problems by trained caregivers. Also, these caregivers can provide psychoeducation when needed and distinguish whether children and adolescents with auditory hallucinations need clinical attention. Perhaps this approach might also contribute to de-stigmatizing auditory hallucinations (and psychiatric symptoms in general).

Clinical relevance of AH in the youth clinical setting

Contrary to our expectations, the majority of children and adolescents seeking help for auditory hallucinations at our outpatient clinic already suffered extremely from both their hallucinations and comorbid psychopathology. Our sample met criteria for DSM diagnoses, covering the entire spectrum from mood -, anxiety - and developmental disorders to personality and schizophrenia spectrum disorders. This indicates that auditory hallucinations are not confined to youth with psychotic disorders, but rather can co-occur with almost all psychiatric diagnoses. Obviously, we were curious whether the characteristics of the auditory hallucinations could be indicative of a specific underlying diagnosis. Although we lacked power to perform statistical analyses, exploration of our data showed no substantial differences within specific auditory hallucination's characteristics and diagnoses. This is in line with recent research, showing that the phenomenology of auditory hallucinations does not differ between, for example, a person with borderline personality disorder (BPD) or a person with schizophrenia spectrum disorder, but that the presence of auditory hallucinations does indicate a more severe BPD symptoms[183].

Clinicians encountering youth with AH: a tailored care model

Following our findings, caregivers should be aware that at least one in four adolescents with auditory hallucinations in the general population might be in need for clinical care. When children and adolescents actually do seek help for auditory hallucinations, they are not only suffering from their hallucinations but often also from a wider range of (multimorbid) psychopathology. Although we did not perform research on this topic ourselves, clinicians should be aware of the frequent occurrence of hallucinations in probably a large part of their patients in general[29, 31]. Therefore, when encountering a child or adolescent with auditory hallucinations, regardless of the setting (from community health services to specialized psychiatric clinic), their experiences should always be taken serious and deserve thorough assessment before determining whether they should receive any more clinical care.

In retrospect, given the high prevalence of auditory hallucinations in the general population and frequent co-occurrence with a broad range of psychiatric diagnoses,

it is remarkable that we had not heard about this phenomenon from our patients more often. However, our experience is that auditory (and other) hallucinations are not always inquired during mental health assessment in youth, unless specifically assessing the presence of a psychotic disorder. Clinicians seem shy to address hallucinations[6], which is also our experience when being consulted, or giving an oral presentation about this topic to colleagues. This might partly be due to the fact that auditory hallucinations are often still regarded to point at a possible underlying psychotic disorder, therefore requiring specific expertise with psychotic disorders in youth when assessing auditory hallucinations. Even in the 2014 review by the ICHR working group, a model of 'psychotic and non-psychotic auditory hallucinations' was still displayed[4]. However, our findings underline the heterogeneous occurrence of auditory hallucinations, with psychotic disorders being diagnosed in only a minority of an overall severely suffering and impaired clinical population. Besides, clinicians seem to lack available knowledge regarding auditory hallucinations and perhaps therefore confidence to address them. Nevertheless, apart from literature about mostly epidemiological findings, until now there were only a few papers providing clinical pointers how to address general diagnostics when encountering youth with auditory hallucinations. Moreover, youth specific treatment options were lacking[4]. We aimed to contribute in filling this gap by describing our help-seeking population, the assessment and intervention strategies we applied and, more specifically, the development of the cognitive behavioral therapy protocol 'Stronger Than Your Voices'. The combination of this work and the collaboration with the experts of the 2017 ICHR working group resulted in a clinical care model, covering both assessment and treatment of youth with auditory hallucinations. With this model, clinicians should be able to provide tailored care to youth with auditory hallucinations, keeping both a holistic and broad view as well as using youth and symptom specific questionnaires and interventions.

Although we do not wish to create an over-awareness on auditory hallucinations in youth in the general population, we do want to encourage caregivers and clinicians to inquire about hallucinations and be receptive to youth disclosing auditory hallucinations, especially in children and adolescents who are not considered to have a psychotic disorder, as auditory hallucinations can also commonly co-occur with mood -, anxiety -, developmental - and personality disorders. It is our understanding that youth with auditory hallucinations do not necessarily need to be referred to specialized outpatient clinics as clinicians working at various settings should now be well able to address auditory hallucinations themselves. We hope that with the insights arisen from this thesis, clinicians will feel well informed and confident to address auditory hallucinations in youth.

Methodological considerations

A large part of our work is based on naturalistic derived data from the outpatient clinic. Although this sample displays a well resemblance of clinical practice, it also has its shortcomings with regard to the extent of available data and limited use of structured questionnaires. Consequently, we could compare the help-seeking and general population samples on a restricted amount of characteristics.

As mentioned in the introduction, we had to abort our cohort study preliminary due to lack of power. The major aim of the cohort study was to determine biological, psychological and social factors that could predict remittance or persistence of auditory hallucinations in youth. A second aim was to reveal which factors determine and predict associated distress and dysfunction in youngsters with auditory hallucinations. Comparing children with AVH to their unaffected siblings would have provided the assessment of resilience factors. Unfortunately, despite parent's enthusiasm regarding the outpatient clinic and our reassurance and explanation of possible benefits of entering a follow up study, parents (and not so much the children) were often reluctant to participate in research. Either because of their child's recent mental health improvement or because of their child's current worse condition and -in both cases- parent's fear for deterioration. This experience does reflect the difficulties of performing research in (youth) clinical setting In comparison to, for example, epidemiologic or offspring studies, including generally healthy youngsters. To optimize participation for research in clinical setting it proved to be mandatory to (i) optimally merge clinical care and research in both baseline and follow up visits and (ii) be restrictive in duration per visit (and thus, consequently, in amount of collectable data).

Directions for future research

The findings following this thesis highlight the importance of better understanding and distinguishing the underlying pathways that auditory hallucinations may represent; from typical and transient developmental phenomenon at one end to signal or symptom of psychopathology at the other. Ideally, an algorithm would be developed, helping caregivers to determine at early stage whether auditory hallucinations are likely typical and transient or warrant further clinical attention and/or follow up as they probably represent a vulnerability to develop psychopathology. Also, in line with previous findings that auditory hallucinations do display an add-on value with regard to BPD severity[183], future research should aim to better understand whether this also applies for other psychopathology and if the presence of auditory hallucinations comorbid to psychopathology also has an add-on value in terms of prognosis.

Although beyond the scope of this thesis, we believe that several other issues need to be unraveled to move forward in understanding the pathways and clinical significance of auditory hallucinations. For example, is there something like true 'benign' or 'typical developmental' auditory hallucinations? And if so, how can they be explained on the level of brain and cognitive development (we briefly hypothesized on this topic in our meta-analysis in chapter 2) and do they differ in characteristics from auditory hallucinations that do display a vulnerability for psychopathology? With regard to the latter, more insight in the association with possible psychopathology could proceed from a more detailed assessment of the auditory hallucinations' characteristics 'content' (What kind of comments or assignments? For example, do they resemble compulsive thoughts or a replay of a traumatic event?) and 'type' (Who do they hear: own voice and/or (un) known others?). It may be hypothesized that there is a concurrence of these more detailed characteristics of auditory hallucinations and related psychopathology. Second, is there a significant add-on value of persistence of auditory hallucinations with regard to mental health outcome? And if so, what would be the cut-off duration for clinical relevant persistence of hallucinations? Or, third, should we not over-value the significance of the specific characteristics of auditory hallucinations (as they are changeable, over time as well as within a specific time period) and/or persistence of auditory hallucinations? And should we rather regard the presence of auditory hallucinations as a possible signal of vulnerability for the development of mental health issues in general, but also as a marker of severity when psychopathology is indeed present? Moreover, research findings on auditory hallucinations can vary or sometimes even be contradictory. This is only natural, as auditory hallucinations represent a heterogeneous phenomenon; the forms of expression within individuals (and within most studies so far) can differ from sporadically hearing an unintelligible noise or positive utterance to daily negative comments, as can the context in which auditory hallucinations occur (from 'healthy' or only in case of strain at school to symptoms of severe psychiatric disorders). Therefore, to better understand their (clinical) relevance, consensus is needed on how to define and conceptualize auditory hallucinations and aligned phenomena such as auditory illusions or inner speech (see also chapter 5)

Large scale cohort studies in both the general population and clinical setting using more detailed assessment of auditory hallucinations and looking into biological, psychological and social determinants are needed to shed light on these important questions. Also, research should not only focus on risk and vulnerability factors to identify youth at risk for worse outcome, as specifically resilience factors (for example in youth with transient auditory hallucinations or siblings without auditory hallucinations) could provide new insights for prevention and intervention strategies.

Conclusion

The findings in this thesis underline the frequent occurrence of auditory hallucinations in the general population and also highlight that almost one in four young adolescents in the general population experiencing auditory hallucinations might be in need for clinical care. Youth with distressing auditory hallucinations experience barriers to disclosure, leading to delay of clinical care. When seeking help, children and adolescents with auditory hallucinations suffer consistently and severely from both their auditory hallucinations and, often, from multi-morbid psychopathology. These youngsters display a heterogeneous group in terms of comorbidity, covering almost the entire extent of the DSM with only a subgroup matching criteria for a psychotic disorder. When encountering youth with auditory hallucinations, these phenomena should always be taken seriously, keeping a broad clinical view to best understand their need for care. Efforts should be made to identify youth with distressing auditory hallucinations at an earlier stage. Caregivers should not be shy to inquire and address auditory hallucinations, as they can rely on a clear clinical guideline and use youth - and symptom specific assessment and intervention tools, such as the Stronger Than Your Voices CBT protocol.

Addendum

References
Nederlandse Samenvatting
Curriculum Vitae
Publications and Presentations
Dankwoord

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NEDERLANDSE SAMENVATTING

Dit proefschrift gaat over auditieve hallucinaties bij kinderen en jongeren (hierna 'jeugdigen'). Een auditieve hallucinatie betekent dat je iets hoort zonder dat daar een prikkel (geluid) van buitenaf voor is. Een auditieve hallucinatie kan van alles zijn; van ondefinieerbare geluiden of gemompel tot duidelijke muziek en/of stemmen die spreken, fluisteren of schreeuwen. Indien het 'stemmen die spreken' betreft, hebben we het over auditief *verbale* hallucinaties of 'stemmen horen'. Onderzoek laat zien dat auditieve hallucinaties vaak voorkomen bij zowel jeugdigen als volwassenen, de precieze cijfers lopen uiteen. Over het algemeen gaat men ervan uit dat auditieve hallucinaties een incidenteel verschijnsel zijn. Onderzoek bij jeugdigen laat zien dat ze in de meeste (tot 95%) van de gevallen weer verdwijnen. Toch kan het ervaren van auditieve hallucinaties veel last geven. Ook kan de aanwezigheid van auditieve hallucinaties een signaal of symptoom zijn van (de ontwikkeling van) psychiatrische stoornissen. Daarom zijn auditieve hallucinaties -ondanks het feit dat ze veel voorkomen en vaak weer verdwijnen- niet zonder meer een onschuldig verschijnsel. Auditieve hallucinaties werden voorheen als één van de kernsymptomen van psychotische stoornissen zoals schizofrenie beschouwd. Echter, door de inzichten die wetenschappelijk onderzoek ons hebben gebracht, worden 'symptomen' zoals hallucinaties vaker omschreven als 'ervaringen' die binnen een continuüm (een glijdende schaal) kunnen voorkomen, van een onschuldige ervaring aan de ene kant tot symptoom van (een breed scala aan verschillende) ernstige psychiatrische aandoening(en) aan de andere kant.

In de afgelopen jaren is er steeds meer wetenschappelijk onderzoek verricht naar auditieve hallucinaties, ook bij jeugdigen. Helaas boden de inzichten die uit dat onderzoek voortkwamen nog weinig handvatten voor de klinische praktijk. Daarom zijn we in maart 2013 in het UMC Utrecht gestart met een polikliniek voor jeugdigen die hulp zochten vanwege het horen van stemmen en hebben we de Module Stemmen Horen Jeugd ontwikkeld. Vanuit deze setting hebben we veel ervaring en kennis kunnen opdoen. We zijn samenwerkingen aangegaan met behandelaren en onderzoekers in binnen- en buitenland. Dit heeft geleid tot verschillende wetenschappelijke en klinische projecten, waarvan u hieronder samenvattend de belangrijkste bevindingen aantreft.

Hoe vaak komen auditieve hallucinaties in de algemene bevolking voor?

Om zowel wetenschappelijk onderzoek als de klinische praktijk goed te kunnen afstemmen op jeugdigen met auditieve hallucinaties is het allereerst belangrijk te weten hoe vaak auditieve hallucinaties precies voorkomen in de algemene bevolking. Daarom hebben we

de gegevens van alle gedegen studies die onderzoek hebben gedaan naar het vóórkomen van auditieve hallucinaties in de algemene bevolking verzameld en onderzocht. In **hoofdstuk 2** wordt beschreven dat we 25 studies vonden met gegevens van in totaal 84 711 deelnemers. Hiermee konden we berekenen dat bijna 1 op de 10 mensen (9.6%) in de algemene bevolking wel een keer in haar leven een auditieve hallucinatie ervaart en dat dit vaker voorkomt bij kinderen (12.7%) en jongeren (12.4%) dan bij volwassenen (5.8%) en ouderen (4.5%).

Wat kenmerkt jeugdigen die hulp zoeken vanwege stemmen horen?

De meeste studies naar auditieve hallucinaties bij jongeren hebben zich gericht op het vóórkomen ervan. Dit biedt voor hulpverleners echter weinig informatie hoe diagnostiek en/of behandeling aan te pakken bij jeugdigen met auditieve hallucinaties in de klinische praktijk, wat vaak het topje van de ijsberg betreft. In **hoofdstuk 3** wordt beschreven wat de kenmerken zijn van jeugdigen die hulp zochten op de polikliniek van het UMC Utrecht vanwege het horen van stemmen. Ook wordt er beschreven welke behandeling zij kregen. De groep jeugdigen die hulp zocht vanwege het horen van stemmen bleek niet alleen consequent ernstig te lijden onder het stemmen horen zelf, maar ook onder een grote diversiteit aan onderliggende psychiatrische stoornissen. Meer dan de helft (52.6%) voldeed aan de criteria van twee of meer psychiatrische diagnosen. Een subgroep (11.6%) voldeed aan de criteria voor een psychosespectrum stoornis en slechts een kleine groep (8.4%) had geen diagnose. Naast uitgebreide diagnostiek en behandeling van onderliggende (psychiatrische) problematiek kregen alle jeugdigen en hun ouders psychoeducatie over auditieve hallucinaties en de relatie met onderliggende oorzaken en/of in stand houdende factoren. Wanneer bleek dat voorgaande stappen nog niet voldoende waren, werd gewerkt aan het versterken van vaardigheden om op een goede wijze met stemmen horen om te kunnen gaan. Enkel een kleine groep jeugdigen die voldeed aan de criteria voor een psychotische stoornis kreeg antipsychotische medicatie voorgeschreven.

Wat is de omvang van de groep jeugdigen met auditieve hallucinaties in de algemene bevolking die zorg nodig heeft?

Ondanks dat auditieve hallucinaties veel voorkomen en in de meeste gevallen van voorbijgaande aard zijn, kunnen jeugdigen die stemmen horen wel zorg nodig hebben. Om deze jeugdigen in een zo vroeg mogelijk stadium te kunnen identificeren en zorg tijdig te kunnen bieden is het van belang zicht te hebben op de omvang van de groep jeugdigen met auditieve hallucinaties in de algemene bevolking die daadwerkelijk zorg nodig heeft. In **hoofdstuk 4** wordt beschreven hoe we daartoe de groep jeugdigen die hulp zochten op de polikliniek (zie hoofdstuk 3) hebben vergeleken met een groep

jeugdigen met auditieve hallucinaties uit de algemene bevolking (deze groep is gevolgd en drie keer beschreven door de Groningse onderzoeksgroep van Agna Bartels-Velthuis, namelijk op de leeftijd van 7/8 jaar, 12/13 jaar en 18/19 jaar). Door deze twee groepen te vergelijken konden we berekenen dat bijna 1 op 4 (23.6%) jonge adolescenten (12/13 jaar) met auditieve hallucinaties in de algemene bevolking zorg nodig had. Een groot deel (69.2%) van deze jeugdigen hoorde al stemmen op de leeftijd van 7/8 jaar. Op deze leeftijd had deze zorgbehoevende groep weliswaar nog niet geïdentificeerd kunnen worden op basis van de ernst van hun auditieve hallucinaties, maar wél op basis van de mate van aanwezige andere problemen, zoals was gemeten met een vragenlijst die screent naar een breed scala aan psychische- en gedragsproblemen. Op de leeftijd van 18/19 jaar rapporteerde de zorgbehoevende groep nog altijd symptomen van somberheid en stress en verminderd sociaal functioneren, wat mogelijk voorkomen had kunnen worden door tijdig aangeboden zorg.

De laatste stand van zaken rondom wetenschap en zorg

In 2014 werd door een werkgroep van het Internationaal Consortium voor Onderzoek naar Hallucinaties (International Consortium on Hallucination Research, ICHR) een uitgebreid overzichtsartikel naar auditieve hallucinaties bij jeugdigen gepubliceerd. In 2017 brachten wij een nieuwe werkgroep bij elkaar en publiceerden een ge-update overzichtsartikel, zoals te lezen in **hoofdstuk 5**. Op basis van wetenschappelijke ontwikkelingen en klinische ervaring van deze werkgroep wordt in dit artikel ook een stappenplan voor hulpverleners gepresenteerd voor diagnostiek en behandeling van jeugdigen met auditieve hallucinaties, met aandacht voor leeftijd- en symptoom-specifieke instrumenten.

Sterker dan je Stemmen

Eerder onderzoek benadrukte de behoefte aan jeugd-specifieke behandeling voor auditieve hallucinaties. Op de polikliniek hebben wij daarom samen met collega's en patiënten het behandelprotocol 'Sterker dan je Stemmen' ontwikkeld. Deze behandeling is bedoeld voor jeugdigen (8-18 jaar) die last hebben van stemmen horen ongeacht de onderliggende oorzaken. Sterker dan je Stemmen is een cognitieve gedragstherapie gericht op het versterken van de vaardigheden om met stemmen horen om te kunnen gaan, bestaande uit psycho-educatie en cognitief-gedragstherapeutische technieken. Het doel van de behandeling is begrip en controle over stemmen horen te vergroten, waardoor de invloed van het stemmen horen en het daaruit voortkomende lijden afnemen. Soms neemt het stemmen horen af of verdwijnt het zelfs, maar dit is geen doel op zich. In **hoofdstuk 6** wordt het pilot-onderzoek naar het Sterker dan je Stemmen

behandelprotocol gepresenteerd. Hieruit bleek dat het behandelprotocol goed toepasbaar is zonder uitgebreide training vooraf of supervisie gedurende de behandeling. Niet alleen waren behandelaren enthousiast over Sterker dan je Stemmen, de resultaten lieten ook zien dat er een duidelijke en klinisch relevante vermindering optrad van de invloed van stemmen horen bij de deelnemers.

Conclusie en overwegingen voor de zorg en toekomstig onderzoek

De bevindingen van het werk in dit proefschrift onderschrijven het veelvuldig voorkomen van auditieve hallucinaties in de algemene bevolking en benadrukken ook de klinische relevantie ervan. Bijna 1 op 4 jonge adolescenten die stemmen hoort blijkt zorg nodig te hebben. Deze jeugdigen vielen al tijdens de kinderleeftijd op wat betreft andere psychische problemen. Op jongvolwassen leeftijd heeft deze groep nog steeds psychiatrische symptomen en verminderd sociaal functioneren. Echter, het lijkt erop dat maar een klein deel van de jeugdigen die last heeft van stemmen horen ook daadwerkelijk hulp zoekt en/of krijgt. De jeugdigen die zelf hulp zochten op de polikliniek hoorden vaak al heel lang stemmen (meer dan de helft al meer dan twee jaar) en hadden niet alleen veel last van het stemmen horen, maar ook van al aanwezige psychiatrische stoornissen. Hoewel naar aanleiding van de resultaten uit wetenschappelijk onderzoek breed bevolkingsonderzoek naar auditieve hallucinaties niet wordt aanbevolen, is het wel van belang om jeugdigen die stemmen horen en hulp nodig (gaan) hebben tijdig op te sporen. Een mogelijkheid hiervoor zou laagdrempeligere screening naar psychiatrische symptomen zoals auditieve hallucinaties vanuit de GGD kunnen zijn. Het inzetten van deze professionals maakt dat (1) jeugdigen met een verhoogd risico op problematiek tijdig worden opgespoord, (2) in een bredere context naar een jeugdige gekeken wordt (en daarmee een zorgvuldigere afweging wanneer deze eventueel moet worden doorverwezen voor zorg) en (3) direct voorlichting gegeven kan worden aan een jeugdige en diens ouders (waarmee onnodige zorgen of te veel aandacht aan een onschuldig fenomeen kan worden voorkomen). Deze aanpak zou ook kunnen bijdragen aan destigmatisatie van psychiatrische symptomen zoals auditieve hallucinaties. In mei 2016 hebben we een jaar samengewerkt met de GGD regio Utrecht om te onderzoeken of het voor jeugdverpleegkundigen en jeugdartsen haalbaar is om te screenen op bijzondere belevingen zoals stemmen horen en hoe kinderen en ouders het ervaren dat hiernaar wordt gevraagd. We hebben toen acht jeugdverpleegkundigen en drie jeugdartsen getraind om te screenen naar het ervaren van bijzondere belevingen bij kinderen uit groep 7 (ongeveer 10/11 jaar oud), die in aanmerking kwamen voor een standaard periodieke controle. Ongeveer 1 op 5 kinderen (21%) gaf aan wel eens iets te hebben gehoord, zoals een stem, wat anderen niet kunnen horen. De professionals lieten achteraf weten zich goed in staat te voelen deze vragen te stellen en hierover uitleg te

kunnen geven. Kinderen en ouders lieten weten dat ze over het algemeen het stellen van deze vragen 'niet belastend' tot zelfs wel 'prettig en goed' vonden.

De groep jeugdigen die daadwerkelijk hulp zoekt vanwege auditieve hallucinaties lijdt zowel onder van het horen van stemmen, maar ook onder onderliggende psychiatrische problematiek. Wanneer een hulpverlener in aanraking komt met een jeugdige met auditieve hallucinaties is het van belang om de hallucinaties goed in kaart te brengen, maar ook met een brede klinische blik te onderzoeken of er verdere (psychische) onderliggende en/of in stand houdende problemen zijn, meer dan alleen psychotische stoornissen. Er zijn verschillende diagnostische instrumenten voor jeugdigen ontwikkeld om auditieve hallucinaties uitgebreid in kaart te brengen. Wat betreft behandeling is het advies om eerst de mogelijk onderliggende/onderhoudende factoren aan te pakken en daarnaast altijd psycho-educatie aan te bieden aan jeugdigen en ouders. Indien de lijdensdruk en de invloed van het stemmen horen desondanks hoog blijft, kan een leeftijd-specifieke cognitieve gedragstherapie zoals Sterker dan je Stemmen worden ingezet om de vaardigheden om met stemmen horen om te gaan te versterken. Toekomstig onderzoek zou zich kunnen richten op een beter begrip welke factoren in een vroeg stadium een aanwijzing zijn of stemmen horen een onschuldig verschijnsel is (en er vooral niet te veel onnodige zorg een aandacht naar uit moet gaan) of een aanwijzing is voor de ontwikkeling van psychiatrische problematiek. En indien dit laatste het geval is, voor wélke psychiatrische problematiek en hoe we dit zouden kunnen voorkomen.

Tot slot…

Gedurende mijn promotieonderzoek heb ik naast de resultaten zoals hierboven beschreven veel geleerd over opzetten en implementeren van zorg en wetenschap, klinisch-wetenschappelijk onderzoek als proces en hoe als behandelaar wezenlijk aan te sluiten bij de hulpvraag van je patiënt.

Klinisch-wetenschappelijk onderzoek bedrijven is weerbarstig en vraagt efficiëntie, prioritering en keuzes maken. We hadden bij aanvang een grootschaliger onderzoek opgezet om jeugdigen die stemmen horen en hun broers en zussen die geen stemmen horen gedurende langere tijd te volgen om te kunnen leren welke factoren van invloed zijn op stemmen horen, het ontwikkelen van psychiatrische problematiek en welke factoren beschermend kunnen werken. Hoewel de polikliniek goed werd bezocht, nam helaas maar een beperkt deel van de gezinnen deel aan het wetenschappelijk onderzoek. Ondanks uitleg over het belang van onderzoek en de minimale belasting van deelname, wilden ouders hier toch voor waken: juist omdat hun kind al zo veel klachten had of omdat het net beter leek te gaan. We hebben hierdoor helaas vroegtijdig moeten besluiten die

studie te stoppen. Ook leerden we dat het verzamelen van gegevens, die relevant waren voor wetenschappelijk onderzoek, zo kort mogelijk moest duren en zo veel mogelijk verweven met de klinische diagnostiek. Dit betekende dat lang niet alle vragenlijsten die interessante kennis zouden hebben kunnen opleveren ook afgenomen konden worden.

Als hulpverlener heb ik des te meer geleerd om niet zélf te bepalen wat de belangrijkste problemen zijn waar een jeugdige hulp bij nodig heeft, maar serieus te nemen dat als iemand hulp vraagt vanwege stemmen horen, méér te doen dan te screenen of dit onderdeel zou kunnen zijn van een psychotische stoornis, zoals nu vaak enkel lijkt te gebeuren. Daarbij hebben we kunnen bijdragen aan concrete handvatten en instrumenten die ingezet kunnen worden bij jeugdigen die stemmen horen en waarmee vrijwel elke behandelaar uit de voeten zou moeten kunnen. Jeugdigen die stemmen horen en zorg nodig hebben kunnen daarmee geholpen worden door behandelaren in hun eigen omgeving en zijn niet per definitie afhankelijk van een verwijzing naar een specialist op dit gebied.

CURRICULUM VITAE

Kimberley (Kim) van Slobbe-Maijer werd op 1 september 1984 geboren in Naarden. Zij behaalde haar VWO diploma in 2002 aan het Willen de Zwijger college te Bussum. Van 2003 tot 2009 studeerde zij geneeskunde aan de Universiteit Utrecht. Tussen 2006 en 2009 droeg zij bij aan het onderzoek naar het chronisch vermoeidheidssyndroom bij adolescenten in het Wilhelmina Kinderziekenhuis onder supervisie van dr. E.M. van de Putte.

Na het behalen van haar artsendiploma op 30 september 2009 werkte Kim een jaar als arts geneeskunde niet in opleiding bij de afdeling kindergeneeskunde in het Sint Antonius Ziekenhuis te Nieuwegein en aansluitend een jaar bij de afdeling kinder- en jeugdpsychiatrie van het Universitair Medisch Centrum (UMC) Utrecht.

Van 2011 tot 2016 volgde zij de opleiding psychiatrie aan het UMC Utrecht met als opleiders dr. J. Wijkstra en dr. N. van Veelen en als deelopleider kinder- en jeugdpsychiatrie prof. dr. F. Scheepers. Gedurende de opleiding verdiepte Kim zich in het onderwerp auditieve hallucinaties bij kinderen en jongeren. In 2013 begon zij haar promotieonderzoek onder begeleiding van promotor prof. dr. I. Sommer en copromotor dr. A. Bartels-Velthuis. Tegelijkertijd startte zij de poliklinische module Stemmen Horen Jeugd in het UMC Utrecht in samenwerking met dr. S. Palmen. Samen met onder andere dr. T. Staring van de Stichting Gedachten Uitpluizen ontwikkelde zij het cognitief gedragstherapeutisch behandelprotocol Sterker dan je Stemmen. In dezelfde periode nam zij deel aan de Visitatie Commissie van de Nederlandse Vereniging voor Psychiatrie (NVvP). Tussen 2015 en 2017 droeg zij bij aan de ontwikkeling van de kinder- en jeugdsecties van het Acute Boekje in opdracht van de NVvP. Daarnaast is zij sinds 2015 lid van de Commissie Wetenschappelijke Activiteiten van de NVvP.

Sinds 2016 is Kim werkzaam als kinder- en jeugdpsychiater en expertisegroep coördinator bij de afdeling Dialectische Gedragstherapie en de open afdeling 020 van de Bascule te Amsterdam. Vanaf 2017 neemt zij deel aan de NVvP werkgroep Een Leven Lang Leren met als opdracht een voorstel te schrijven gericht op bij- en nascholing voor psychiaters en sinds 2018 neemt zij deel aan de expertgroep borderline persoonlijkheidsstoornis van het Kenniscentrum kinder- en jeugdpsychiatrie (www.kenniscentrum-kjp.nl).

Op 7 september 2013 trouwde Kim met Maurits van Slobbe. Samen hebben zij drie kinderen; Sem (2015), Julia (2016) en Olivia (2018).

Kimberley (Kim) van Slobbe-Maijer was born on September 1st 1984 in Naarden, the Netherlands. In 2003, she finished her secondary education at the Willem de Zwijger college in Bussum. From 2003 to 2009 she studied medicine at the University of Utrecht. Between 2006 and 2009 she performed a scientific internship under supervision of dr. E. van de Putte, focusing on chronic fatigue syndrome in adolescents.

After graduating medicine on September 30th 2009, Kim worked for a year as a resident at the Pediatrics department of the Antonius Ziekenhuis in Nieuwegein and, subsequently, at the Child- and Youth Psychiatry department of the University Medical Center (UMC) Utrecht.

From 2011 to 2016 she performed her psychiatry residency at the UMC Utrecht under supervision of dr. J. Wijkstra. dr. N van Veelen and prof. dr. F Scheepers respectively program directors psychiatry and child- and youth psychiatry. During her residency, Kim has developed a special interest in auditory hallucinations in children and adolescents. In 2013, she started as PhD student under the supervision of promotor prof. dr. I Sommer and copromotor dr. A Bartels-Velthuis. Simultaneously, she founded an outpatient clinic for youth suffering from auditory hallucinations at the UMC Utrecht in collaboration with dr. S. Palmen. Together with, amongst others, dr. T Staring from the Dutch 'Gedachten Uitpluizen' foundation she developed the cognitive behavior therapy 'Stronger Than Your Voices' (a free download of the Dutch version is available at www.gedachtenuitpluizen.nl). During these years she was member of the 'Visitation Committee' of the Dutch Psychiatry Association (DPA), assessing the quality of Dutch psychiatry institutions that train residents. Between 2015 and 2017, Kim contributed to the development of child- and adolescent sections of several chapters of the Acute Psychiatry booklet of the DPA. Also, since 2015, Kim is member of the 'Scientific Committee' of the DPA.

Since 2016, Kim is works as a child- and youth psychiatrist and expertise coordinator at the department of Dialectical Behavior Therapy and at the ward '020' of the Bascule in Amsterdam. Since 2017, she participates in the working group Life Long Learning, aiming to present a proposal for educating psychiatrist of the DPA and since 2018 she participates the expert group borderline personality disorders of the Dutch child and youth psychiatry 'Knowledge Center' (www.kenniscentrum-kjp.nl).

On September 7th 2013 Kim married with Maurits van Slobbe. Together they raise their three children; Sem (2015), Julia (2016) and Olivia (2018)

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Personality disorders in youth. E*ducational presentation for clinicians at the 'Dealing with Extremes' symposium by Lemiom*, Lunteren, the Netherlands 23-11-2017

Hallucinations in Children and Adolescents. *Oral presentation at the International Consortium Meeting on Hallucination Research*, Lille, France 07-11-2017

Youth seeking help for auditory hallucinations; who are they and what do they need. *Educational presentation for clinicians at youth mental health care facility Triversum*, Alkmaar, the Netherlands 18-09-2017

Early detection and interventions in youth with psychotic symptoms. *Oral presentation for at youth mental health care facility Accare, Zwolle, the Netherlands* 18-05-'17

Children and adolescents hearing voices; who are they and what do they need? *Oral presentation at the Phrenos Early psychosis Masterclass,* Utrecht, the Netherlands 10-02-2017

Auditory verbal hallucinations in youth: a longitudinal observational study. *Poster presentation European College of Neuropsychopharmacology (ECNP),* Barcelona, Spain 20-10-2014

Auditory verbal hallucinations in Youth. *Workshop at the International Consortium Meeting on Hallucination Research*, Trondheim, Norway 09-10-2014

Auditory verbal hallucinations in schools and community settings. *Oral and poster presentation at the 'Child Development in School & Community Setting' symposium at Yulius Center*, Rotterdam, the Netherlands 27-06-'14

Auditory Hallucinations in Children and Adolescents. *Poster presentation at the Dutch Psychiatry Association Congress*, Maastricht, the Netherlands 10-04-2014

Several media interviews, such as newspapers (e.g. Algemeen Dagblad, Trouw), radio (e.g. Radio1) and an item on a television program 'News for Youth' (https://jeugdjournaal.nl/artikel/485230-ziekenhuisafdeling-voor-stemmen-in-je-hoofd.html) March-April 2013

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