

Abstract

Background: Depression in young people may lead to reduced school attendance through social withdrawal, loss of motivation, sleep disturbance and low energy. We systematically reviewed the evidence for an association between depression and poor school attendance.

Methods: Seven electronic databases were searched for quantitative studies with school-aged children and/or adolescents, reporting a measure of association between depression and school attendance. Articles were independently screened by two reviewers. Synthesis incorporated random-effects meta-analysis and narrative synthesis.

Results: Searches identified 4930 articles. Nineteen studies from eight countries across North America, Europe, and Asia, were included. School attendance was grouped into: 1) absenteeism (i.e. total absences), 2) excused/medical absences, 3) unexcused absences/truancy, and 4) school refusal. Meta-analyses demonstrated small-to-moderate positive cross-sectional associations between depression and absenteeism (correlation coefficient $r=0.11$, 95% confidence interval 0.07 to 0.15, $p=0.005$, $I^2=63\%$); and depression and unexcused absences/truancy ($r=0.15$, 95% confidence interval 0.13 to 0.17, $p<0.001$, $I^2=4\%$; odds ratio=3.74, 95% confidence interval 2.11 to 6.60, $p<0.001$, $I^2=65\%$). Few studies reported associations with school refusal or excused/medical absences, and few utilised longitudinal data, although results from two studies suggested an association between depression and subsequent absenteeism.

Limitations: Study quality was poor overall, and methodological heterogeneity, despite creating a broad evidence-base, restricted meta-analysis to only small subsamples of studies.

Conclusions: Findings suggest associations between depression and poor school attendance, particularly absenteeism and unexcused absences/truancy. Clinicians and school staff should be alert to the possibility of depression in children and adolescents with poor attendance. Future research should utilise longitudinal data to confirm the direction of the association, investigate associations with excused absences, and test potential moderators of the relationship.

Keywords: depression, school attendance, absenteeism, truancy, children, adolescents

Introduction

Depression is a leading contributor to the burden of disease in children and adolescents (Gore et al., 2011), and is associated with impairments in school, family and social functioning (Costello et al., 1996; Fergusson and Woodward, 2002; Horowitz and Garber, 2006; Rutter et al., 2006). Depression affects approximately 3% of the school-aged population worldwide, with many more children experiencing subthreshold symptoms (Polanczyk et al., 2015), and there is also evidence from the UK (Fink et al., 2015), and worldwide (Bor et al., 2014), that depression in this population may be on the rise, particularly for adolescent girls. Effective interventions include individual- and group-delivered cognitive behavioral therapy, and antidepressant medication (Das et al., 2016; Weisz et al., 2017). However, fewer than 20% of children and adolescents with depression receive treatment, and studies in the UK and the USA have demonstrated that young people with internalizing difficulties such as anxiety and depression are less likely to be in contact with mental health services and other support services, compared to young people with other psychiatric disorders such as neurodevelopmental or conduct disorders (Collins et al., 2004; Ford et al., 2007; Merikangas et al., 2010).

Since most children and adolescents spend a large proportion of their time at school, recent reports have called for schools to play a greater role in promoting mental wellbeing, identifying students who may be experiencing mental distress, and referring to specialist services where necessary (Department of Health and Department for Education, 2017; YoungMinds, 2017). The UK Department for Education suggests that attendance data may assist in the identification of students at risk of poor mental health (Department for Education, 2016). There is some evidence to suggest that there may be an association between depression and poor attendance at school. For example, in a large USA community sample, Egger et al. (2003) reported that 14% of school refusers, and 8% of truants, met diagnostic criteria for depression, compared to 2% of controls. Likewise, in a large UK survey, 44% of 5-16 year olds who met diagnostic criteria for a depressive disorder, had at least one unexcused absence in the previous school term, compared to 9% of those with neither depression nor anxiety (Green et al., 2005). Symptoms of depression such as social withdrawal, loss of motivation, sleep disturbance and reduced energy, may impact a child's ability to attend school, but the inactivity and social isolation associated with school non-attendance may also increase a child's risk of depression.

There have been no systematic reviews to date that have examined the association between depression and poor school attendance. In a narrative review of the literature, Kearney (1993) concluded that depression is highly prevalent among youth with poor attendance. However, the

studies reported had severe methodological limitations including small, unrepresentative samples, and there had been no longitudinal research at that time. An up-to-date analysis using rigorous systematic review methods would enhance our understanding of the association between depression and school attendance, and would allow findings from individual studies, utilising different methodological approaches, to be brought together, thus allowing for broader conclusions to be made regarding this association. Further insight into the relationship between depression and school attendance has the potential to inform practice. For example, if a relationship is identified, clinicians and educators should be encouraged to consider patterns of school attendance in order to identify young people who may be experiencing mental distress. This study therefore aims to systematically review the evidence for an association between child and adolescent depression and poor attendance at school.

Methods

This systematic review and meta-analysis was conducted following guidelines for best practice (Centre for Reviews and Dissemination, 2009), and is reported in accordance with the PRISMA statement (Moher et al., 2009). Searches were performed as part of a broader review that focused on associations between all emotional disorders and poor school attendance (Finning, In preparation). Only those studies reporting depression are included here, because the breadth of studies and concepts from the whole review was considered too extensive to be included in one paper. The protocol was registered on the PROSPERO database (CRD42016052961), and published in a peer-reviewed journal (Finning et al., 2017).

Eligibility criteria

We searched for quantitative studies from any country, in school-aged children and/or adolescents, which reported the association between depression and school attendance. The age range was expected to vary between studies, and we included any age ranges applicable for the education system of the country of study. Depression had to be ascertained by assessment using a validated scale, diagnosis using a standardised diagnostic measure, or a history of medical diagnosis. Any terminology and method of measuring school attendance was included. Exclusion criteria were: intervention studies, case studies/series, retrospective reports collected in adulthood, studies using samples not comparable to the general population or to other study samples (e.g. children with a particular health condition) and, due to resource constraints, those not published in English.

Information sources & search strategy

MEDLINE, PsycINFO, Education Resources Information Centre (ERIC), Education Research Complete, British Education Index, Australian Education Index, and Applied Social Sciences Index and Abstracts (ASSIA) were searched by KF from date of *inception* to December 12 2016. In addition, ProQuest Dissertations and Theses, Health Management Information Consortium, Conference Proceedings Citation Index, and OpenGrey (<http://www.opengrey.eu>) were searched for grey literature. The search strategy combined child, school attendance and depression terms (see Table 1). Searches were supplemented with forwards and backwards citation chasing via Google Scholar, and contact with experts in the field and lead authors of included studies.

Study selection and data extraction

KF and EDW independently screened titles and abstracts, followed by full texts, using EndNote X7. Disagreements were resolved through discussion, and referral to TF and DAM where necessary. Data were extracted by KF, and checked by DAM, IRDJ, LSh, or LSt. Items extracted included study details (author, year of publication, country of study, design, primary aim, population), participant characteristics (sample size, age, gender, ethnicity), methods used to assess depression and school attendance (name of measure, informant, measure validation), and study results (effect estimates, confidence intervals, p-values, adjustment for confounding). Authors were contacted wherever possible to clarify unclear data. Where there were multiple publications from one study, all sources were extracted together.

Assessment of study quality

Quality assessment was conducted alongside data extraction using the Newcastle-Ottawa Scale (NOS) (Wells, 2008) adapted for use in the current review (see Supplementary Material 1). The NOS is a widely-used scale designed to assess the quality of observational studies, with versions for case-control and cohort studies, and an adaptation for cross-sectional studies (Herzog et al., 2013). Studies are assessed on selection of participants, comparability of participant groups, and assessment of the outcome (for cohort and cross-sectional studies) or exposure (for case-control studies). Stars are awarded for each item where a study is judged to be of high quality, up to a maximum of nine stars for cohort and case-control studies, and eight stars for cross-sectional studies. Study quality was taken into consideration during data synthesis, but was not used to exclude studies.

Summary measures and data analysis

Summary measures extracted from studies included correlation coefficients (r), where depression and school attendance were reported as continuous variables; standardised mean differences (d), where studies reported, for example, mean depression scores for students with good versus poor attendance; and odds ratios (OR), where studies reported depression and school attendance as binary variables. Where this data was not reported by studies, summary statistics, 95% confidence intervals (CI) and p-values were calculated using an online calculator produced by the Campbell Collaboration (Wilson, 2017) or with Stata 14.2 (StataCorp, 2015). Published guidelines guided the interpretation of effect sizes (Chen et al., 2010; Cohen, 1992; Hemphill, 2003).

Where at least two studies investigated the same constructs in comparable populations, and the same summary statistic was reported or calculated (i.e. correlation coefficient, standardised mean difference, odds ratio), random effects meta-analysis was performed in RevMan v5.3 software (The Cochrane Collaboration, 2014), using the DerSimonian and Laird method (DerSimonian and Laird, 1986). The comparability of populations was discussed on a case-by-case basis by KF, TF, OU and DM. Populations did not need to be identical but, for example, a study that sampled children living in the midst of civil conflict (Siriwardhana et al. 2013) was not combined in meta-analyses with other studies. Where individual studies reported multiple results that were relevant to this review (e.g. results from data collected at more than one time-point, or symptoms reported by more than one informant), the one result deemed to be most comparable to other studies was selected for inclusion in meta-analysis, and additional results were synthesised narratively. For example, in the case of studies reporting cross-sectional results at multiple time-points, we meta-analysed the baseline data, as this was considered most comparable to true cross-sectional studies where data were only collected at one time-point. Where studies reported correlations, meta-analysis was performed on Fisher's transformation of the correlation coefficients. Forest plots on the transformed scale were not considered to be helpful for interpretation of results, and so they are not presented in these scenarios, but the back-transformed pooled effect estimate, 95% confidence interval and p-value are reported in the text. Heterogeneity was quantified using the I^2 statistic, which is the percentage of the total variation across study estimates that is due to heterogeneity rather than sampling variation (Higgins et al., 2003).

Meta-analysis was not appropriate in many scenarios due to methodological heterogeneity in terms of the population, setting, school attendance construct, and method of measuring depression and/or school attendance. Results from such studies were synthesised narratively. An effect direction plot was produced to provide a visual summary of results from all studies (Thomson and

Thomas, 2013). The protocol for this review stated that subgroup analyses would be performed, if possible, to investigate the effects of mean age of the child, method of measuring depression (e.g. self-report of continuous symptoms, diagnostic interview), measurement source (e.g. child-report, parent-report), study setting, or type of school, on the relationship between depression and school attendance. However, there were insufficient studies for subgroup analyses to be performed. The protocol also stated that publication bias would be assessed, if possible, using funnel plots and Egger's regression, but again there were insufficient studies to do so (Sterne et al., 2011).

Results

Characteristics of included studies

Searches identified 4930 articles, of which 3086 were title and abstract screened, and 239 full-text screened (see Figure 1). Twenty articles from nineteen studies were included in the review.

Characteristics of included studies are summarised in Table 2. Fourteen were journal articles, five were theses/dissertations, and one was a published report. Despite the large time gap, Newman (2003) and Kingery et al. (2011) were a linked PhD thesis and journal article providing identical results from the same sample. Data from both sources were extracted, but will be referred to throughout this paper as Kingery et al. (2011). Eleven studies were conducted in the USA, two in the UK, one in Canada, and the remainder from five different countries in Europe and Asia. Thirteen studies were cross-sectional in design, two were case-control, and four were longitudinal, with length of follow-up ranging from five months to four years. Sample sizes ranged from 108 to 14428, with a combined sample size from all studies of 54325. Studies reported mean ages between 10.4 and 17.2 years, covering children aged from five to 23 years. Two study samples (Bailly et al. 1992; Ingul et al. 2012) included young people in their twenties. Since both of these papers explained that the age range was in keeping with the education system of the country of study (France and Norway), they were eligible for inclusion in the review. The percentage of females ranged from 41% to 71%. Seven samples were predominantly (>50%) Caucasian, two were predominantly African-American, one was predominantly Hispanic, one was highly mixed, and ethnicity was unreported in the remainder.

Twelve studies reported a continuous measure of depressive symptoms using a validated scale, two created a binary variable by utilising a clinical cut-off on a validated scale, four produced a binary variable using a diagnostic interview, and one study asked participants whether they had ever been given a diagnosis of depression by a medical professional. Full details of the measures used to assess depression can be found in Supplementary Material 2. Studies used a variety of methods to assess

school attendance which, due to their complexity, are not discussed here but can be viewed in full in Supplementary Material 3. For the purposes of data synthesis, attendance measures were grouped into four overarching constructs: 1) absenteeism, where studies reported a measure of total absences that did not distinguish between different types or reasons for the absence; 2) excused/medical absences, 3) unexcused absences/truancy, and 4) school refusal, which is typically defined as non-attendance due to anxiety or emotional distress (Kearney, 2008). One study additionally reported a separate analysis for students meeting criteria for both school refusal and truancy (“mixed school refusal and truancy”). Absence categories were mutually exclusive, such that any one result was included in only absence category. Where school attendance terminology used by the study was inconsistent with the assessment method, we used the method, rather than the terminology, to determine our grouping of constructs.

Results of quality assessment

Table 3 reports the results of quality assessment. Cross-sectional studies were of poor-to-moderate quality, with NOS scores that ranged from zero to six out of eight. Common issues included no justification for sample size, no description of non-respondents, relying on self-reported depressive symptoms, and inappropriate or poorly reported statistics. Longitudinal studies were of poor-to-moderate quality, with NOS scores that ranged from two to five out of nine. All used self-reported depression, most used self-reported school attendance, and none controlled for confounding. The two case-control studies scored one and seven out of nine. Neither reported response rates for cases versus controls. Otherwise, Jones et al. (2009) was methodologically strong, and Honjo et al. (2001) very poor.

Data synthesis

Table 4 summarises the direction and statistical significance of results from all studies. Synthesis is presented under subheadings related to different school attendance constructs: absenteeism, excused/medical absences, unexcused absences/truancy, and school refusal, with the addition of a fifth subheading “mixed school refusal and truancy”, for one study that conducted a separate analysis for students meeting criteria for both types of non-attendance (Egger et al., 2003). Under each subheading, results are first presented for cross-sectional associations. Where data were available, this is followed by findings for longitudinal associations between baseline depression and subsequent school attendance, and/or longitudinal associations between baseline school attendance and subsequent depression. Meta-analysis was possible for sub-samples of studies within the constructs of “absenteeism” and “unexcused absences/truancy”. Narrative synthesis is

provided for results that could not be included in meta-analyses due to methodological heterogeneity.

Absenteeism

Meta-analysis of four studies reporting correlation coefficients (Juvonen et al., 2000; Kingery et al., 2011; Tsar, 2011; Zadeh, 2010) demonstrated a small positive, cross-sectional association between depressive symptoms and absenteeism (pooled correlation coefficient $r=0.11$, 95% CI 0.07 to 0.15, $p=0.005$; $I^2=63\%$). Three additional results demonstrated positive associations in unadjusted ($r=0.15$, 95% CI 0.05 to 0.25, $p=0.004$ (Kingery et al., 2011); OR=2.72, 95% CI 1.66 to 4.46, $p<0.001$ (Puura et al., 1998) and adjusted analyses (regression coefficient=1.20, $p<0.001$, i.e. annual absence increased by 1.2 days for each one-point increase on the Child Depression Inventory score, where scores can range from zero to 20 (Zadeh, 2010)). There were positive longitudinal associations between baseline depressive symptoms and absenteeism at six- ($r=0.13$, 95% CI 0.03 to 0.23, $p=0.013$, (Kingery et al., 2011)) and twelve-month follow-up (regression coefficients 0.05, $p<0.01^1$ and 0.10, $p<0.001^1$ for middle- and high-school students, respectively, which indicates a 0.05% and 0.10% increase in days absent per 1% increase in depressive symptom score (Wood et al., 2012)). One study reported no association between baseline number of days absent and depressive symptoms six-months later ($r=0.02$, 95% CI -0.08 to 0.12, $p=0.703$ (Kingery et al., 2011)), while another reported strong evidence of a positive relationship for middle-school students, but little evidence for high-school students, between baseline absenteeism and depressive symptoms at 12-month follow-up (regression coefficients 0.06, $p<0.001$ and 0.02, $p>0.05^1$, respectively, representing the percentage increase in days absent per 1% increase in depressive symptom score (Wood et al., 2012)). Overall, therefore, the evidence suggested a small, positive, cross-sectional association between depression and absenteeism. There was also evidence from two longitudinal studies that depression may precede absenteeism, but mixed results in terms of absenteeism preceding depression.

Excused/medical absences

One study found increased odds of depression in students who missed at least 20% of school days for medical reasons, compared to controls with good attendance (best 10% of the year group) (OR=2.62, 95% CI 1.23 to 5.59, $p=0.011$ (Jones et al., 2009)). Another study found no association between medical absences and child-, teacher- or peer-reported depressive symptom scores ($r=-0.04$, 95% CI -0.16 to 0.08, $p=0.510$; $r=-0.00$, 95% CI -0.12 to 0.11, $p=1.000$; and $r=0.06$, 95% CI -0.06 to 0.18, $p=0.322$, respectively), although this study was of poor methodological quality (see Table 3)

¹Wood et al. (2012) did not report exact p-values and these could not be calculated from data provided in the paper. The authors did not respond to our request for further information.

(Rosenberg, 1987). In terms of longitudinal evidence, one study reported only weak evidence of a correlation between baseline depressive symptom score and number of excused absences six-months later ($r=0.17$, 95% CI -0.02 to 0.35 , $p=0.079$ (Burton et al., 2014)). Overall, therefore, there were mixed findings from the small number of studies available that explored the association between depression and excused/medical absences, although the study of highest quality reported the strongest cross-sectional association.

Unexcused absences/truancy

Meta-analysis of three studies reporting correlation coefficients (Hunt and Hopko, 2009; Repetto, 2003; Sigfusdottir et al., 2007), found a small positive cross-sectional association between depressive symptoms and unexcused absences/truancy (pooled $r=0.15$, 95% CI 0.13 to 0.17 , $p<0.001$; $I^2=4\%$). One study reported further cross-sectional associations at one- ($r=0.12$, 95% CI 0.04 to 0.19 , $p=0.003$), two- ($r=0.12$, 95% CI 0.04 to 0.20 , $p=0.003$), and three- ($r=0.14$, 95% CI 0.06 to 0.22 , $p<0.001$) year follow-up (Repetto, 2003). Ingul et al. (2012) reported greater depressive symptoms in students with “high” versus “no” (standardised mean difference $d=0.65$, 95% CI 0.40 to 0.89 , $p<0.001$) and “high” versus “normal” ($d=0.41$, 95% CI 0.20 to 0.63 , $p=0.004$) unexcused absences, and Hunt and Hopko (2009) found a positive association in a multiple linear regression controlling for other predictor variables (regression coefficient= 0.26 , $p=0.002$, i.e. unexcused absences increased by 0.26 days per one-point increase on the Youth Self-Report internalizing scale, where YSR scores can range from zero to 64). A second meta-analysis of four studies reporting odds ratios for depression measured as a binary variable, found a positive cross-sectional association (pooled OR= 3.74 , 95% CI 2.11 to 6.60 , $p<0.001$; $I^2=65\%$; see Figure 2), with Green et al. (2005) reporting a larger association than the other studies. One explanation for this is that the studies used different definitions for truancy, with Green et al. (2005) using a lower threshold that only required students to have had one unexcused absence in the previous term in order to be considered a truant. . Several other results, which could not be included in the meta-analysis, are synthesised narratively below.

In addition to parent-reported truancy (see Figure 2), Puura et al. (1998) demonstrated a small association between teacher-reported truancy and 8-9 year old child-reported depression (OR = 2.54 , 95% CI 1.43 to 4.49 , $p=0.001$), but neither result remained statistically significant when all other significant questionnaire items were controlled for. In addition to the analysis adjusting for age, gender and other types of school non-attendance (see Figure 2), Egger et al. (2003) reported a small positive association when additionally adjusting for psychiatric comorbidity (OR = 2.6 , 95% CI 1.2 to 5.6 , $p=0.010$). Gase et al. (2014) found a small positive association for students with “mild

depression” (OR = 1.64, 95% CI 1.28 to 2.10, $p=0.001$) in addition to the association for “severe depression” shown in Figure 2, and Vaughn et al. (2013) reported evidence of positive associations between a lifetime diagnosis of depression and moderate (OR = 1.43, 95% CI 1.04 to 1.98, $p=0.029$) and high (OR = 3.41, 95% CI 2.07 to 5.60, $p<0.001$) truancy, although when adjusting for lifetime anxiety, the association only remained statistically significant for high truancy. Bailly et al. (1992) reported “no correlation” but provided no accompanying statistics.

In terms of longitudinal evidence, one study reported a positive correlation between baseline depressive symptom score and number of unexcused absences six-months later ($r=0.32$, 95% CI 0.14 to 0.48, $p<0.001$ (Burton et al., 2014)). Repetto (2003) however, reported small and mostly non-statistically significant correlations between depressive symptom score and subsequent school skipping over three years, as well as little evidence for associations between baseline school skipping and subsequent depressive symptoms.

Overall, therefore, the evidence suggested a small-to-moderate, positive, cross-sectional association between depression and unexcused absences/truancy, which remained when important theoretical confounders such as age, gender, ethnicity, and psychiatric comorbidity were adjusted for. There was limited evidence from only a small number of studies regarding longitudinal associations. The evidence for associations between depression and unexcused absences/truancy was derived from studies of poor methodological quality (see Table 3).

School refusal

One study demonstrated greater self-reported depressive symptoms in school refusers compared to controls ($d=0.54$, 95% CI 0.22 to 0.87, $p=0.001$ (Honjo et al., 2001)) and another reported large associations between school refusal and depression assessed via diagnostic interview, when adjusting for age, gender, and other types of absence (OR=10.0, 95% CI 4.1 to 26.0, $p<0.001$) and when additionally adjusting for psychiatric comorbidity (OR=13.0, 95% CI 3.4 to 42.0, $p<0.001$ (Egger et al., 2003)). Overall, therefore, the evidence suggested a medium-to-large, positive, cross-sectional association between depression and school refusal, which remained after adjusting for confounds. There were no studies reporting longitudinal relationships between these variables.

Mixed school refusal and truancy

One study reported a large positive cross-sectional association between depression and mixed school refusal/truancy when adjusting for age, gender and other types of absence (OR=8.5, 95% CI 3.1 to 23.0, $p<0.001$), but this did not remain when additionally adjusting for psychiatric comorbidity (OR=0.8, 95% CI 0.2 to 2.7, $p=0.700$ (Egger et al., 2003)).

Discussion

This systematic review presented and synthesised findings from 19 studies, and provided an overview of the association between depression in children and adolescents, and poor attendance at school. Results were grouped into four school attendance constructs: absenteeism, excused/medical absences, unexcused absences/truancy, and school refusal. Overall, the evidence suggests a small positive association between depression and absenteeism, and between depression and unexcused absences/truancy; and a moderate-to-large positive association between depression and school refusal. Only two studies reported associations between depression and excused/medical absences, and findings from these two studies were mixed, which limits our ability to draw conclusions in this regard. Few studies utilised longitudinal data, and hence we can only draw tentative conclusions regarding the potential direction of these relationships. However, two studies provided evidence that depression may precede absenteeism, rather than the reverse.

Strengths and limitations

A variety of terms and methods to assess school attendance exist in the literature, and our grouping of constructs enabled results from multiple studies to be synthesised, and allowed for clearer and broader conclusions to be made than is possible from individual studies. We followed best practice guidelines for conducting (Centre for Reviews and Dissemination, 2009) and reporting (Moher et al., 2009) systematic reviews. Searches did not restrict by date or country, and depression had to be assessed with a validated scale or diagnostic measure. Inclusion criteria for school attendance were broad, which resulted in conceptual breadth. Grey literature was included, and database searches were supplemented with additional strategies to minimise the likelihood of missing studies. Screening was completed independently by two reviewers, and data extraction and quality assessment completed by one reviewer and double-checked by a second, thus minimising bias and error.

However, this review also had limitations. Due to methodological heterogeneity between studies in terms of the population, setting, school attendance construct, and method of measuring depression and/or school attendance, meta-analysis was only possible for sub-samples of studies, with the majority of results synthesised narratively. For each meta-analysis the number of included studies was small, which results in less certain summary estimates and a limited representation of potential between-study variance, compared to meta-analyses with a greater number of included studies (Borenstein et al., 2009). There were insufficient studies to examine publication bias, and it is possible that such bias was present in this review, although the searches included strategies to

minimise this. Included studies were from eight countries across North America, Europe and Asia, and it is possible that respondents from different countries understand depression differently. There were insufficient data to perform sensitivity analyses in this respect, but since all countries were high-income, and given the requirement for the use of a validated scale or diagnostic measure, we would not anticipate substantial differences between countries. The exclusion of papers not published in English is also a limitation of this review, and as this was a criterion of database searches, we do not know how many non-English studies would have otherwise met inclusion criteria. The quality assessment tool (NOS) benefits from having versions available for all study designs relevant to this review, however the NOS required adaptation in order to allow direct comparison between studies of different designs, and this limits comparability with other reviews.

There were common limitations observed across included studies. Many did not adjust for confounding factors, which is an important limitation given that several factors have previously been demonstrated to be associated with both depression and school attendance, such as the child's age and socioeconomic status (Department for Education, 2018; Green et al., 2005). Furthermore, some of the studies that did control for confounders reported statistically significant associations only in unadjusted analyses. Most studies measured depressive symptoms with questionnaires, which is judged by the Newcastle-Ottawa Scale as a sign of lower study quality compared to those that use diagnostic assessments. However, given the internalizing nature of depression it could be argued that validated self-report measures are not in themselves a sign of low study quality. Results were often poorly reported, rarely including effect estimates, confidence intervals, and exact p-values.

Implications

Overall, the evidence suggests that depression is associated with poor attendance at school, and in the few studies to explore temporal relationships, depression preceded poor attendance. Poor school attendance, particularly when it is a change from previous patterns of behaviour, may therefore form part of the clinical picture of a child presenting with depression, and clinicians should be encouraged to question children, and the adults around them, about patterns of school attendance. Likewise, teachers and other school staff should be educated to recognise that poor school attendance may be a sign of depression, and should therefore be alert to changing patterns of attendance in order to help identify students with additional mental health needs, and to signpost to appropriate support services within or beyond the school setting.

The association between depression and unexcused absences/truancy is surprising, since there is a long-held belief that while "school refusal" is associated with emotional disorder, "truancy" is associated with behavioural, but not emotional disorders (Berg et al., 1993; Elliott and Place, 2017;

Thambirajah et al., 2008). Given that studies reporting on truancy or unexcused absences rarely assessed or excluded “school refusers” from their sample, it is possible that the association between depression and truancy is in fact a result of unidentified school refusal cases. However, Egger et al. (2003) did separate these constructs and still reported an association between depression and truancy. Additionally, Egger et al (2003) reported a community prevalence of 0.5% mixed school refusal and truancy (compared to 1.6% pure school refusal and 5.8% pure truancy), and we therefore consider it highly unlikely that the association between depression and truancy is entirely due to unidentified cases of school refusal. Altogether, the findings presented here demonstrate that different patterns of non-attendance are associated with depression.

Since the strength of associations reported by individual studies included in this review were variable, future research should investigate moderators of the association between depression and poor school attendance. It may be that there are particular circumstances under which poor school attendance is a particularly robust signifier of depression, and this would have implications for clinicians and school staff. In particular, since depression is rare in young children and becomes more common during adolescence (Ford et al., 2003), it would be beneficial for future research to elucidate the impact of age on the relationship between depression and poor school attendance. There is a lack of evidence regarding associations between depression and excused or medical absences. Since the majority of school absences are excused/authorised (Department for Education, 2018; Kearney, 2008), this warrants further research. Somatic symptoms such as headaches, stomach-aches and fatigue are common in children and adolescents with depression, and these absences may be authorised by the school, particularly if interpreted by adults as signs of physical illness rather than psychological distress.

The majority of studies included in this systematic review used questionnaires to measure symptoms of depression as perceived by children, parents, teachers and/or peers, with few studies utilising diagnostic measures. The benefit of such an approach is that it allows investigation of the entire spectrum of depressive symptoms, rather than focusing solely on children with diagnosable disorders. However, given that diagnostic frameworks play a key role in policy and service provision, it would be helpful for future studies to use diagnostic criteria instead of, or in addition to, measures of symptoms. Finally, few studies have utilised longitudinal data, and further research in this respect would allow conclusions to be made about the direction of the association, which could theoretically be bi-directional. This has important implications for practice because, for example, if depression precedes poor school attendance, then changes in school attendance might help parents and school staff to identify young people with additional mental health needs, allowing for more timely recognition of mental distress and more prompt referral to specialist mental health services.

Alternatively, if poor school attendance precedes depression, it may suggest a need for additional, preventative mental health support to be provided for children who frequently miss school, for example those with physical health conditions.

Conclusions

This systematic review provides evidence for an association between depression and poor attendance at school, particularly absenteeism, unexcused absences/truancy, and school refusal. However, there is a lack of high-quality research, few longitudinal studies, and limited data regarding the most common type of school absence: excused absence.

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 report. EDW performed second screening of all identified studies. DAM, LSh, IRDJ and LSt double-checked data extraction and quality assessment. OCU provided statistical advice. All authors contributed to preparation of the manuscript and approved the final article.

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Conflict of interests

None.

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Table 1: Master search strategy for MEDLINE

#	Keywords	Search terms
1	Children and adolescents	child* or adolescen* or student* or youth* or pupil* or schoolchild* or (young adj (people or person)) or [child] or [adolescent] or [students]
2	School attendance	((school* or kindergarten or nursery or education*) adj4 (attend* or non-attend* or refus* or absen* or school phobi* or truan*))
3	Depression	(emotional adj (disorder* or distress or symptom*)) or depressi* or affect* disorder* or mood disorder* or dysthymi* or bipolar or internalising or internalizing or [mood disorder]
#1 AND #2 AND #3		
limit to English language		

NB terms in square brackets refer to MEDLINE Medical Subject Headings (MESH)

Table 2: Summary of study characteristics

Study	Country	Publication status	Design	Recruitment setting	Sample size (% female)	Age in years*	Ethnicity
Bailly et al. (1992)	France	Journal	CS	15 representative, randomly selected high schools	728 (41%)	17.2 (1.5) 14–23	NR
Burton et al. (2014)	USA	Journal	LO	Two primary care medical clinics, Pennsylvania & Ohio	108 (71%)	16.3 (0.9) T1 14–19 T1	59% African-American
Egger et al. (2003)	USA	Journal	CS	Public schools in 11 counties in North Carolina, taking part in GSMS	1422 [†] (44%)	9–16	70% White
Gase et al. (2014)	USA	Journal	CS	Applications to 1 of 3 high-performing public schools; application open to all youths in catchment area	909 (55%)	16.4	84% Hispanic
Green et al. (2005)	UK	Report	CS	Children and adolescents living in private households in England, Scotland and Wales, sampled via UK Child Benefit Records	7621/4689 [‡] (48%)	5–16	86% White [‡]
Honjo et al. (2001)	Japan	Journal	CC	Clinical setting implied – no further details	287 (51%)	14.1 7–17	NR
Hunt and Hopko (2009)	USA	Journal	CS	Four high schools in Appalachian mountains	367 (58%)	15.9 (1.4) 14–19	94% Caucasian
Ingul et al. (2012)	Norway	Journal	CS	One urban and one rural high school	809 (52%)	17.2 (1.2) 16–21	NR
Jones et al. (2009)	Scotland	Journal	Nested CC	Ten representative local authority secondary schools in Edinburgh	184 (60%)	15.0 13–16	NR
Juvonen et al. (2000)	USA	Journal	CS	One large public middle school, Los Angeles	178 (55%)	12–15	Mixed [§]
Kingery et al. (2011)	USA	Journal/Thesis	LO	Elementary & middle schools from 6 public school districts, New England	365 (52%)	11.2 T1	99% Caucasian
Puura et al. (1998)	Finland	Journal	CS	Representative sample of all children born in Finland in 1981, recruited via sampling at town- and district-level	5686 (49%)	8–9	NR

Repetto (2003)	USA	Thesis	LO	Four public high schools in Flint, Michigan	602 (52%)	14.5 (0.6) T1	100% African-American
Rosenberg (1987)	USA	Thesis	CS	Two school districts in Ohio	274 (53%)	8–11	NR
Sigfusdottir et al. (2007)	Iceland	Journal	CS	All Icelandic secondary schools in March 2000	5810 (52%)	14–15	NR
Tsar (2011)	Canada	Thesis	CS	50 randomly selected schools in large district school board, Ontario	715 (53%)	10.4 (0.5)	71% Caucasian
Vaughn et al. (2013)	USA	Journal	CS	Representative sample of US youth selected through multistage area probability sampling (NSDUH study)	13056 (49%)	14.6 (1.7)	59% White
Wood et al. (2012)	USA	Journal	LO	Stratified random sample of all US secondary schools (AddHealth study)	14428 (50%)	12–18 T1	67% White
Zadeh (2010)	USA	Thesis	CS	Students from 10 locations across US, taking part in NICHD SECCYD study	776 (51%)	11–12	NR

CC – Case-control; CS – Cross-sectional; GSMS – Great Smoky Mountains Study; LO – Longitudinal; N – no; NICHD SECCYD – National Institute of Child Health and Human Development Study of Early Child Care and Youth Development; NR – not reported; NSDUH – National Survey on Drug Use and Health; T1 = time-point one; Y – yes.

*Age reported here as mean (standard deviation) and/or range, as provided by included studies. † Egger et al. (2003) aggregated data from multiple time waves and thus analysed 6676 observations from 1422 participants. ‡ 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. § Juvonen et al. (2000) sample ethnicity was 23% Chicano/Latino, 18% African-American, 16% Middle Eastern, 13% European American, 12% Asian American, 11% Multiracial/other.

Table 3: Results of quality assessment

CROSS-SECTIONAL STUDIES	SELECTION				COMPARABILITY	OUTCOME		TOTAL (out of 8)	
	Representative -ness	Sample size	Non-respondents	Ascertainment of emotional disorder	Comparability	Assessment of school attendance	Statistical test		
Rosenberg (1987)	-	-	-	-	-	-	-	0	
Puura et al. (1998)	+	-	-	-	-	-	-	1	
Sigfusdottir et al. (2007)	+	-	-	-	-	-	-	1	
Bailly et al. (1992)	+	-	-	+	-	-	-	2	
Juvonen et al. (2000)	+	-	-	-	-	+	-	2	
Tsar (2011)	+	-	-	-	-	+	-	2	
Zadeh (2010)	+	+	-	-	-	+	-	3	
Ingul et al. (2012)	+	-	+	-	-	+	-	3	
Green et al. (2005)	+	-	-	+	++	-	-	4	
Hunt & Hopko (2009)	+	-	-	-	++	+	-	4	
Vaughn et al. (2013)	+	-	-	-	++	-	+	4	
Gase et al. (2014)	+	-	-	-	++	-	+	4	
Egger et al. (2003)	+	-	-	+	++	+	+	6	
LONGITUDINAL STUDIES	SELECTION				COMPARABILITY	OUTCOME			TOTAL (out of 9)
	Representativeness 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 et al. (2014)	-	+	-	-	-	-	+	-	2
Repetto (2003)	-	+	-	-	-	-	+	+	3
Wood et al. (2012)	+	+	-	-	-	-	+	-	3
Kingery et al. (2011)	+	+	-	-	-	+	+	+	5
CASE-CONTROL STUDIES	SELECTION				COMPARABILITY	EXPOSURE			TOTAL (out of 9)
	Definition of cases	Representativeness of cases	Selection of controls	Definition of controls	Comparability	Ascertainment of exposure	Same method of ascertainment	Non-response rate	
Honjo et al.(2001)	-	-	-	-	-	-	+	-	1
Jones et al. (2009)	+	+	+	+	++	-	+	-	7

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

Table 4: Effect direction plot showing associations between depression and school attendance for all included studies

Study	Design	Study quality	Sample size	Depression measurement type	SCHOOL ATTENDANCE CONSTRUCT				
					Absenteeism	Excused or medical absences	Unexcused absences or truancy	School refusal	Mixed refusal & truancy
CROSS-SECTIONAL ASSOCIATIONS BETWEEN DEPRESSION AND SCHOOL ATTENDANCE									
Honjo et al. (2001)	CC	1/9	287	Continuous				▲	
Hunt & Hopko (2009)	CS	4/8	367	Continuous			▲		
Ingul et al. (2012)	CS	3/8	809	Continuous			▲		
Juvonen et al. (2000)	CS	2/8	178	Continuous	▲				
Kingery et al. (2011)	LO*	5/8	365	Continuous	○				
Repetto (2003)	LO*	3/8	602	Continuous			▲		
Rosenberg (1987)	CS	0/8	274	Continuous		○			
Sigfusdottir et al. (2007)	CS	1/8	5810	Continuous			▲		
Tsar (2011)	CS	2/8	715	Continuous	▲				
Zadeh (2010)	CS	3/8	776	Continuous	▲				
Puura et al. (1998)	CS	1/8	5686	Cut-off	△		○		
Bailly et al. (1992)	CS	2/8	728	Diagnostic			◁		
Egger et al. (2003)	CS	6/8	1422	Diagnostic			▲	▲	○
Gase et al. (2014)	CS	4/8	909	Diagnostic			▲		
Green et al. (2005)	CS	4/8	4689	Diagnostic			▲		
Jones et al. (2009)	Nested CC	7/9	184	Diagnostic		▲			
Vaughn et al. (2013)	CS	4/8	13056	Other			▲		
LONGITUDINAL ASSOCIATIONS BETWEEN DEPRESSION AND SUBSEQUENT SCHOOL ATTENDANCE									
Burton et al. (2014)	LO	2/9	108	Continuous		△	▲		
Kingery et al. (2011)	LO	5/9	365	Continuous	▲				
Repetto (2003)	LO	3/9	602	Continuous			△		
Wood et al. (2012)	LO	3/9	14428	Continuous	▲				
LONGITUDINAL ASSOCIATIONS BETWEEN SCHOOL ATTENDANCE AND SUBSEQUENT DEPRESSION									
Kingery et al. (2011)	LO	5/9	365	Continuous	△				
Repetto (2003)	LO	3/9	602	Continuous			△		

Wood et al. (2012)	LO	3/9	14428	Continuous	△
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▲ = positive association ($p < 0.05$); △ = positive association ($p \geq 0.05$); ◁ = no association – Bailly 1992 simply reported “no association”, with no accompanying statistics; ○ = conflicting results. CC = case-control; CS = cross-sectional; LO = longitudinal. *Kingery 2011 and Repetto 2003 were longitudinal studies but results referred to here are based on cross-sectional data. NB where studies reported multiple outcomes: if at least 70% same direction & significance – reported as one effect; less than 70% in same direction – reported as conflicting results; same direction and at least 70% statistically significant – reported as significant; same direction but less than 70% significant – reported as not significant.

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

Figure 2. Forest plot showing odds ratios for the association between depression and unexcused absences/truancy, for those studies where meta-analysis was deemed appropriate