The association between anxiety and poor attendance at school: A systematic review

Abstract

Background. Anxiety may be associated with poor attendance at school, which can lead to a range of adverse outcomes. We systematically reviewed the evidence for an association between anxiety and poor school attendance.

Methods. Seven electronic databases were searched for quantitative studies that reported an estimate of association between anxiety and school attendance. Anxiety had to be assessed via standardised diagnostic measure or validated scale. Articles were screened independently by two reviewers. Meta-analyses were performed where possible, otherwise results were synthesised narratively.

Results. 4930 articles were screened. Eleven studies from six countries across North America, Europe, and Asia, were included. School attendance was categorised into: 1) absenteeism (i.e. total absences), 2) excused/medical absences, 3) unexcused absences/truancy, and 4) school refusal. Findings from eight studies suggested associations between truancy and any anxiety disorder, as well as social and generalised anxiety. Results also suggested cross-sectional associations between school refusal and separation, generalised, and social anxiety disorders, as well as simple phobia. Few studies investigated associations with absenteeism or excused/medical absences.

Conclusions. Findings suggest associations between anxiety and unexcused absences/truancy, and school refusal. Clinicians should consider the possibility of anxiety in children and adolescents with poor attendance. However, there is a lack of high quality evidence, little longitudinal research, and limited evidence relating to overall absenteeism or excused/medical absences, despite the latter being the most common type of absence. These gaps should be a key priority for future research.

Key practitioner message

- Anxiety may be associated with poor attendance at school, which can lead to a range of adverse academic, social, and economic outcomes.
- This systematic review found evidence for cross-sectional associations between unexcused absences/truancy and any anxiety, as well as social anxiety and generalised anxiety, specifically.
- Evidence was also found for a cross-sectional association between school refusal and separation anxiety, generalised anxiety, social anxiety, and simple phobia.
- Clinicians should consider the possibility of anxiety in children and adolescents with poor school attendance.
- There is a lack of high quality evidence, little longitudinal research, and limited evidence relating to associations between anxiety and overall absenteeism, or excused/medical absences, despite the latter being the most common type of absence. Further research is required to address these gaps.

Introduction

School plays a key role in children's academic, emotional and social development. Frequent absence from school is a risk factor for poor academic outcomes (Credé, Roch, & Kieszczynka, 2010), social isolation (Kearney, Pursell, & Alvarez, 2001), economic deprivation (Kearney, 2008b), and future unemployment (Attwood & Croll, 2014). In the UK, 56.7 million school days were missed in 2016/17 due to pupil absence, and 10.8% of children were deemed "persistently absent" as a result of missing 10% or more of school sessions in that academic year (Department for Education, 2018). There are many reasons why a child might be absent from school, and a range of personal, familial, school, and community influences are risk factors (Egger, Costello, & Angold, 2003; Kearney & Albano, 2004; Kearney & Silverman, 1995; Malcolm, 2003).

Several studies have demonstrated that poor mental health is associated with reduced school attendance, with anxiety described in the literature as a particular risk factor (Egger et al., 2003; Elliott & Place, 2017; Kearney, 2008b). There are many facets of the school setting that have the potential to evoke anxiety, including separation from primary caregivers, social interaction with school staff and peers, and academic stress, all of which may lead to avoidance of school by way of negative reinforcement (Kearney, 2008b). Somatic symptoms such as headaches, stomach-aches and fatigue are also common among children with anxiety (Campo, 2012), and may contribute to school absence, particularly if interpreted by adults around the child as signs of physical, as opposed to mental ill health. Anxiety is commonly considered to be related to "school refusal", rather than other types of absence such as truancy or absenteeism in general (Elliott & Place, 2017; Kearney, 2008b; Pellegrini, 2007). Indeed, "school refusal" is a term used to describe absence due to anxiety or emotional distress, in contrast with "truancy", which is often used to describe absence associated with antisocial behaviour (King & Bernstein, 2001). However, evidence suggests that there is substantial overlap between "school refusal" and "truancy", with many school refusers displaying signs of behavioural disorder, and many truants experiencing emotional distress (Egger et al., 2003). This has led several scholars to promote the use of broader terminology such as "problematic absenteeism" (Kearney, 2008a) or "extended non-attendance" (Pellegrini, 2007), which avoid assumptions about the underlying aetiology of the problem. However, others argue that co-occurrence of school refusal and truancy is rare and that these subcategories are valuable for understanding individual differences in the presentation of attendance problems (Heyne et al., 2018), and debate continues regarding the utility of various different definitions.

The diversity of terminology used among researchers is a central challenge to the study of school attendance, and there is a lack of consensus about how best to define, measure and address poor attendance (Kearney, 2008b; Lauchlan, 2003; Pellegrini, 2007). Terminology has important implications, because evidence suggests that anxiety-related school refusal is viewed more sympathetically by school staff than is truancy (Finning et al., 2017; Torrens Armstrong et al., 2011).

These views can result in disparate attitudes towards children who are frequently absent from school, and can influence their access to intervention or support, as well as the type of intervention provided, with an emphasis placed on therapeutic interventions for anxious school refusers, and punitive approaches for truants (Finning et al., 2017; Lyon & Cotler, 2007; Torrens Armstrong et al., 2011).

To date there have been no systematic reviews to investigate the relationship between anxiety and school attendance. Given the frequent emphasis in the literature on the presumed role of anxiety in poor attendance, the current study aims to systematically review the evidence regarding the association between anxiety and poor school attendance. Although anxiety is commonly comorbid with depression, much of the literature in relation to school attendance has separated these two constructs. Therefore, this paper focuses on associations between anxiety and school attendance, and findings for associations with depression and internalising problems (i.e. combined symptoms of anxiety and depression) are reported elsewhere (Finning, In preparation; Finning et al., 2019). Understanding the role of anxiety in relation to poor school attendance is important in order that children with anxiety can be identified quickly, and appropriate interventions implemented.

Methods

This systematic review was conducted and reported in line with best practice guidelines (Centre for Reviews and Dissemination, 2009; Moher et al., 2009). . Searches were conducted as part of a broader review that reported associations between school attendance and all emotional disorders (anxiety, depression, internalising difficulties) (Finning, In preparation; Finning et al., 2019). In order to explore the impact of anxiety in sufficient depth, only studies that investigated anxiety are included in the current paper, but we acknowledge that anxiety is commonly comorbid with depression. The protocol was registered on the PROPSPERO database (CRD42016052961), and published in a peer-reviewed journal (Finning et al. 2017).

Eligibility criteria

We searched for quantitative studies of any design, from any country, where the sample was school-aged children and/or adolescents, which reported the association between anxiety and school attendance. Any age ranges applicable for the education system of the country of study were eligible. Given that both anxiety disorders and subclinical symptoms of anxiety have the potential to negatively impact a young person's education, studies were eligible if they used measures of anxiety symptoms using a validated scale, diagnosis using a standardised diagnostic measure, or a history of medical diagnosis. We included any terminology and any method of measuring school attendance. Exclusion criteria were: case studies/series, retrospective reports collected in adulthood, studies where the sample was not considered comparable to the general population (e.g. children with a specific health condition), and those not published in English. Intervention studies were also excluded because it was considered that the samples would be selective, and that the intervention might impact the association of interest to this review.

Information sources & search strategy

We searched MEDLINE, PsychINFO, Education Resources Information Centre (ERIC), Education Research Complete, British Education Index, Australian Education Index, and Applied Social Sciences Index and Abstracts (ASSIA), from date of inception to 12 December 2016. ProQuest Dissertations and Theses, Health Management Information Consortium, Conference Proceedings Citation Index, and OpenGrey (http://opengrey.eu) were searched for grey literature. The search strategy combined child, school attendance, and anxiety terms (see Supporting Information for full search strategy). In addition, forwards and backwards citation chasing was performed using Google Scholar, and lead authors of included studies and experts in the field were contacted for additional sources.

Study selection and data extraction

KF and EDW independently screened titles and abstracts, and then full texts, using EndNote X7. Disagreements were resolved through discussion and, if necessary, referral to TF and DAM. Twenty papers (0.6%) were referred at the stage of title and abstract screening, and nine (3.8%) at full text screening. The following items were extracted from included studies by KF and checked by DAM, IRDJ, LSh or LSt: study details (author, year of publication, country, design, primary aim, population), participant characteristics (sample size, age, gender, ethnicity), methods used to assess anxiety and school attendance (name of measure, validation, informant), and study results (effect estimates, 95% confidence intervals, p-values, adjustment for confounding). Where necessary and possible, study authors were contacted to clarify unclear data (n=3 studies).

Assessment of study quality

The Newcastle-Ottawa Scale (NOS) (Wells, 2008), adapted for the current review, was used to assess the quality of included studies. The NOS is a widely used measure designed to assess the quality of observational studies. There are published versions for case-control and cohort studies, as well as a recent adaptation for cross-sectional studies (Herzog et al., 2013). The NOS evaluates studies on the selection of participants, comparability of participant groups, and assessment of the outcome for cohort and cross-sectional studies, or assessment of the exposure for case-control studies. A star-rating system is used to indicate the overall quality of studies, with a maximum of nine stars for cohort and case-control studies, and eight for cross-sectional studies.

Data analysis

Effect sizes included correlation coefficients (r), standardised mean differences (Cohen's *d)*, and odds ratios (ORs). Some studies did not report effect sizes, and in these instances we used an online calculator published by the Campbell Collaboration (Wilson, 2017) or Stata 14.2 (StataCorp, 2015) to

calculate effect sizes, 95% confidence intervals, and p-values. Published guidelines were used to aid the interpretation of effect sizes (Chen, Cohen & Chen, 2010; Cohen, 1992; Hemphill, 2003).

Where two or more studies investigated the same constructs in comparable populations, and reported the same type of effect size (correlation coefficient, standardised mean difference, or odds ratio), random effects meta-analysis was performed using the DerSimonian and Laird method (DerSimonian & Laird, 1986), in RevMan v5.3 (The Cochrane Collaboration, 2014). The I-squared (I^2) statistic was used to quantify heterogeneity; this is the percentage of the total variation across estimates that is due to heterogeneity as opposed to sampling variation (Higgins et al., 2003). Some studies reported multiple results that were applicable to this review. For example, one study reported results for the same association using both a correlation and multiple linear regression (Hunt and Hopko, 2009), and other studies reported both adjusted and unadjusted results (e.g. Vaughn et al., 2013). In these cases, for the purposes of meta-analysis we selected the one result considered most comparable to other studies, and additional results were synthesised narratively. Analyses that adjusted for variables likely to be on the causal pathway between anxiety and school absence (e.g. psychiatric comorbidity), were not included in meta-analyses due to the potential for bias (Schisterman, Cole & Platt, 2009). Results that could not be included in meta-analyses due to heterogeneity, were synthesised narratively. An effect direction plot was used to provide a visual display of findings from all studies (Thomson & Thomas, 2012).

Our protocol specified that subgroup analyses would be performed to explore the impact of age, anxiety measurement method, informant, setting, or school type, on the association between anxiety and school attendance, but this was not possible due to methodological heterogeneity. The protocol also specified that funnel plots and Egger's test would be used to assess publication bias, but there were too few studies for this (Sterne et al., 2011).

Results

Searches identified 4930 articles, of which 3086 were title and abstract screened, and 239 full-text screened (see Figure 1). Eleven studies were included.

[Figure 1 here]

Study characteristics

Study characteristics are summarised in Table 1. Studies were conducted in six countries across North America, Europe, and Asia. Sample sizes ranged from 54 to 13056, with a combined sample size from all studies of 25724. The combined mean age across all studies was 14.62 years, covering children aged from five to 21 years. Two studies included young people in their twenties, but since both explained that this age range was typical of the education system in their respective countries (Norway and Germany), they were included. Anxiety was assessed by measuring continuous symptoms with a validated scale (n=6), binary classification using diagnostic interviews (n=4), history of medical diagnosis (n=1), and screening questions from a diagnostic interview (n=1); see Supporting Information for further details. Studies used a variety of methods to assess school attendance (see Supporting Information), which, for the purposes of data synthesis, were grouped into four categories that were mutually exclusive (i.e. each result was included in only one category). These categories were: absenteeism (i.e. absence for any reason; n=1), excused/medical absences (n=2), unexcused absences/truancy (n=8), and school refusal (n=2). One study additionally reported a separate analysis for students meeting criteria for school refusal and truancy ("mixed school refusal and truancy"). Although there was variation in the ways in which each study measured these four constructs (see Supporting Information), we considered the methods used within each construct to be sufficiently similar to justify their grouping for the purposes of data synthesis. In some cases there were discrepancies between the construct that studies reported to be measuring,

and what was actually measured. In these cases, we used the measurement method, rather than the terminology, to inform our grouping of constructs.

[Table 1 here]

Results of quality assessment

Results of quality assessment are provided in Table 2. Cross-sectional studies scored between one and six out of eight on the Newcastle-Ottawa Scale (NOS), suggesting poor-to-moderate quality. Common problems were no justification of sample sizes, no description of non-respondents, using questionnaires rather than diagnostic measures, and inappropriate or poorly reported statistical tests. The two longitudinal studies scored two and six out of nine. Both used symptom questionnaires rather than diagnoses of anxiety, and neither adjusted for confounds. The two case-control studies were of higher quality than other study designs, scoring seven out of nine.

[Table 2 here]

Data synthesis

Table 3 summarises the direction and statistical significance of all results (Thomson & Thomas, 2012). The following synthesis is presented under subheadings relating to the four school attendance constructs, plus a fifth heading for "mixed school refusal and truancy". Meta-analysis was only possible for small sub-samples of studies, and the majority of results are synthesised narratively.

[Table 3 here]

Absenteeism

One study investigated associations between overall absenteeism and anxiety, and reported a small positive, cross-sectional association (r=0.08, 95% CI 0.01 to 0.15, p=0.032), although this study was of poor quality (Tsar, 2011). There was no longitudinal evidence regarding associations between anxiety and absenteeism.

Excused/medical absences

Two studies reported associations between excused/medical absences and anxiety. Jones et al. (2009) reported small, non-statistically significant increased odds of anxiety for students who missed at least 20% of school days for medical reasons, compared to controls with good attendance (best 10% of the year group) (any anxiety disorder OR=1.36, 95% CI 0.69 to 2.69, p=0.380; obsessive-compulsive disorder OR=2.07, 95% CI 0.99 to 4.2, p=0.060; post-traumatic stress disorder OR=2.12, 95% CI 0.65 to 6.89, p=0.220). Likewise, Burton, Marshal, and Chisolm (2014) reported a small and non-statistically significant correlation between self-reported symptoms of anxiety and excused absences six months later (r=0.17, 95% CI -0.02 to 0.35, p=0.079). Overall, there is little evidence to suggest associations between anxiety and excused or medical absences.

Unexcused absences/truancy

There were mixed findings regarding associations between overall anxiety and unexcused absences/truancy. Vaughn et al. (2013) reported an association between a lifetime diagnosis of any anxiety disorder and "moderate" (OR=1.72, 95% CI 1.18 to 2.51, p=0.005) and "high" (OR=3.46, 95% CI 1.72 to 6.79, p<0.001) truancy. After adjusting for lifetime depression, this only remained statistically significant for moderate truancy (OR=1.97, 95% CI 1.13 to 3.44, p=0.017), however this result is likely to be biased given that depression might lie on the causal pathway between anxiety and truancy. Pflug and Schneider (2016) reported a greater number of anxiety disorder screening questions answered "yes" for truants compared to non-truants (Cohen's *d*=0.21, 95% CI 0.00 to 0.42, p=0.046), but Corville-Smith et al. (1998) reported only weak evidence of a difference in anxiety symptoms between cases with a high number of unexcused absences and controls with good attendance (*d*=0.49, 95% CI 0.06 to 1.03, p=0.076), although this was based on a small sample (n=54). Hunt and Hopko (2009) also reported little evidence for an association between self-reported anxiety and unexcused absences in a correlation (r=0.05, 95% CI -0.05 to 0.15, p=0.339), and multiple linear regression adjusting for other predictors (regression coefficient = -0.05, p=0.542;

suggesting that for each one point increase on the Youth Self-Report anxiety subscale, unexcused absences decreased by 0.05 days). Only one study reported longitudinal evidence, and found a non-statistically significant correlation between baseline anxiety symptoms and unexcused absences at six months (r=0.15, 95% CI -0.04 to 0.33, p=0.121; Burton et al. (2014)).

In terms of particular types of anxiety, two studies demonstrated positive, cross-sectional associations between unexcused absences and social anxiety, both in response to a social anxiety screening question (OR=1.98, 95% CI 1.27 to 3.08, p=0.003; Pflug & Schneider (2016)), and a self-report questionnaire that compared students with "high" versus "no" (*d*=0.34, 95% CI 0.10 to 0.58, p=0.005) and "high" versus "normal" (*d*=0.33, 95% CI 0.12 to 0.54, p=0.003) unexcused absences (Ingul et al. 2012). Egger et al. (2003), however, found little evidence of an association between truancy and social anxiety assessed via diagnostic interview (OR=0.3, 95% CI 0.1 to 1.4, p=0.100). Meta-analysis of two studies found little evidence for an association between unexcused absences/truancy and separation anxiety disorder (SAD) (pooled OR = 0.75, 95% CI 0.22 to 2.57, p=0.65; see Figure 2). Additional findings that could not be meta-analysed also provided little evidence for an association. Pflug and Schneider (2016) reported no association between unexcused absences and a SAD screening question (OR=0.84, 95% CI 0.30 to 2.37, p=0.741). Ingul et al. (2012) reported a difference in self-reported SAD symptoms between students with "high" and "no" unexcused absences (*d*=0.36, 95% CI 0.12 to 0.60, p=0.003), but not when comparing those with "high" and "normal" unexcused absences (*d*=0.19, 95% CI -0.03 to 0.40, p=0.088).

Meta-analysis of two studies also revealed little evidence for an association between unexcused absences/truancy and generalised anxiety disorder (GAD) (pooled OR=1.62, 95% CI 0.35 to 7.53, p=0.54; see Figure 3), although there was substantial heterogeneity between studies (I^2= 79%), with Green et al. (2005) reporting a moderate positive association and Egger et al. (2003) reporting a small negative association. Pflug and Schneider (2016) reported no association between unexcused absences and answers to a GAD screening question (OR=1.37, 95% CI 0.90 to 2.07, p=0.138), but

Ingul et al. (2012) reported differences in GAD symptoms when comparing students with "high" and "no" (*d*=0.45, 95% CI 0.21 to 0.69, p<0.001) and "high" and "normal" (*d*=0.30, 95% CI 0.08 to 0.51, p=0.007) unexcused absences. There was little evidence for associations between unexcused absences/truancy and specific phobia (pooled OR=1.57, 95% CI 0.41 to 5.92, p=0.51; see Figure 4), agoraphobia (OR=1.15, 95% CI 0.71 to 1.87, p=0.572; Pflug and Schneider (2016)), or panic disorder assessed via a screening question (OR=1.32, 95% CI 0.85 to 2.06, p=0.219; Pflug and Schneider (2016)) or diagnostic interview (OR=0.7, 95% CI 0.1 to 3.7, p=0.700; Egger et al. (2003)).

Overall, there is evidence to suggest that unexcused absences/truancy may be associated with symptoms of anxiety in general, as well as social anxiety disorder and GAD specifically. However, findings between individual studies were inconsistent, and there was a lack of longitudinal research.

[Figures 2, 3 and 4 here]

School refusal

Using diagnostic interviews, Egger et al. (2003) reported large positive, cross-sectional associations between school refusal and SAD (OR=11.0, 95% CI 4.9 to 24.0, p<0.001), social anxiety (OR=6.6, 95% CI 2.6 to 17.0, p<0.001), GAD (OR=2.9, 95% CI 1.0 to 8.0, p=0.050) and simple phobia (OR=11.0, 95% CI 3.3 to 39.0, p<0.001). After adjusting for psychiatric comorbidity, only the association with SAD remained statistically significant, however these results may be biased given that other disorders might be on the causal pathway between anxiety and school refusal. One longitudinal study found little evidence for differences in baseline state (*d*=0.31, 95% CI -0.15 to 0.78, p=0.342) or trait (*d*=0.28, 95% CI -0.19 to 0.75, p=0.216) anxiety, nor SAD assessed via diagnostic interview (OR=1.30, 95% CI 0.47 to 3.57, p=0.618), for students with and without school refusal at five month follow-up (Park et al., 2015). However, this study had low statistical power due to the small number of school refusal cases (n=19).

Overall, therefore, the evidence suggests that school refusal may be associated with SAD, GAD, social anxiety and simple phobia, but there is little evidence for a longitudinal association. However, only two studies investigated these relationships.

Mixed school refusal and truancy

Egger et al. (2003) reported large, positive, cross-sectional associations between mixed school refusal/truancy and SAD (OR=19.0, 95% CI 3.3 to 110, p=0.001), panic disorder (OR=38.0, 95% CI 11.0 to 135.0, p<0.001), and GAD (OR=4.4, 95% CI 1.0 to 19.0, p=0.040). The association with GAD did not remain after adjusting for psychiatric comorbidity, but as previously described, this result is likely to be biased.

Discussion

This systematic review synthesised findings from eleven studies, and provided an overview of the evidence for the association between anxiety and poor school attendance. The greatest body of evidence was in relation to unexcused absences or truancy, which may be associated with anxiety overall, as well as GAD and social anxiety specifically. School refusal appears to be associated with SAD, GAD, social anxiety and simple phobia, although only two studies investigated this relationship. These conclusions should be interpreted in light of the substantial limitations of the evidence, which are discussed below. There was little evidence with respect to absenteeism in general, or excused/medical absences, and there was also a lack of longitudinal research, preventing any conclusions about the direction of relationships.

The strength of the association between unexcused absences/truancy and anxiety varied between studies. Those that compared overall symptoms of anxiety for students with “high” versus “low” unexcused absences were more likely to report an association than studies that reported unexcused absences on a continuous scale. It is possible that unexcused absences are associated with anxiety only when they exceed a certain threshold, perhaps because the avoidance of school

may reduce anxiety in these subclinical cases. Egger et al. (2003) found little evidence for associations between truancy and social anxiety or GAD, despite other studies reporting statistically significant associations (Green et al. 2005; Ingul et al., 2012; Pflug & Schneider 2016). Egger et al. (2003) was of higher quality, but they also used a unique definition of truancy that required "truants" to have missed at least a half day in the previous three months, stayed at home in the mornings, been taken to school to ensure arrival, and/or failed to reach school or left early, which was *not* deemed to be due to anxiety or emotional disturbance. The majority of studies, by contrast, measured truancy as the number of unexcused absences. It could be argued that the construct measured by Egger et al. (2003) is qualitatively different to other studies, and the lack of association in their study is perhaps unsurprising given the stipulation that absence was "not due to anxiety or emotional disturbance".

Our findings support previous claims regarding the lack of consensus over how best to measure and define poor attendance (Heyne et al., 2018; Kearney, 2008b; Lauchlan, 2003; Pellegrini, 2007). Studies used widely varied methods to assess attendance (see Supplementary Information), which hampered our ability to draw broad conclusions. Furthermore, whilst "truancy" and "unexcused absences" are sometimes considered to represent different constructs, the studies included in this review tended to use these terms interchangeably, and many used the phrase "truancy" when they had in fact measured unexcused absences. Achieving consensus on appropriate terminology, creating a clear definition, and establishing agreed methods for measuring and reporting these constructs, should be a key priority for future research. Government policy may provide a helpful starting point for the development of such consensus. The UK Department for Education (DfE) uses the term "persistent absence" to describe students who miss 10% or more of school sessions, whether authorised or unauthorised (Department for Education, 2018). This metric is also commonly utilised in the USA (Whitemore et al., 2016). However, it is unclear whether 10% is the most meaningful cut-point in terms of the potential for adverse educational, social or emotional

consequences. Future research to explore the effects of different thresholds would help inform discussions about the measurement and reporting of poor attendance.

It is surprising that research to-date has largely focused on associations between anxiety and unexcused absences or truancy, since truancy is commonly believed to be associated with behavioural, rather than emotional disorders (Elliott & Place, 2017; Kearney, 2008b; Pellegrini, 2007). Further research is needed to investigate relationships between anxiety and absenteeism in general, as well as excused or authorised absences, especially given that the majority of absences are authorised (Department for Education, 2018; Kearney, 2008b). Since school staff take a more sympathetic approach to absence perceived to be related to anxiety, rather than behavioural difficulties (Finning et al., 2017; Torrens Armstrong et al., 2011), it is possible that the absences of anxious children are more likely to be authorised. Additionally, somatic symptoms commonly accompany anxiety (Campo, 2012) and if these symptoms are interpreted as signs of physical illness rather than emotional distress, any associated absences are likely to be authorised.

The majority of research to-date has been cross-sectional, and only two longitudinal studies (maximum follow-up period of six months) were included in this review. Longitudinal research is essential in order to understand the direction of the association, which could have important implications for practice. For example, if anxiety is a cause of poor attendance, then attendance patterns may assist clinicians, school staff, and families in identifying children with anxiety, which would allow for prompt recognition and implementation of appropriate intervention. However, the isolation and withdrawal associated with missing school may itself cause anxiety, which would have implications for children who are frequently absent from school, for example those with long-term conditions. Future research should utilise longitudinal data to explore the direction of these relationships.

Strengths and limitations

This was the first systematic review that we are aware of to synthesise the literature regarding associations between anxiety and poor school attendance. We followed best practice guidelines for conducting (Centre for Reviews and Dissemination, 2009) and reporting (Moher et al., 2009) systematic reviews. Our searches did not restrict by date or country, and anxiety had to be assessed using a validated scale or diagnostic measure, which included both diagnoses and symptoms of anxiety. The inclusion criteria for school attendance were broad, which resulted in a review with conceptual breadth. Grey literature was included, and searches were supplemented with additional search strategies to reduce the likelihood of missing relevant studies. Screening was independently completed by two reviewers, and data extraction and quality assessment completed by one reviewer and checked by a second, minimising bias and error.

However, there were also limitations. Methodological heterogeneity made synthesis challenging, restricted our ability to draw broad conclusions, and limited our ability to combine studies in meta-analyses. The meta-analyses that were performed each included only two studies, which results in less certain effect estimates and a limited representation of between-study variance (Borenstein et al., 2009). We were unable to assess publication bias as there were insufficient studies, and it is possible that such bias was present, although the searches included strategies to minimise this. The NOS was considered the most appropriate and user-friendly quality assessment tool for this review after extensive consideration and pilot testing of several tools. However, the NOS required adaptation in order for us to directly compare studies of different designs, and this limits comparability with other reviews. Given that the searches were conducted in December 2016, it is possible that new studies that meet our inclusion criteria have since been published.

There were also limitations of the included studies. Although variable, the quality of included studies was mostly poor-to-moderate. Five out of eleven studies only reported unadjusted results, which is important given that several variables are likely to confound the association between

anxiety and school attendance (e.g. age, socio-economic status). There were no longitudinal studies that adjusted for confounds. Results were often poorly reported, and rarely included effect estimates, confidence intervals, and exact p-values. In addition, most used questionnaires to assess symptoms of anxiety rather than clinical diagnoses. This benefits from allowing the entire spectrum of symptoms to be assessed, but given the key role that diagnostic frameworks play in policy and service provision, it may be helpful for future studies to also utilise clinical diagnoses.

Conclusions

There is evidence to suggest that both unexcused absences/truancy and school refusal are associated with anxiety. However, these conclusions should be interpreted in light of the inconsistent findings between studies, and the limitations of the evidence. Little research has investigated associations between anxiety and total absenteeism, or excused/medical absences, despite the latter being the most common type of absence. There is also a lack of longitudinal research. These gaps should be a key priority for future research.

Acknowledgements

Study funding

This project was funded by a PhD studentship awarded to KF by the University of Exeter Medical School, supported by the Wellcome Trust (104908/Z/14/Z). OCU was supported by the National Institute for Health Research (NIHR) Collaboration for Leadership in Applied Health Research and Care South West Peninsula (NIHR CLAHRC South West Peninsula). The views expressed are those of the author(s) and not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

Contributors

KF, TF, OCU and DAM proposed the idea for the systematic review and developed the protocol. KF conducted searches, screened studies, extracted data, performed quality assessment, synthesised

results, and produced the first draft of the manuscript. EDW performed second screening of all identified studies. DAM, LSh, IRDJ and LSt double-checked data extraction and quality assessment. OCU provided statistical support. All authors contributed to preparation of the manuscript. We would like to thank Dr Sophie Epstein at King's College London, for her knowledge-sharing and collaboration; and Simon Briscoe from the University of Exeter Medical School Information Specialist team, for his assistance in the development of our search strategy. The authors have no conflicts of interest to declare.

References

Attwood, G., & Croll, P. (2014). Truancy and well-being among secondary school pupils in England. *Educ Stud, 41*. https://doi.org/10.1080/03055698.2014.955725.

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*: Wiley.

Burton, C. M., Marshal, M. P., & Chisolm, D. J. (2014). School absenteeism and mental health among sexual minority youth and heterosexual youth. *Journal of School Psychology, 52*(1), 37-47. doi: 10.1016/j.jsp.2013.12.001

Campo, J.V. (2012). Annual Research Review: Functional somatic symptoms and associated anxiety and depression – developmental psychopathology in pediatric practice. *J Child Psychol Psychiatry, 53*(5), 575-592. doi:10.1111/j.1469-7610.2012.02535.x

Centre for Reviews and Dissemination. (2009). *Systematic reviews: CRD's guidance for undertaking reviews in health care*. Centre for Reviews and Dissemination, University of York.

Chen, H., Cohen, P., & Chen, S. (2010). How Big is a Big Odds Ratio? Interpreting the Magnitudes of Odds Ratios in Epidemiological Studies. *Communications in Statistics - Simulation and Computation, 39*(4), 860-864. https://doi.org/10.1080/03610911003650383

Cohen, J. (1992). A power primer. *Psychol Bull, 112*(1), 155-159. http://dx.doi.org/10.1037/0033-2909.112.1.155

Corville-Smith, J., Ryan, B. A., Adams, G. R., & Dalicandro, T. (1998). Distinguishing Absentee Students from Regular Attenders: The Combined Influence of Personal, Family, and School Factors. *Journal of Youth and Adolescence, 27*(5), 629-640. http://dx.doi.org/10.1023/A:1022887124634

Credé, M., Roch, S. G., & Kieszczynka, U. M. (2010). Class Attendance in College: A Meta-Analytic Review of the Relationship of Class Attendance With Grades and Student Characteristics. *Review of Educational Research, 80*(2), 272-295. https://doi.org/10.3102/0034654310362998

Department for Education. (2018). *Pupil absence in schools in England: 2016 to 2017* (No. SFR 18/2018).

DerSimonian, R., & Laird, N. (1986). Meta-analysis in clinical trials. *Control Clin Trials, 7*(3), 177-188. https://doi.org/10.1016/0197-2456(86)90046-2

Egger, H. L., Costello, J. E., & Angold, A. (2003). School Refusal and Psychiatric Disorders: A Community Study. *Journal of the American Academy of Child & Adolescent Psychiatry, 42*(7), 797-807. https://doi.org/10.1097/01.CHI.0000046865.56865.79

Elliott, J. G., & Place, M. (2017). Practitioner Review: School refusal: developments in conceptualisation and treatment since 2000. *Journal of Child Psychology and Psychiatry*, Online First 02 December 2017. https://doi.org/10.1111/jcpp.12848.

Finning, K. (In preparation). *The association between child and adolescent emotional disorder and poor attendance at school.* Ph.D, University of Exeter.

Finning, K., Harvey, K., Moore, D., Ford, T., Davies, B., & Waite, P. (2017). Secondary school educational practitioners' experiences of school attendance problems and interventions to address them: a qualitative study. *Emotional and Behavioural Difficulties*, 1-13. https://doi.org/10.1080/13632752.2017.1414442

Finning, K., Ukoumunne, O.C., Ford, T., Danielsson-Waters, E., Shaw, L., Romero De Jager, I., Stentiford, L., & Moore, D.A. (2019). The association between child and adolescent depression and poor attendance at school: A systematic review and meta-analysis. *Journal of Affective Disorders, 245,* 928-938.

Green, H., McGinnity, A., Meltzer, H., Ford, T., & Goodman, R. (2005). *Mental health of children and young people in Great Britain, 2004*. London: The Office for National Statistics.

Hemphill, J. F. (2003). Interpreting the magnitudes of correlation coefficients. *Am Psychol, 58*(1), 78-79. http://dx.doi.org/10.1037/0003-066X.58.1.78

Herzog, R., Álvarez-Pasquin, M. J., Díaz, C., Del Barrio, J. L., Estrada, J. M., & Gil, Á. (2013). Are healthcare workers' intentions to vaccinate related to their knowledge, beliefs and attitudes? a systematic review. *BMC Public Health, 13*(1), 154. https://doi.org/10.1186/1471-2458-13-154

Heyne, D., Gren-Landell, M., Melvin., G. & Gentle-Genitty, C. (2018). Differentiation between school attendance problems: Why and how? *Cognitive and Behavioral Practice,* https://doi.org/10.1016/j.cbpra.2018.03.006.

Higgins, J. P. T., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ, 327*, 557-560. https://doi.org/10.1136

Hunt, M. K., & Hopko, D. R. (2009). Predicting high school truancy among students in the Appalachian south. *Journal of Primary Prevention, 30*(5), 549-567. https://doi.org/10.1007/s10935-009-0187-7

Ingul, J. M., Klöckner, C. A., Silverman, W. K., & Nordahl, H. M. (2012). Adolescent school absenteeism: modelling social and individual risk factors. *Child and Adolescent Mental Health, 17*(2), 93-100. https://doi.org/10.1111/j.1475-3588.2011.00615.x

Jones, R., Hoare, P., Elton, R., Dunhill, Z., & Sharpe, M. (2009). Frequent medical absences in secondary school students: survey and case-control study. *Arch Dis Child, 94*(10), 763-767. http://dx.doi.org/10.1136/adc.2008.140962

Kearney, C. A. (2008a). An Interdisciplinary Model of School Absenteeism in Youth to Inform Professional Practice and Public Policy. *Educational Psychology Review, 20*(3), 257-282. http://dx.doi.org/10.1007/s10648-008-9078-3

Kearney, C. A. (2008b). School absenteeism and school refusal behavior in youth: A contemporary review. *Clinical Psychology Review, 28*(3), 451-471. https://doi.org/10.1016/j.cpr.2007.07.012

Kearney, C. A., & Albano, A. M. (2004). The Functional Profiles of School Refusal Behavior:Diagnostic Aspects. *Behavior Modification, 28*(1), 147-161. https://doi.org/10.1177/0145445503259263

Kearney, C. A., Pursell, C., & Alvarez, K. (2001). Treatment of school refusal behavior in children with mixed functional profiles. *Cognitive and Behavioral Practice, 8*(1), 3-11. https://doi.org/10.1016/S1077-7229(01)80037-7

Kearney, C. A., & Silverman, W. K. (1995). Family environment of youngsters with school refusal behavior: A synopsis with implications for assessment and treatment. *The American Journal of Family Therapy, 23*(1), 59-72. https://doi.org/10.1080/01926189508251336

King, N. J., & Bernstein, G. A. (2001). School Refusal in Children and Adolescents: A Review of the Past 10 Years. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*(2), 197-205. https://doi.org/10.1097/00004583-200102000-00014

Lauchlan, F. (2003). Responding to Chronic Non-attendance: A review of intervention approaches. *Educational Psychology in Practice, 19*(2), 133-146. https://doi.org/10.1080/02667360303236

Lyon, A. R., & Cotler, S. (2007). Toward reduced bias and increased utility in the assessment of school refusal behavior: The case for diverse samples and evaluations of context. *Psychology in the Schools, 44*(6), 551-565. https://doi.org/10.1002/pits.20247

Malcolm, H., Wilson, Y., Davidson, J. & Kirk, S. . (2003). *Absence from school: A study of its causes and effects in seven LEAs, Research Report 424*.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med, 6*(7). https://doi.org/10.1371/journal.pmed.1000097

Park, M. H., Yim, H. W., Park, S., Lee, C., Lee, C. U., Hong, S. C., et al. (2015). School refusal behavior in South Korean first graders: A prospective observational community-based study. *Psychiatry Research, 227*(2-3), 160-165. https://doi.org/10.1016/j.psychres.2015.04.011

Pellegrini, D. W. (2007). School Non-attendance: Definitions, meanings, responses, interventions. *Educational Psychology in Practice, 23*(1), 63-77. https://doi.org/10.1080/02667360601154691

Pflug, V., & Schneider, S. (2016). School Absenteeism: An Online Survey via Social Networks. *Child Psychiatry & Human Development, 47*(3), 417-429. https://doi.org/10.1007/s10578-015-0576-5

Schisterman, E.F., Cole, S.R. & Platt, R.W. (2009). Overadjustment bias and unnecessary adjustment in epidemiologic studies. *Epidemiology, 20*(4), 488-495. doi: 10.1097/EDE.0b013e3181a819a1.

StataCorp. (2015). Stata Statistical Software: Release 14. College Station, TX: StataCorp LP.

Sterne, J. A. C., Sutton, A. J., Ioannidis, J. P. A., Terrin, N., Jones, D. R., Lau, J., et al. (2011). Recommendations for examining and interpreting funnel plot asymmetry in meta-analyses of randomised controlled trials. *BMJ, 343*. doi: https://doi.org/10.1136/bmj.d4002

The Cochrane Collaboration. (2014). Review Manager (RevMan) (Version 5.3). Copenhagen: The Nordic Cochrane Centre.

Thomson, H. J., & Thomas, S. (2013). The effect direction plot: visual display of non-standardised effects across multiple outcome domains. *Research Synthesis Methods, 4*(1), 95-101. https://doi.org/10.1002/jrsm.1060

Torrens Armstrong, A. M., McCormack Brown, K. R., Brindley, R., Coreil, J., & McDermott, R. J. (2011). Frequent Fliers, School Phobias, and the Sick Student: School Health Personnel's Perceptions of Students Who Refuse School. *Journal of School Health, 81*(9), 552-559. doi: 10.1111/j.1746-1561.2011.00626.x.

Tsar, V. (2011). *Mental health is a unique risk factor for poor academic achievement: Results from a longitudinal study of Canadian children.* Unpublished M.A., University of Ottawa (Canada), Ann Arbor.

Vaughn, M. G., Maynard, B. R., Salas-Wright, C. P., Perron, B. E., & Abdon, A. (2013). Prevalence and correlates of truancy in the US: results from a national sample. *J Adolesc, 36*. https://doi.org/10.1016/j.adolescence.2013.03.015

Wells, G. A., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M., & Tugwell, P. (2008). The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Nonrandomised Studies in Meta-Analyses. Ottawa, ON, Canada: University of Ottawa.

Whitemore Schanzenbach, D., Bauer, L., & Mumford, M. (2016). *Lessons for Broadening School Accountability under the Every Student Succeeds Act*: The Hamilton Project.

Wilson, D. B. (2017). Practical meta-analysis effect size calculator. Retrieved 5 December 2017, from https://www.campbellcollaboration.org/escalc/html/EffectSizeCalculator-Home.php

Table 1. Summary of study characteristics

Study	Country	Publication status	Design	Emotional disorder & school attendance main aim?	Recruitment Setting	Sample size (% female)	Age in years (mean (SD); range, as provided)	Ethnicity
Burton 2014	USA	Journal	LO (follow-up 6 months)	N	Two primary care medical clinics, Pennsylvania & Ohio	108 (71%)	16.3 (0.9) T1 14 to 19 T1	59% African-American
Corville-Smith 1998	Canada	Journal	CC	Y (one of)	Two high schools from one small city in Ontario	54 (70%)	15 to 19	NR
Egger 2003	USA	Journal	CS	Y	Public schools in 11 counties in North Carolina, taking part in GSMS	1422[a] (44%)	9 to 16	70% White
Green 2005	UK	Report	CS	N	Children and adolescents living in private households in England, Scotland and Wales, sampled via UK Child Benefit Records	7621/4689[b] (48%)	5 to 16	86% White[b]
Hunt 2009	USA	Journal	CS	Y (one of)	Four high schools in Appalachian mountains	367 (58%)	15.9 (1.4) 14 to 19	94% Caucasian
Ingul 2012	Norway	Journal	CS	Y	One urban and one rural high school	809 (52%)	17.2 (1.2) 16 to 21	NR
Jones 2009	Scotland	Journal	Nested CC	Y (one of)	Ten representative local authority secondary schools in Edinburgh	184 (60%)	15.0 13 to 16	NR
Park 2015	South Korea	Journal	LO (follow-up 5 months)	Y	Participants expected to enter primary school in next 2 months, from 34 kindergartens in Seoul	248 (48%)	6 to 7 T1	NR
Pflug 2016	Germany	Journal	CS	Y (one of)	Social network, advert in journal for teachers & Facebook profile; open to all secondary-aged students in Germany	977/1140[c] (47%)	15.1 (2.3) 10 to 21	NR
Tsar 2011	Canada	Thesis	CS	N	50 randomly selected schools in large district school board, Ontario	715 (53%)	10.4 (0.5)	71% Caucasian
Vaughn 2013	USA	Journal	CS	Y (one of)	Representative sample of US youth selected through multistage area probability sampling (NSDUH study)	13056 (49%)	14.6 (1.7)	59% White

CC – Case-control; CS – Cross-sectional; GSMS – Great Smoky Mountains Study; LO – Longitudinal; N – no; NR – not reported; NSDUH – National Survey on Drug Use and Health; T1 = time-point one; Y – yes.

[a] Egger et al. (2003) aggregated data from multiple time waves and thus analysed 6676 observations from 1422 participants. [b] Green et al. (2005) had total sample of 7977, of which school attendance data available for 7621 and 4689 using parent- and teacher-reports, respectively; gender and ethnicity distribution refers to entire 7977 sample. [c] Pflug (2016) had total sample of 1359, of which 1140 had data from diagnostic interviews and 977 had data from the Strengths and Difficulties Questionnaire; gender distribution refers to entire 1359 sample.

Table 2. Results of quality assessment (Newcastle-Ottawa Scale)

CROSS-SECTIONAL STUDIES	SELECTION				COMPARABILITY	OUTCOME		TOTAL (out of 8)
	Representative-ness	Sample size	Non-respondents	Ascertainment of anxiety	Comparability	Assessment of school attendance	Statistical test	
Pflug 2016	+	–	–	–	–	–	–	1
Tsar 2011	+	–	–	–	–	+	–	2
Ingul 2012	+	–	+	–	–	+	–	3
Green 2005	+	–	–	+	++	–	–	4
Hunt 2009	+	–	–	–	++	+	–	4
Vaughn 2013	+	–	–	–	++	–	+	4
Egger 2003	+	–	–	+	++	+	+	6

LONGITUDINAL STUDIES	SELECTION				COMPARABILITY	OUTCOME			TOTAL (out of 9)
	Representative-ness of exposed	Selection of non-exposed	Ascertainment of exposure	Outcome not present at start	Comparability	Ascertainment of outcome	Length of follow-up	Adequacy of follow-up	
Burton 2014	–	+	–	–	–	–	+	–	2
Park 2015	+	+	+	+	–	–	+	+	6

CASE-CONTROL STUDIES	SELECTION				COMPARABILITY	EXPOSURE			TOTAL (out of 9)
	Definition of cases	Representative-ness of cases	Selection of controls	Definition of controls	Comparability	Ascertainment of exposure	Same method of ascertainment	Non-response rate	
Corville-Smith 1998	+	+	+	+	++	–	+	–	7
Jones 2009	+	+	+	+	++	–	+	–	7

+ One star awarded as per the NOS rating scale; ++ two stars awarded as per the NOS rating scale; – no stars awarded as per the NOS rating scale. A higher score reflects greater study quality (i.e. lower risk of bias).

Table 3. Effect direction plot showing associations between anxiety and school attendance for all included studies

Study	Design	Quality rating	Sample size	Anxiety measurement type	SCHOOL ATTENDANCE CONSTRUCT				
					Absenteeism	Excused or medical absences	Unexcused absences or truancy	School refusal	Mixed school refusal & truancy
CROSS-SECTIONAL ASSOCIATIONS BETWEEN TOTAL ANXIETY AND SCHOOL ATTENDANCE									
Corville-Smith 1998	CC	7/9	54	Continuous			△		
Hunt 2009	CS	4/8	367	Continuous			○		
Pflug 2016	CS	1/8	1140	Continuous			▲		
Tsar 2011	CS	2/8	715	Continuous	▲				
Jones 2009	Nested CC	7/9	184	Diagnostic		△			
Vaughn 2013	CS	4/8	13056	Other			▲		
CROSS-SECTIONAL ASSOCIATIONS BETWEEN SEPARATION ANXIETY AND SCHOOL ATTENDANCE									
Ingul 2012	CS	3/8	809	Continuous			△		
Egger 2003	CS	6/8	1422	Diagnostic			◁	▲	▲
Green 2005	CS	4/8	4689	Diagnostic			▽		
Pflug 2016	CS	1/8	1140	Other			▽		
CROSS-SECTIONAL ASSOCIATIONS BETWEEN GENERALISED ANXIETY AND SCHOOL ATTENDANCE									
Ingul 2012	CS	3/8	809	Continuous			▲		
Egger 2003	CS	6/8	1422	Diagnostic			▽	○	△
Green 2005	CS	4/8	4689	Diagnostic			▲		
Pflug 2016	CS	1/8	1140	Other			△		
CROSS-SECTIONAL ASSOCIATIONS BETWEEN SOCIAL ANXIETY AND SCHOOL ATTENDANCE									
Ingul 2012	CS	3/8	809	Continuous			▲		
Egger 2003	CS	6/8	1422	Diagnostic			▽	△	
Pflug 2016	CS	1/8	1140	Other			▲		
CROSS-SECTIONAL ASSOCIATIONS BETWEEN PANIC DISORDER AND SCHOOL ATTENDANCE									
Egger 2003	CS	6/8	1422	Diagnostic			▽	○	▲
Pflug 2016	CS	1/8	1140	Other			△		
CROSS-SECTIONAL ASSOCIATIONS BETWEEN SIMPLE PHOBIA AND SCHOOL ATTENDANCE									
Egger 2003	CS	6/8	1422	Diagnostic			○	△	

Green 2005	CS	4/8	4689	Diagnostic		▲		
CROSS-SECTIONAL ASSOCIATIONS BETWEEN OCD AND SCHOOL ATTENDANCE								
Jones 2009	Nested CC	7/9	184	Diagnostic	△			
CROSS-SECTIONAL ASSOCIATIONS BETWEEN PTSD AND SCHOOL ATTENDANCE								
Jones 2009	Nested CC	7/9	184	Diagnostic	△			
CROSS-SECTIONAL ASSOCIATIONS BETWEEN AGORAPHOBIA AND SCHOOL ATTENDANCE								
Pflug 2016	CS	1/8	1140	Other		△		
LONGITUDINAL ASSOCIATIONS BETWEEN TOTAL ANXIETY AND SUBSEQUENT SCHOOL ATTENDANCE								
Burton 2014	LO	2/9	108	Continuous	△	△		
Park 2015	LO	6/9	248	Continuous			△	
LONGITUDINAL ASSOCIATIONS BETWEEN SEPARATION ANXIETY AND SUBSEQUENT SCHOOL ATTENDANCE								
Park 2015	LO	6/9	248	Diagnostic			△	

▲ = positive association ($p<0.05$); △ = positive association ($p\geq0.05$); ◁ = no association (Egger 2003 reported an odds ratio of 1.0); ▽ = negative association ($p>0.05$); ○ = conflicting results. CC = case-control; CS = cross-sectional; LO = longitudinal; OCD = obsessive-compulsive disorder; PTSD = post-traumatic stress disorder.

Where studies reported multiple outcomes: if at least 70% in the same direction and statistical significance – reported as one; if <70% in same direction – reported as conflicting results; if same direction and at least 70% statistically significant – reported as significant; if same direction but <70% significant – reported as not significant. Procedure derived from Thomson & Thomas (2012).

Figure 1. PRISMA diagram showing flow of studies through the review

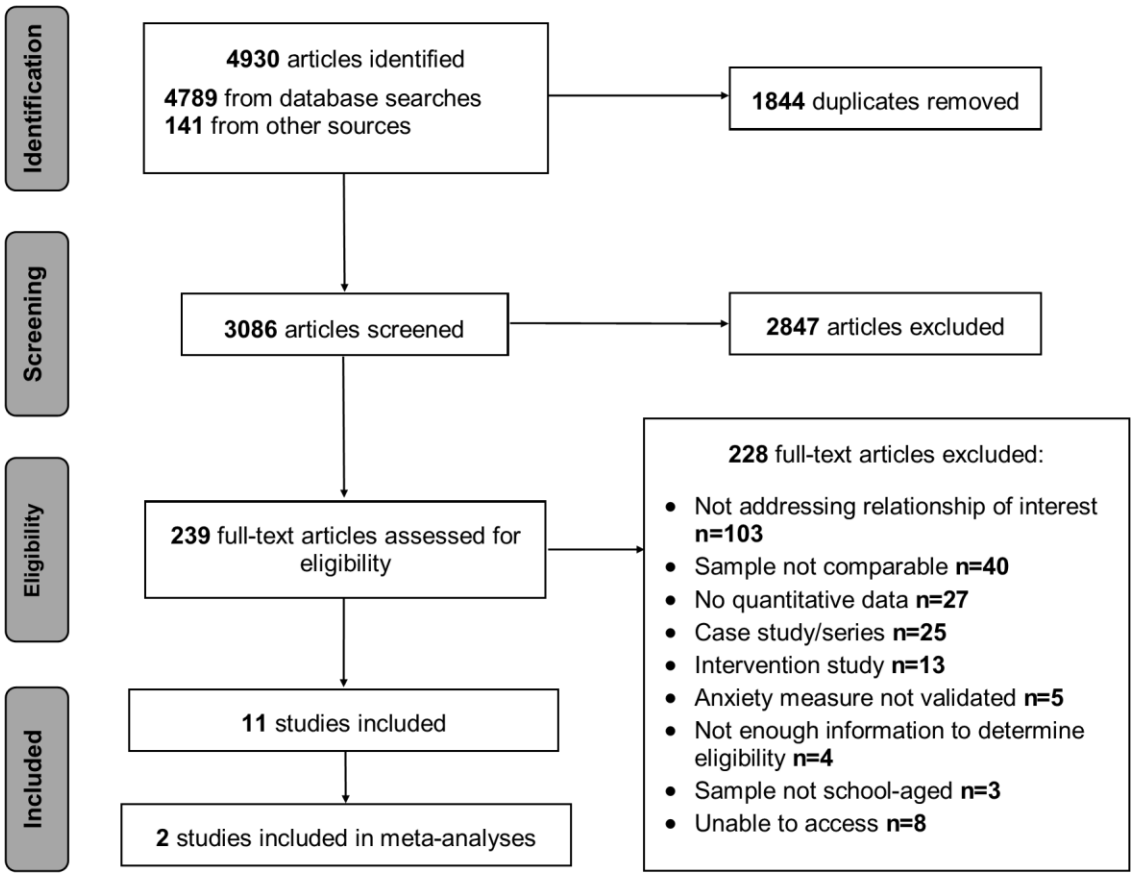

Figure 2. Forest plot showing pooled odds ratio for the association between separation anxiety disorder (SAD) and unexcused absences/truancy

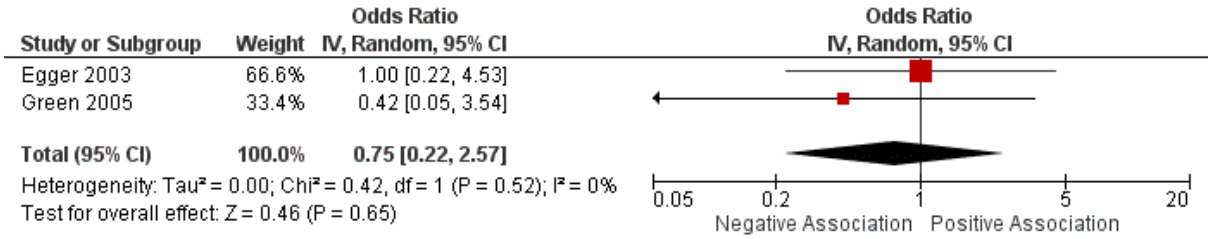

Figure 3. Forest plot showing pooled odds ratio for the association between generalised anxiety disorder (GAD) and unexcused absences/truancy

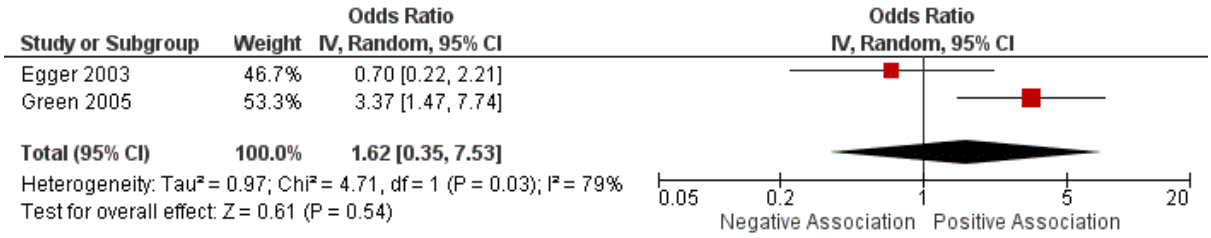

Figure 4. Forest plot showing pooled odds ratio for the association between specific phobia and unexcused absences/truancy