Prevalence and correlates of mental and neurodevelopmental symptoms and disorders among deaf children and adolescents: a systematic review protocol

Brandon Swanepoel, Leslie Swartz, Renate Gericke, Sumaya Malla

To cite: Swanepoel B, Swartz L, Gericke R, et al. Prevalence and correlates of mental and neurodevelopmental symptoms and disorders among deaf children and adolescents: a systematic review protocol. BMJ Open 2020;10:e038431. doi:10.1136/bmjopen-2020-038431

ABSTRACT

Introduction Little is known of the prevalence and correlates of mental and neurodevelopmental symptoms and disorders among deaf children and adolescents. Research suggests that this is a vulnerable population group at high risk of these disorders. However, little is known of correlates of prevalence estimates of these mental disorders and it seems that heterogeneous tools have been used to derive these estimates. Given the heterogeneity of studies measuring the prevalence and correlates of mental and neurodevelopmental symptoms and disorders among deaf children and adolescents, we seek to systematically examine and synthesise observational epidemiological evidence in this area to articulate a more detailed account of these symptoms and disorders and their correlates among this population group.

Methods and analysis We will conduct a systematic search of the following electronic databases to identify published observational epidemiological studies examining the prevalence and correlates of mental and neurodevelopmental symptoms and disorders among deaf children and adolescents: EBSCOhost, ERIC, PsycARTICLES, PsycINFO, PubMed, ScienceDirect, SCOPUS and Web of Science. As research in this area is limited, eight databases have been included to widen our search to include as many articles as possible. The search terms will be related to mental and neurodevelopmental symptoms and disorders as well as deaf children and adolescents. Two reviewers will review and extract data from each article independently and, where relevant, discuss differences to reach consensus. Additionally, the reviewers will assess overall study quality and risk of bias using a quality appraisal scale. Findings from studies will be synthesised to produce a quantitative review that summarises existing evidence on mental and neurodevelopmental symptoms and disorders among deaf children and adolescents and their correlates. The publication date of studies will not be restricted so that as much data as possible that fit our inclusion criteria can be sourced. We will conduct our searches between August 2020 and March 2021.

Ethics and dissemination This systematic review will use publicly available data and therefore does not require a direct ethical review. The protocol was however submitted for ethics waiver clearance with Stellenbosch University Health Research Ethics Committee. The protocol will be disseminated in a peer-reviewed journal. The review protocol was registered with the PROSPERO International Prospective Register of systematic reviews (http://www.crd.york.ac.uk/PROSPERO). PROSPERO registration number CRD42020189403.

Strengths and limitations of this study

► To our knowledge, this is the first systematic review to synthesise rigorous prevalence and correlates of mental disorders in deaf children and adolescents.
► Inclusion criteria have been devised by a team of experienced researchers.
► Data synthesis and analysis will be based on a detailed assessment of methodological quality and risk of bias.
► If most of the studies are cross-sectional, we will have limited opportunity to infer causality or risk factors for the onset of mental disorders in deaf children and adolescents.
► We anticipate a paucity of research in the area and thus may have to include older studies.

INTRODUCTION

Background

Research suggests that deaf children and adolescents are at high risk of mental and neurodevelopmental disorders with prevalence figures ranging between 19% and 77%. Despite the wide range these estimates present, they do suggest that the risk of mental disorders might be higher among deaf children and adolescents compared with hearing children and adolescents. Mental and neurodevelopmental disorders include intellectual disabilities, autism spectrum disorder, mood disorders, schizophrenia spectrum and psychotic disorders and trauma and stress-related disorders, classified by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and the International Classification of Diseases (ICD-10) as mood, anxiety, and neurodevelopmental disorders. The prevalence of mental health disorders is generally higher among deaf children and adolescents compared with hearing children and adolescents. Approximately 6% of the general population has been reported as having a disorder of the nervous system or a learning disability, whereas studies among deaf children and adolescents have reported prevalence figures ranging from 25% to 40%.

Research suggests that this is a vulnerable population group at high risk of these disorders. However, little is known of correlates of prevalence estimates of these mental disorders and it seems that heterogeneous tools have been used to derive these estimates. Given the heterogeneity of studies measuring the prevalence and correlates of mental and neurodevelopmental symptoms and disorders among deaf children and adolescents, we seek to systematically examine and synthesise observational epidemiological evidence in this area to articulate a more detailed account of these symptoms and disorders and their correlates among this population group.
and Statistical Manual of Mental Disorders (DSM), the International Classification of Diseases (ICD) or similar manuals used in the study country.

Generalisation of these findings is however difficult, as studies seem to vary widely on the range of symptoms and disorders assessed, the instruments used to assess symptoms and disorders, sample characteristics and research participants. Some studies base results on questionnaires or checklists administered to parents and teachers\(^2\)\(^4\)\(^7\)\(^10\) while others base findings on self-report questionnaires administered to adolescents.\(^5\)\(^11\) It is worth noting that very few studies have based results on direct clinical assessments of deaf children and adolescents. Furthermore, sample characteristics in prevalence studies vary considerably in terms of aetiology of deafness, type and degree of hearing loss, age of hearing-impaired diagnosis, primary language, use of assistive device, educational level and any coexisting disabilities or comorbidities.

Although studies report a high prevalence of mental and neurodevelopmental symptoms and disorders among this group, very few studies investigate specific types of disorders that affect this group. Those that do, find deaf children and adolescents at risk of depression, anxiety, oppositional defiant disorder, conduct disorder, attention deficit hyperactivity disorder, psychosis, somatoform disorder and pain disorder.\(^7\)\(^9\)

The causes of mental and neurodevelopmental disorders also remain unknown, as studies tend to focus on correlates that vary widely among studies. Correlates that have been reported include: communication and developmental delays,\(^12\) quality of parent–child communication,\(^15\) early detection of hearing loss,\(^14\) degree of hearing loss,\(^15\)\(^16\) secondary disabilities,\(^1\)\(^2\)\(^17\) maternal stress,\(^2\)\(^18\) physical and sexual abuse,\(^19\)\(^20\) teasing and bullying\(^15\) and type of school attended.\(^21\) To further understand the additional difficulties experienced by deaf children and adolescents, it is important to quantify and synthesise the findings to date.

Given the heterogeneity of studies measuring the prevalence and correlates of mental and neurodevelopmental symptoms and disorders among deaf children and adolescents, we seek to systematically examine and synthesise observational epidemiological evidence in this area. In doing so, we wish to examine and synthesise prevalence estimates and their correlates among this population group. To our knowledge, there are two systematic reviews related to mental disorders in deaf children and adolescents: the first focus is on behaviour problems in deaf children and the interventions used to address these problems,\(^22\) and the second is limited to studies measuring emotional and behaviour problems among deaf children using one assessment tool, the Strengths and Difficulties Questionnaire (SDQ).\(^23\) Thus, while these reviews are valuable, their contribution is limited to an explication of behavioural problems in this population and their prevalence as assessed by the SDQ.

**Objectives**

The objective of this review is to systematically examine and synthesise observational epidemiological evidence of prevalence and correlates of mental and neurodevelopmental symptoms and disorders among deaf children and adolescents, thereby providing an in-depth examination of prevalence estimates and correlates among this population group.

**METHODS AND ANALYSIS**

**Types of studies**

We summarise our inclusion and exclusion criteria in table 1. Our review will include English and non-English studies from high, middle and low-income countries. The specific inclusion criteria for this review include (1) peer-reviewed, (2) observational, (3) cross-sectional and (4) cohort studies that (5) investigate the prevalence and, where available, correlates of mental and neurodevelopmental symptoms and disorders among all subgroups of school-going deaf children and adolescents (typically 6–18 years of age) (6) using validated questionnaires or standardised psychiatric assessments administered to (7) parents, teachers, clinicians or children to assess mental health. The various instruments and informants used will be specified in our data extraction table and in the article. We are aware that in some countries, deaf individuals may not reach the level of their hearing peers and can attend school past the age of 18. We will include participants older than 18 years of age in our study on condition that they are still attending school.

**Type of participants**

All subgroups of school-going deaf participants will be included. Subgroups include individuals with coexisting disabilities (developmental, physical or otherwise), congenital or postlingual hearing loss, mild to profound hearing loss, oral or sign language communication users, participants with and without cochlear implants or hearing aids and those attending mainstream or specialised schooling. The different subgroups will be specified in our data extraction table and discussed in the review.

**Types of variables to be measured**

**Exposure variables**

The exposure variables will be all the correlates of mental and neurodevelopmental symptoms and disorders mentioned in the existing literature, for example, communication and developmental delays, quality of parent–child communication, early detection of hearing loss, degree of hearing loss, maternal stress, secondary disabilities, physical and sexual abuse, teasing and bullying and sociodemographic factors.

**Outcome variables**

The outcome variables will be all mental and neurodevelopmental symptoms and disorders as classified and defined by the DSM (all revisions thereof), the ICD (all revisions thereof), the ICD (all revisions thereof).
revisions thereof) or similar manuals used in the study country (and revisions thereof) and assessed using validated instruments or standardised assessments. In our analysis, we will distinguish between diagnostic outcomes according to DSM or other algorithms, and outcomes in terms of symptoms, which may or may not reach the threshold of diagnostic caseness. We anticipate that several studies will assess symptoms (by use, eg, of standard questionnaires) but will not have a formal assessment of diagnosis.

### Search methods for identification of studies

We will conduct a systematic search of the following electronic databases EBSCOHost, ERIC, PsycARTICLES, PsycINFO, PubMed, ScienceDirect, SCOPUS and Web of Science. Eight databases have been included to widen our search and to include as many articles as possible. We have developed a search strategy that will be adapted to different search engines (see table 2). The search strategy will include both free text and Medical Subject Heading terms. Duplicate articles generated by the search engines will be removed. In addition to database search results, reference sections of the included journal articles will also be reviewed to identify any relevant articles that were missed by search engines. We will also use citation indices to follow-up on articles that cite earlier articles found through our search. Restrictions on the publication date of studies that fit our inclusion criteria have not been imposed as our objective is to glean as much evidence as possible on what we expect to be an under-researched field. We will conduct our searches between August 2020 and March 2021.

### Exclusion criteria

This systematic review will exclude (1) grey literature, (2) unpublished articles, (3) opinion pieces, (4) case reports, (5) narrative reports, (6) qualitative studies, (7) case-control studies, (8) randomised controlled trials (RCTs)

| Table 1 | Inclusion and exclusion criteria |
|---------|----------------------------------|
| **Included** | **Excluded** |
| **Publication type** | English and non-English. | Grey literature, unpublished articles, opinion pieces, case and narrative reports, publications that do not have primary data and a clear description of methods used. |
| **Study design** | Peer-reviewed systematic reviews, cross-sectional and cohort studies. | Randomised controlled trials and case-control studies. |
| **Study population** | All subgroups of school going deaf children and adolescents (typically aged 6–18 years of age). Subgroups include individuals with coexisting disabilities (developmental, physical or otherwise), congenital or postlingual hearing loss, mild to profound hearing loss, oral or sign language communication users, participants with and without cochlear implants or hearing aids, and those attending mainstream or specialised schooling. We are aware that in some countries, deaf individuals may not reach the level of their hearing peers and can attend school past the age of eighteen. We will include participants older than 18 years of age in our study on condition that they are still attending school. Studies conducted in high, middle and low-income countries. | Participants not attending school. |
| **Exposure variables** | The exposure variables will be all the correlates of mental and neurodevelopmental symptoms and disorders mentioned in the existing literature for example, communication and developmental delays, quality of parent–child communication, early detection of hearing loss, degree of hearing loss, maternal stress, secondary disabilities, physical and sexual abuse, teasing and bullying and sociodemographic factors. | |
| **Outcome variables** | The outcome variables will be all mental and neurodevelopmental symptoms and disorders as classified and defined by the DSM (all revisions thereof), the ICD (all revisions thereof), or similar manuals used in the study country (and revisions thereof) and assessed using validated instruments or standardised assessments. | All other disorders. |

Instruments that have not been validated and assessments that are not standardised.

DSM, Diagnostic and Statistical Manual of Mental Disorders; ICD, International Classification of Diseases.
Table 2  Search terms

| Concept A: Mental disorders and neurodevelopmental disorders | Concept B: deafness | Concept C: child/adolescent |
|---------------------------------------------------------------|---------------------|----------------------------|
| Within Concept A, terms used will include:                    | Within Concept B, terms used will include: | Within Concept C, terms used will include: |
| (“mental disorder” OR “mental illness” OR “emotional disorder” OR “neurodevelopmental disorder” OR “intellectual disability” OR “mental handicap” OR “mental retardation” OR “cognitive impairment” OR autism OR aspergers OR “attention deficit disorder” OR “attention deficit hyperactivity disorder” OR ADD OR ADHD OR “learning disorder” OR “tic disorder” OR “ tourette disorder” OR “psychotic disorder” OR schizo OR “disregulated mood disorder” OR “mood disorder” OR “bipolar disorder” OR “manic depressive disorder” OR “manic depression” OR “cyclothymic disorder” OR “depressive disorder” OR depression OR suicide OR self-harm OR self-mutilation OR “anxiety disorder” OR “separation anxiety disorder” OR “selective mutism” OR “social anxiety disorder” OR “panic disorder” OR agoraphobia OR “generalized anxiety disorder” OR “obsessive compulsive disorder” OR OCD OR “body dysmorphic disorder” OR “hoarding disorder” OR trichotillomania OR excoriation OR “skin-picking disorder” OR “trauma disorder” OR “stress disorder” OR “reactive attachment disorder” OR “attachment disorder” OR “disinhibited social engagement disorder” OR “post-traumatic stress disorder” OR “acute stress disorder” OR “adjustment disorder” OR “dissociative disorder” OR “dissociative amnesia” OR “depersonalization disorder” OR “derealization disorder” OR “somatic disorder” OR “illness anxiety disorder” OR “conversion disorder” OR “feeding disorder” OR “eating disorder” OR pica OR “rumination disorder” OR “avoidant food intake disorder” OR “anorexia nervosa” OR anorexia OR “bulimia nervosa” OR bulimia OR “binge eating disorder” OR enuresis OR encopresis OR “sleep disorder” OR insomnia OR “hypersomnia” OR “disruptive sleep disorder” OR narcolepsy OR “sex disorder” OR “gender dysphoria” OR “gender identity disorder” OR “behavior disorder” OR “disruptive behavior disorder” OR “impulse control disorder” OR “conduct disorder” OR “oppositional defiant disorder” OR pyromania OR kleptomania OR “substance disorder” OR “substance related disorder” OR “alcohol disorder” OR “cannabis disorder” OR “hallucinogen disorder” OR “opiod disorder” OR “neurocognitive disorder” OR delirium OR “traumatic brain injury” OR “personality disorder” OR “schizo personality disorder” OR “paranoid personality disorder” OR “factitious disorder” OR psychopath OR sociopath OR “antisocial personality disorder” OR “borderline personality disorder” OR “histrionic personality disorder” OR “narcissistic personality disorder” OR “avoidant personality disorder” OR “dependent personality disorder” OR “obsessive compulsive personality disorder”) | (Deaf OR deaf* OR “hard of hearing” OR “deaf or hard of hearing” OR “deaf and hard of hearing” OR DHH OR “hearing impaired” OR “permanent childhood hearing loss” OR PCHL OR “sign language”) | (Child* OR adolesc* OR juvenile* OR youth OR toddler OR pubescent OR infant*) |

and (9) publications that do not have primary data and a clear description of the methods used. In cases where studies analysing the same data are published in more than one journal, we will only include the most recent and complete publication. Qualitative studies, RCTs and case-control studies have been excluded as they do not measure prevalence estimates.

**Data collection and analysis**

**Selection of studies to be included in the review**

The selection of studies to be included in the systematic review will follow a rigorous screening process to ensure adherence to inclusion criteria. Two reviewers will independently collect data. Working in pairs, we will go through a thorough four-stage screening process following Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. The first stage will include a detailed search of articles from the eight search engines and removal of duplicates that may occur due to the same article appearing in multiple databases. This will be followed by a screening process through the review of publication titles and abstracts to ensure that only eligible articles are retained as per the inclusion criteria. In the same pairs, we will then independently review the selected full-text articles of potentially eligible studies and exclude those that do not meet the full inclusion criteria. We will document reasons for excluding articles, while those that meet the full inclusion criteria will form part of the systematic review. We will address any discrepancies through discussions with the third expert. Details of the study selection process are shown on a PRISMA flowchart (see figure 1).

**Data extraction and management**

We will extract data from included studies using a data extraction table developed to summarise key study
characteristics, findings and conclusions (see table 3). Extracted data will include study details (author, year of publication, country of study), methodology (study type, inclusion and exclusion criteria, sample size, instruments used to assess disorders and correlates and study participants), sample characteristics (age, sex, coexisting disabilities, type and degree of hearing loss, primary language use, use of cochlear implant or hearing aid, special or mainstream schooling) and findings (types and prevalence rates of disorders and their correlates and confidence intervals).

Quality appraisal and assessment of bias
We will assess the included studies for quality and risk of bias using the instrument developed by Giannakopoulos et al.24 In comparison to other instruments,25–27 this instrument was chosen as it is specifically designed to assess quality in prevalence studies that use heterogeneous examination and diagnostic protocols. Moreover, this instrument is validated by an extensive literature review and expert consensus supporting its reliability for use in scientific reviews. Kappa and the intrarater correlation coefficient (ICC) were used to test intrarater reliability. The latter was assessed on the results of three independent investigators. The instrument has 11 items that assess sampling, measurement and analysis. It also allows for the calculation of a Total Quality Score (TQS) by totaling the points assigned to each of the items. The TQS ranges from 0 to 4 (poor), 5 to 9 (moderate), 10 to 14 (good) and 15 to 19 (outstanding). TQS scores will not be used to exclude studies but to comment on study quality. Quality appraisal and assessment of bias for each study will be summarised in tabular form and discussed in the review (see table 4).

Data synthesis and analysis
The study design is quantitative. Extracted data from included studies will be quantified and synthesised to provide a summary of evidence on the prevalence of mental disorders among deaf children and adolescents. A summary of the methodology and results of each included study will also be summarised in tabular form. Finally, the summarised findings will be discussed in a systematic review of existing literature in the field.

Patient and public involvement
This study involves a review of publicly available published peer-reviewed papers. We did not directly include patient and public involvement in this study.
Table 3  Data extraction table

| Author | Year | Country | Study type | Study population | Inclusion criteria | Exclusion criteria | Sample size | Instrument used to measure disorders | Instrument used to measure correlates | Instrument administered to | Age | Sex | Coexisting disability | Type of hearing loss | Degree of hearing loss | Primary language use | Instrument used to measure correlates | Instrument administered to | Prevalence rate of disorder | Prevalence rate of correlate | Type of disorder | Type of correlate |
|--------|------|---------|------------|------------------|-------------------|-------------------|-------------|-------------------------------------|-------------------------------------|----------------------------|-----|-----|----------------------|----------------------|---------------------|---------------------|--------------------------------------|--------------------------|------------------------|-----------------------|----------------------|
|        |      |         |            |                  |                   |                   |             |                                     |                                     |                            |     |     |                      |                      |                     |                     |                                     |                         |                        |                       |                      |
| 1      |      |         |            |                  |                   |                   |             |                                     |                                     |                            |     |     |                      |                      |                     |                     |                                     |                         |                        |                       |                      |
| 2      |      |         |            |                  |                   |                   |             |                                     |                                     |                            |     |     |                      |                      |                     |                     |                                     |                         |                        |                       |                      |
| 3      |      |         |            |                  |                   |                   |             |                                     |                                     |                            |     |     |                      |                      |                     |                     |                                     |                         |                        |                       |                      |
| 4      |      |         |            |                  |                   |                   |             |                                     |                                     |                            |     |     |                      |                      |                     |                     |                                     |                         |                        |                       |                      |

Table 4  Quality assessment of papers included in systematic review

| Study | Ethics commission approval? | Recruitment procedure | Sample power | Target population clearly defined? | Probability sampling used? | Do respondents match the target population? | Standardised data collection methods? | Reliable survey instruments? | Valid survey instruments? | Were special features accounted for? | Satisfactory confidence intervals? | Total quality score |
|-------|-----------------------------|------------------------|--------------|-----------------------------------|-----------------------------|---------------------------------------------|-----------------------------|-------------------------------|-------------------------------|----------------------------------|------------------------------|-------------------|
| 1     |                             |                        |              |                                    |                             |                                             |                             |                               |                               |                                  |                              |                   |
| 2     |                             |                        |              |                                    |                             |                                             |                             |                               |                               |                                  |                              |                   |
| 3     |                             |                        |              |                                    |                             |                                             |                             |                               |                               |                                  |                              |                   |
| 4     |                             |                        |              |                                    |                             |                                             |                             |                               |                               |                                  |                              |                   |
Ethics and dissemination

This systematic review will use publicly available peer-reviewed data from the eight identified search engines (EBSCOHost, ERIC, PsycARTICLES, PsycINFO, PubMed, ScienceDirect, SCOPUS and Web of Science) and will therefore not require an ethical review but an ethics waiver. The systematic review protocol was submitted for ethics waiver clearance with the Stellenbosch University Health Research Ethics Committee as part of a larger study. The findings from this review will be disseminated through peer-reviewed publications.

Author affiliations

1Faculty of Arts and Social Sciences, Department of Psychology, Stellenbosch University, Stellenbosch, Western Cape, South Africa
2School of Community and Human Development, Department of Psychology, University of the Witwatersrand, Johannesburg, Gauteng, South Africa
3School of Public Health, Division of Epidemiology and Biostatistics, University of the Witwatersrand, Johannesburg, Gauteng, South Africa

Contributors BS, LS and SM contributed to the conception of the study. The protocol was drafted by BS and reviewed by LS, RG and SM. BS and RG will screen all potential studies and extract data from the included studies independently. BS and RG will also assess the risk of bias. BS and RG will conduct data synthesis. LS and SM will arbitrate any review differences and ensure quality assurance during the research process.

Funding

The authors have not declared a specific grant for this research from any funding agency in the public, commercial or non-for-profit sectors.

Competing interests

None declared.

Patient and public involvement

Patients and/or the public were not involved in the design, conduct, or reporting, or dissemination plans of this research.

Patient consent for publication

Not required.

Provenance and peer review

Not commissioned; externally peer reviewed.

Open access

This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/.

ORCID iDs

Brandon Swanepoel http://orcid.org/0000-0002-4956-1461
Leslie Swartz http://orcid.org/0000-0003-1741-5897
Renate Gericke http://orcid.org/0000-0001-9077-1850

REFERENCES

1 Hindley PA, Hill PD, McGuigan S, et al. Psychiatric disorder in deaf and hearing impaired children and young people: a prevalence study. J Child Psychol Psychiatry 1994;35:917–34.
2 Hintermair M. Prevalence of socioemotional problems in deaf and hard of hearing children in Germany. Am Ann Deaf 2007;152:320–30.
3 Hogan A, Shipley M, Strazdins L, et al. Communication and behavioural disorders among children with hearing loss increases risk of mental health disorders. Aust N Z J Public Health 2011;35:377–83.
4 Vostanis P, Hayes M, Du FEU M. Behavioural and emotional problems in hearing impaired children: a preliminary study of teacher and parent ratings. Eur J Spec Needs Educ 1997;12:239–46.
5 Remine MD, Brown PM. Comparison of the prevalence of mental health problems in deaf and hearing children and adolescents in Australia. Aust N Z J Psychiatry 2010;44:351–7.
6 Fiorillo CE, Rashidi V, Westgate PM, et al. Assessment of behavioral problems in children with hearing loss. Otol Neurotol 2017;38:1456–62.
7 Van Gent T, Goedhart AW, Hindley PA, et al. Prevalence and correlates of psychopathology in a sample of deaf adolescents. J Child Psychol Psychiatry Allied Discip 2007;48:950–8.
8 Huber M, Kipman U. The mental health of deaf adolescents with cochlear implants compared to their hearing peers. Int J Audiol 2011;50:146–54.
9 Theunissen SC, Rieff C, Kouwenberg M, et al. Behavioral problems in school-aged hearing-impaired children: the influence of sociodemographic, linguistic, and medical factors. Eur Child Adolesc Psychiatry 2014;23:187–96.
10 van Eldik T, Treffers PD, Veerman JW, et al. Mental health problems of deaf Dutch children as indicated by parents’ responses to the child behavior checklist. Am Ann Deaf 2004;148:390–5.
11 van Eldik T. Mental health problems of Dutch youth with hearing loss as shown on the youth self report. Am Ann Deaf 2005;150:11–16.
12 Hindley PA. Mental health problems in deaf children. Current Paediatrics 2005;15:114–9.
13 Barker DH, Quittner AL, Fink NE, et al. Predicting behavior problems in deaf and hearing children: the influences of language, attention and parent-child communication. Dev Psychopathol 2009;21:373–92.
14 Laugen NJ, Jacobsen KH, Rieff C, et al. Predictors of psychosocial outcomes in hard-of-hearing preschool children. J Deaf Stud Deaf Educ 2016;21:259–67.
15 Fellinger J, Hobzinger O, Sattel H, et al. Correlates of mental health disorders among children with hearing impairments. Dev Med Child Neurol 2009;51:635–41.
16 Polat F. Factors affecting psychosocial adjustment of deaf students. J Deaf Stud Deaf Educ 2003;8:325–39.
17 Buskermolen WM, Hoekman J, Aldenkamp AP. The nature and rate of behaviour that challenges in individuals with intellectual disabilities who have hearing impairments/deafness (a longitudinal prospective cohort study). Br J Learn Disabil 2017;45:32–8.
18 Topol D, Girard N, St Pierre L, et al. The effects of maternal stress and child language ability on behavioral outcomes of children with congenital hearing loss at 18–24months. Early Hum Dev 2011;87:807–11.
19 Black PA, Glickman NS, Demographics GNS. Demographics, psychiatric diagnoses, and other characteristics of North American deaf and hard-of-hearing inpatients. J Deaf Stud Deaf Educ 2006;11:303–21.
20 Sullivan PM, Knutson JF. Maltreatment and behavioral characteristics of youth who are deaf and hard-of-hearing. Sex Disabil 1998;16:295–319.
21 Meijstad L, Heiling K, Svedin CG. Mental health and self-image among deaf and hard of hearing children. Am Ann Deaf 2009;153:504–15.
22 Bigler D, Burke K, Laureano N, et al. Assessment and treatment of behavioral disorders in children with hearing loss: a systematic review. Otolaryngology–Head and Neck Surgery 2019;160:36–48.
23 Stevenson J, Kreppner J, Pimperton H, et al. Emotional and behavioural difficulties in children and adolescents with hearing impairment: a systematic review and meta-analysis. Eur Child Adolesc Psychiatry 2015;24:477–96.
24 Giannakopoulos NN, Rampelbergs P, Eberhard L, et al. A new instrument for assessing the quality of studies on prevalence. Clin Oral Invest 2012;16:781–8.
25 Munn Z, Moala S, Riitano D, et al. The development of a critical appraisal tool for use in systematic reviews addressing questions of prevalence. Int J Heal Policy Manag 2014.
26 Hoy D, Brooks P, Woolf A, et al. Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. J Clin Epidemiol 2012;65:934–9.
27 Loney PL, Chambers LW, Bennett KJ, et al. Critical appraisal of the health research literature: prevalence or incidence of a health problem. Chronic Dis Can 1998;19:170–6.