Case Study 1: An Evidence-Based Practice Review Report

Theme: School (setting) based interventions for children with special educational needs (SEN)

How effective is Attribution Retraining at improving the attributions and academic achievement of school-aged children who have or are at-risk of learning difficulties?

1.1 Summary

The aim of the current paper was to review the effectiveness of school-based attribution retraining (AR) interventions at improving the attributions and, consequently, the academic achievement of children who are struggling with their learning.

Weiner (1985)'s attribution theory outlines the causal explanations that children attach to an experience of academic success or failure and the subsequent impact these beliefs can have on motivation and learning. This theory has been used to explain the pattern of maladaptive attributions often adopted by children who are underachieving academically. AR aims to modify these maladaptive attributional beliefs and research has shown it can be effective at improving academic achievement for children with learning difficulties (LDs; Robertson, 2000). The current report sought to provide a review of the efficacy of AR at improving the attributions and academic achievement of children who are underachieving.

A systematic review of the literature retrieved five studies which met the inclusion criteria. These studies were critically appraised using Gough's (2007)

'Weight of Evidence' framework, including an evaluation of the methodological quality and relevance of each study. The review concluded that AR is a promising intervention for improving the attributions and academic achievement of struggling learners, but updated research is necessary. The paper finishes with a discussion of the review's limitations alongside recommendations for practice and future research.

2.1 Introduction

2.2 Attribution Theory

The attribution theory (Heider, 1958) outlines the thought processes that take place when an individual encounters an unexpected or undesirable event. Specifically, the theory suggests that when an event occurs, individuals undertake a causal search for why that particular outcome took place. These beliefs about causality are known as attributions and have been shown to impact an individual's subsequent feelings, motivation and behaviour (Chodkiewicz & Boyle, 2014).

Weiner (1985) was the first to apply this theory to explain motivation in academic contexts. He suggested that there are three possible causal dimensions to which an event can be attributed: locus (internal or external), controllability (controllable or uncontrollable) and stability (constant or varying over time). In the academic domain, children often attribute success and failure to internal, stable and uncontrollable causes (such as ability) or external, unstable and uncontrollable causes (such as luck). Individuals who develop these maladaptive attributional styles are more likely to give up during difficult tasks and perform poorer academically (Núñez et al., 2005). Conversely, those who attribute academic success and failure to internal, unstable and

controllable factors (such as effort), are more motivated to apply themselves during future academic tasks, resulting in improved academic achievement (Graham, 1991).

2.3 Attribution Retraining

AR aims to replace maladaptive attributional styles with more adaptive attributions to promote future motivation to achieve. Children receiving the intervention are taught to attribute failure and success to internal and controllable causes such as effort. The way the intervention has been delivered varies greatly across studies (Försterling, 1985). However, students are generally exposed to real or imagined situations involving academic success and failure (Chodkiewicz & Boyle, 2014). Then, through the use of techniques such as direct attributional feedback, self-talk, modelling, role-play and practise, children are taught to attribute failure to insufficient effort and success to sufficient effort.

AR has been implemented across a range of educational contexts including primary schools (Miranda et al., 1997), secondary schools (Lavasani et al., 2012) and higher education (Hamm et al., 2020). It has been delivered at a whole-class level (Horner & Gaither, 2004), in small groups of children with LDs (Robertson, 2000) and within alternative provisions (Cooper & Christenson, 2015). AR has been delivered in conjunction with Cognitive Behavioural Therapy (CBT; Bosnjak et al., 2017; Toland & Boyle, 2008), academic strategy instruction (Berkeley et al., 2011; Borkowski et al., 1988) and by itself (Cue & Taylor, 2020; Sukariyah & Assaad, 2015). It has also been used across different

academic domains including reading (Berkeley et al., 2011), spelling (Fulk, 2010), writing (Hall et al., 2004), mathematics (Okolo, 1992) and physics (Ziegler & Heller, 2000).

2.4 Rationale and Relevance

Children who are struggling with their learning are often exposed to repeated experiences of academic failure, resulting in them becoming discouraged (Robertson, 2000). Over time, these negative school experiences can result in the development of maladaptive attributional styles and a sense of 'learned helplessness', where children feel they have little control over their learning (Seligman, 1975). Indeed, research has repeatedly shown that students with LDs are more likely to attribute academic failure to internal and stable causes than typically developing children (Borkowski et al., 1988; Tabassam & Grainger, 2002).This also applies to children who have not been diagnosed with a LD, but are struggling academically (Banks & Woolfson, 2008; Carr et al., 1991). The relationship is reciprocal as maladaptive attributions can result in poor academic achievement which in turn leads to increasingly negative attributions (Marsh & Martin, 2011). Thus, educational interventions which seek to retrain the attributions of struggling learners remain pertinent.

That said, much of the research into AR for children with LDs is now outdated, with the most recent reviews being conducted in 2000 (Robertson, 2000) and 2013 (Koles & Boyle, 2013). Moreover, both these papers were narrative reviews, which provide a less objective and rigorous review process than systematic reviews (Pae, 2015). Additionally, the focus of previous reviews has

been on children with identified LDs. Given research which shows the high prevalence of maladaptive attributions in underachievers (who often go unidentified; Butler & De La Paz, 2021), there exists a need to conduct a systematic review of research which studies AR in children with LDs and non-labelled underachievers.

In the world of Educational Psychology, there has been a strong drive to integrate research evidence with best practice within schools, with Educational Psychologists (EPs) playing a crucial role in bridging the gap between research and practice (Sedgwick, 2019). AR is said to be the best example of applying the attribution theory to real-world educational practice (Graham & Taylor, 2021). Therefore, EPs are in a unique position to promote the use of AR and train school staff on how to implement the intervention. Additionally, given the rising concern of poor academic achievement and related student wellbeing (Clarke, 2020), AR is more relevant than ever as an approach which tackles both areas.

2.5 Research Question

How effective is AR at improving the attributions and academic achievement of school-aged children who have or are at-risk of LDs?

3.1 Critical Review of the Evidence Base

3.2 Systematic Literature Search

A systematic literature search was conducted on the 13th of January 2022, using the following three electronic databases: PsycINFO, ERIC and Web of Science. Table 1 illustrates the terms which were used to search the three databases. To ensure the most comprehensive search, subject heading searching was used alongside text word searching.

Table 1

Literature Search Terms

Intervention	Population needs	Population age
"Attribution retraining" OR	"Learning difficult*" OR	Child* OR
"Attribution training" OR	"Learning need*" OR	Adolescen* OR
Retrain* NEAR/2 attribution* OR	"Learning disab*" OR	Teen* OR
Attribution* OR	"Learning disorder*" OR	"Young people" OR
"Attribution theory"	"Academic achievement" OR	Student* OR
	"Academic progress" OR	"School aged"
	Failure OR	
	Struggling OR	
	"At-risk" OR	
	Learning OR	
	Underachiev*	

Note. Quotation marks were used to ensure that words in a phrase were searched for together. An Asterix (*) was used for truncated words which have alternative endings. The 'NEAR/2' was used to search for terms within a specified proximity from each other. The 'OR' was used to combine alternative versions of the same concept. Each column was combined with an 'AND'. A filter for publication date was applied so that only studies published within the past 20 years were retrieved (see criteria number two in Table 2).

Overall, 339 studies were yielded through database searching and 21 duplicate records were removed. The remaining 318 papers were screened via their titles using the inclusion and exclusion criteria outlined in Table 2. If papers did not meet the inclusion criteria, they were excluded from the review. Overall, 264 papers were removed through title screening and 25 through abstract screening. The remaining 29 studies were screened via the full-text. See Appendix A for a list of the studies excluded via full-text screening and the reasons for exclusion. Figure 1 demonstrates a visual summary of the screening process.
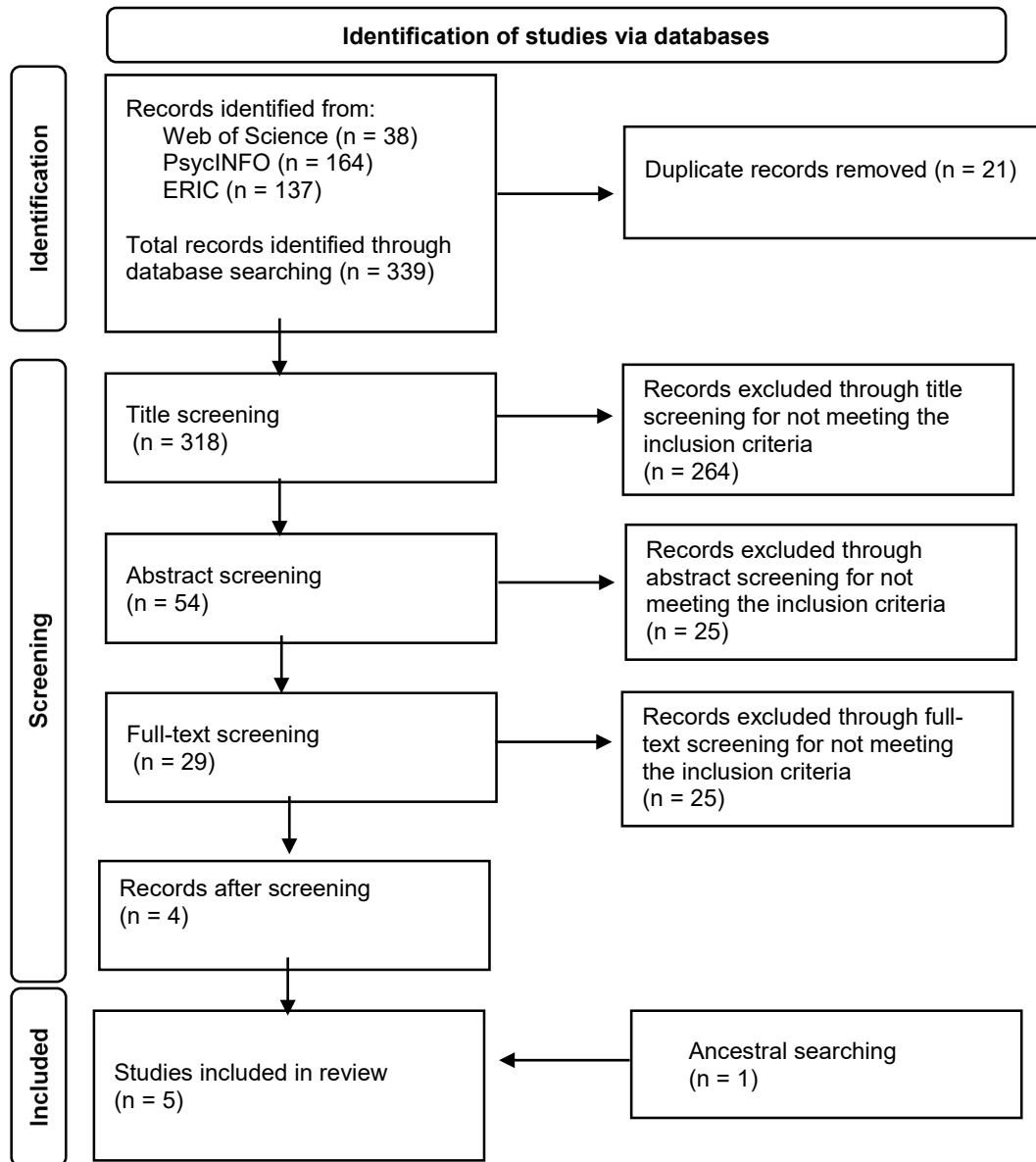
Table 2

Inclusion and Exclusion Criteria

Study feature	Inclusion criteria	Exclusion criteria	Rationale
1. **Language**	The study must be published in English.	Studies which are published in any language other than English.	No access to professional translation services and ensures that meaning is not lost during translations.
2. **Date of publication**	Studies published between 2001 and the present day.	Studies published before 2001.	The review aims to evaluate the most up-to-date research in the area.
3. **Intervention**	One or more of the intervention conditions must include AR.	Studies which do not include AR in one of the intervention conditions.	The review question aims to evaluate the effectiveness of AR.
4. **Age of sample**	Participants are school-aged (between 4-18 years).	Participants are not school-aged (younger than 4 years or older than 18 years).	AR has been used effectively for both primary and secondary school-aged children and EPs work with children across both age groups.
5. **Type of need**	Participants experiencing challenges with their learning. This includes children with (general or specific) LDs and children who do not have an identified LD but are struggling with their learning and	Participants who are not experiencing challenges with their learning and are working at age-expected academic levels.	The review question looks at the effectiveness of AR for struggling learners.

Study feature	Inclusion criteria	Exclusion criteria	Rationale
	working behind age-expected academic levels.		
6. **Setting**	The AR intervention is conducted in a school setting.	The AR intervention is not conducted in a school setting (e.g., a clinical or residential setting).	The intervention is intended for use within schools, therefore studies should only be included if the intervention is conducted in a school setting.
7. **Outcome variables**	The study must include at least one outcome variable focused on attributions or attitudes to learning and at least one outcome variable focused on academic achievement.	Studies which do not include at least one outcome variable focused on attributions or attitudes to learning and at least one variable focused on academic achievement.	The review question is looking at the impact of attribution retraining at improving attributional style and consequently, academic achievement.
8. **Study design**	Studies must be empirical and collect primary data.	Studies which use secondary data (e.g., reviews and meta-analyses).	The review aims to examine primary empirical data.
9. **Publication type**	Studies which have been published in a peer-reviewed journal.	Studies which have not been published in a peer-reviewed journal (e.g., theses).	Peer-reviewed articles have been subjected to a rigorous review process and are more likely to be of high quality.

Figure 1

Flow Chart of the Screening Process

Identification of studies via databases	

Identification	Records identified from:
	    Web of Science (n = 38)
	    PsycINFO (n = 164)
	    ERIC (n = 137)
	
	Total records identified through database searching (n = 339)

	Duplicate records removed (n = 21)
Screening	Title screening (n = 318)
	Records excluded through title screening for not meeting the inclusion criteria (n = 264)
	Abstract screening (n = 54)
	Records excluded through abstract screening for not meeting the inclusion criteria (n = 25)
	Full-text screening (n = 29)
	Records excluded through full-text screening for not meeting the inclusion criteria (n = 25)
	Records after screening (n = 4)
Included	Studies included in review (n = 5)
	Ancestral searching (n = 1)

3.3 Included Studies

After the screening process and with the addition of one study identified through ancestral searching, five studies remained and these papers were included in the current review. Table 3 provides the full references for these studies.

Table 3

References for Final Studies Included in the Review.

	Reference
1	Berkeley, S., Mastropieri, M. A., & Scruggs, T. E. (2011). Reading comprehension strategy instruction and attribution retraining for secondary students with learning and other mild disabilities. *Journal of Learning Disabilities, 44*(1), 18–32. https://journals.sagepub.com/doi/10.1177/0022219410371677
2	Bosnjak, A., Boyle, C., & Chodkiewicz. (2017). An intervention to retrain attributions using CBT: A pilot study. *The Educational and Developmental Psychologist, 34*(1), 19–30. https://www.researchgate.net/publication/314448272_An_Intervention_to_Retrain_Attributions_Using_CBT_A_Pilot_Study
3	Cue, E. N., & Taylor, A. Z. (2020). Modifying Harmful Beliefs About Academic Setbacks: An Attribution Retraining Intervention for African-American Middle School Students at Risk for Academic Failure. *Journal of Education and Development*, *4*(3),30. https://doi.org/10.20849/jed.v4i3.799
4	Kolić-Vehovec, S. (2002). Self-monitoring and attribution training with poor readers. *Studia Psychologica, 44*(1), 57–68. https://www.researchgate.net/publication/286990268_Self-monitoring_and_attribution_training_with_poor_readers
5	Toland, J., & Boyle, C. (2008). Applying Cognitive Behavioural Methods toRetrain Children's Attributions for Success and Failure in Learning. *School Psychology International*, *29*(3), 286–302. https://www.researchgate.net/publication/257308053_Applying_Cognitive_Behavioural_Methods_to_Retrain_Children%27s_Attributions_for_Success_and_Failure_in_Learning

3.4 Mapping the Field

All of the included studies investigated the effectiveness of AR for children with or at-risk of developing LDs. However, the studies varied greatly in their choice

of design, sample, outcome measures and intervention delivery. The key features of each study have been summarised in Appendix B.

3.5 Weight of Evidence

Gough's (2007) 'Weight of Evidence' (WoE) framework was used to critically appraise each of the five studies across three dimensions, including methodological quality (WoE A), methodological relevance (WoE B) and topic relevance (WoE C). WoE was calculated using an adapted version of Law et al.'s (1998) coding protocol due to its relevance for use with quantitative research studies. Adaptations made to the protocol alongside reasons for these changes can be viewed in Appendix C. WoE B was based on recommendations outlined within Petticrew and Roberts' (2003) paper and criteria for WoE C were developed by the reviewer. WoE A, B and C were averaged to give an overall WoE rating (WoE D) which can be seen in Table 4. Further information regarding how WoE A, B, C and D were calculated can be found in Appendix D. See Appendix E for an example of a completed coding protocol.

Table 4

Overall Weight of Evidence Ratings for Included Studies

Study	WoE A	WoE B	WoE C	WoE D
Berkeley et al. (2011)	2.7 (High)	3 (High)	2.25 (Medium)	2.65 (High)
Bosnjak et al. (2017)	2.25 (Medium)	2.33 (Medium)	2.25 (Medium)	2.28 (Medium)
Cue & Taylor (2020)	2.12 (Medium)	2.67 (High)	2.63 (High)	2.47 (High)
Kolic-Vehovec (2002)	1.88 (Medium)	2.67 (High)	1.88 (Medium)	2.14 (Medium)
Toland & Boyle (2008)	1.75 (Medium)	1.33 (Low)	2 (Medium)	1.69 (Low)

Note. A score of < 1.7 is considered 'low', 1.7 – 2.4 is 'medium' and > 2.4 is 'high'. All values have been rounded to two decimal places.

3.6 Critical Review of Included Studies

Participants. There was a total of 228 participants across all studies, with samples ranging from 16 (Bosnjak et al., 2017) to 64 participants (Cue & Taylor, 2020). All of the studies included participants aged between 6 and 15 years old. Three of the studies focused on children at primary school (Bosnjak et al., 2017; Kolic-Vehovec, 2002; Toland & Boyle, 2008) and the remaining two focused on children at secondary school.

Three studies included participants with general and/or specific LDs (Berkeley et al., 2011; Kolic-Vehovec, 2002; Toland & Boyle, 2008) and the remaining two included participants who were underachieving academically. Two of the studies included participants without any identified academic difficulties. These participants made up 21% of the sample in Toland and Boyle's (2008) study

and 13% of participants in Bosnjak et al.'s (2017) study. As such, these studies received lower WoE C ratings for the category of 'participant sample type' as the review question focuses on struggling learners.

With regards to participant recruitment, three studies used more objective sample selection processes based on well-established standardised tests (Berkeley et al., 2011) or school-based assessments (Cue & Taylor, 2020; Kolic-Vehovec, 2002). The remaining two studies used sample selection processes which were more prone to bias as participants were identified based on the subjective judgements made by school staff, thereby reducing their WoE A and C ratings.

Setting. All five of the studies were carried out in a school setting as per the inclusion criteria. The number of schools that the studies were conducted in ranged from one (Bosnjak et al., 2017) to five (Kolic-Vehovec, 2002). One study was conducted in the UK (Toland & Boyle, 2008), two in America (Berkeley et al., 2011; Cue & Taylor, 2020), one in Australia (Bosnjak, et al., 2017) and one in Croatia (Kolic-Vehovec, 2002). The studies carried out in member countries of the Organisation for Economic Co-operation and Development (OECD, 2020) scored higher for the WoE C category of 'setting' as the education systems in these countries are more similar to that of the UK.

Research Design. Four of the studies used a randomised controlled trial (RCT) design and one used a single group, pre-test, post-test design (Toland & Boyle, 2008). As RCTs have been identified as the most appropriate research design for answering effectiveness questions (Petticrew & Roberts, 2003), the four RCTs were given higher WoE B ratings. Randomly allocating participants to groups helps to reduce the likelihood of selection bias.

Two studies (Berkeley et al., 2011; Kolic-Vehovec, 2002) used an active control group where participants took part in an alternative intervention. These two studies received higher WoE B ratings than the studies which used either a 'no intervention' (Bosnjak, et al., 2017) or 'wait-list' control group (Cue & Taylor, 2020). This is because having an active control group helps to ensure that any beneficial effects are due to the active component of the intervention alone (the AR) rather than receiving attention. Additionally, there are ethical issues associated with denying participants access to an intervention (in the 'no intervention' control group).

All of the studies collected academic achievement data pre- and post-intervention. However, Toland and Boyle (2008) did not collect post-intervention data for attributions, thereby receiving the lowest WoE B rating. Additionally, two studies (Berkeley et al., 2011; Cue & Taylor, 2020) collected academic and attributional data at a six-week follow-up. These two studies received the highest WoE B ratings as it was possible to see whether the effects of AR could be maintained over time.

Intervention. There was large variation between studies regarding intervention delivery. Some studies administered AR on a daily basis (Kolic-Vehovec, 2002) while others carried out the intervention on a weekly (Berkeley et al., 2011; Bosnjak, et al., 2017; Cue & Taylor, 2020) or fortnightly basis (Toland & Boyle, 2008). Sessions ranged from just 10 (Berkeley et al., 2011) to 75 minutes (Bosnjak, et al., 2017), with the majority of sessions lasting around 20-30 minutes. Participants received between three (Cue & Taylor, 2020) and 20 sessions (Kolic-Vehovec, 2002). All of the studies delivered AR in a small

group. Full details regarding the number, length, frequency and content of sessions alongside group sizes can be viewed in Appendix B.

Three of the studies combined AR with another intervention in the main intervention condition including CBT (Bosnjak, et al., 2017; Toland & Boyle, 2008) and strategy instruction (Berkeley et al., 2011). One of the studies used AR as the secondary intervention condition (Kolic-Vehovec, 2002), although it was delivered in its sole form. Only one of the studies used AR in the main intervention group without using components of another intervention (Cue & Taylor, 2020), therefore this study received the highest WoE C rating. Combining AR with other interventions made it difficult to determine whether positive effects were due to the AR alone.

All but one of the papers (Kolic-Vehovec, 2002) described the intervention in sufficient detail to enable replication, thereby reducing its WoE A rating. Bosnjak, et al. (2017), Cue and Taylor (2020) and Toland and Boyle (2008) provided the most comprehensive AR interventions involving direct attributional feedback, instruction, practise and consolidation. These three studies received higher WoE C ratings for the category of 'implementation' than the remaining two studies which relied on direct attributional feedback alone.

All of the studies used researchers to conduct the interventions. However, Berkeley et al. (2011) also used trained teaching staff to carry out some of the intervention groups. This better represents how the intervention would be carried out in practice, therefore this study received a higher WoE C rating for the category of 'instructor'.

      Academic Outcome Measures. Bosnak et al. (2017) and Toland and Boyle (2008) used well-established tools for assessing academic achievement

including the Wechsler Individual Achievement Test, 3rd Edition (WIAT-III; Wechsler, 2009a) and the British Ability Scales (BAS; Elliott, 1996), respectively. These tools have strong reliability and validity scores, resulting in higher WoE A ratings for these studies. Two studies used curriculum-based measures of academic achievement. Specifically, Kolic-Vehovec (2002) used a one-minute reading activity which had strong correlations with other reading measures (ranging from 0.73 to 0.91) and was checked for validity (Marston, 1989). Cue and Taylor (2020) instead calculated each participant's Grade Point Average (GPA). However, there are two issues with using GPA as a measure of academic achievement. Firstly, it is possible that high and low scores cancelled each other out. Secondly, it is unlikely that the measure was sensitive enough to detect changes in performance over such a short period of time. Studies which used curriculum-based measures of assessment received lower scores for WoE A (the 'outcomes' category) than those which used tests with higher psychometric properties. Only one study assessed academic achievement using tests created by the researchers. The tool was checked for face validity and internal consistency (α = .77). However, as the tool was not well-established, this study received a lower WoE A score.

All but one study explored the impact of AR on reading outcomes (Cue & Taylor, 2020), two looked at spelling (Bosnak et al., 2017; Toland & Boyle, 2008) and one at mathematics (Bosnjak et al., 2017). As Cue and Taylor (2020) looked at GPA, a range of subjects were explored including mathematics, English, history and science. Studies which looked at more than one area of academic achievement received higher ratings for the category 'scope of academic outcome measures' (WoE C).

Attributional Outcome Measures. All but one study used self-report questionnaires to assess attributional style. Toland and Boyle (2008) instead used teacher feedback regarding students' 'attitudes towards work'. As this was not a direct assessment of children's attributions, the study received a lower WoE C rating for the category of 'measuring attributions'. Two of the studies assessed general attributional style (Berkeley et al., 2011; Bosnak et al., 2017) and two measured attributions specific to reading (Berkeley at al., 2011; Kolic-Vehovec, 2002). Studies which assessed general attributional style received higher WoE C ratings as this was more relevant to the review question. Only two of the studies reported the psychometric properties of the attributional measures used (Berkeley et al., 2011; Bosnak et al., 2011), resulting in higher WoE A ratings. Internal consistency of measures ranged from good (α = .87; Berkeley et al., 2011) to questionable (α = .61; Bosnak et al., 2011).

Findings and Effect Sizes. For studies that reported partial eta squared effect sizes (Bosnak et al., 2017) or no effect sizes (Cue & Taylor, 2020; Kolic-Vehovec, 2002), the Campbell Collaboration Online Calculator (Wilson, 2015) was used to compute Cohen's *d* effect sizes. However, it was not possible to do this for two studies whereby statistical data and statistical analyses were missing (Kolic-Vehovec, 2002; Toland & Boyle, 2008). Studies with missing data received lower WoE A ratings.

A summary of the effect sizes for each study can be viewed in Table 6. The descriptors (Cohen, 1992) used for interpreting these values are outlined in Table 5.

Table 5

Cohen's d and Partial Eta Squared Effect Size Descriptors

Cohen's *d*	Partial Eta Squared (η_P^2)	Descriptor
0.2	0.01	Small
0.5	0.06	Moderate
0.8	0.14	Large

Table 6

Summary of Effect Sizes for Studies Included in the Review

Study	Outcome measures	*p*-value		Reported effect size and descriptor		Converted effect size (Cohen's *d*) and descriptor	
		Post-test	Follow-up	Post-test	Follow-up	Post-test	Follow-up
Berkeley et al. (2011)	**Academic** 1.Summarisation test	.000*	.000*	**d** = 1.44 (Large)	**d** = 1.21 (Large)	N/A	N/A
N = 59	2. Passage specific content test	.89	.59	**d** = 0.14 (Small)	**d** = 0.26 (Small)	N/A	N/A
WoE D: 2.65 (High)	**Attributions** 1.For success	.001*	.02*	**d** = 0.86 (Large)	**d** = 0.54 (Moderate)	N/A	N/A
	2.For failure	.14	.24	**d** = 0.07 (Small)	**d** = 0.41 (Small)	N/A	N/A
Bosnjak et al. (2017)	**Academic** 1.WIAT-III: Reading	<.01*	N/A	η_p^2 = 0.63 (Large)	N/A	2.61 (Large)	N/A
N = 16	2. WIAT-III: Mathematics	.19	N/A	η_p^2 = 0.12 (Moderate)	N/A	0.74 (Moderate)	N/A
WoE D: 2.28 (Medium)	3. WIAT-III: Spelling	.81	N/A	η_p^2 = 0.00 (Small)	N/A	0.00 (Small)	N/A

Study	Outcome measures	*p*-value		Reported effect size and descriptor		Converted effect size (Cohen's *d*) and descriptor	
		Post-test	Follow-up	Post-test	Follow-up	Post-test	Follow-up
	Attributions 1.Attrubutional style	.31	N/A	$\eta_p^2 =$ 0.07 (Moderate)	N/A	0.53 (Moderate)	N/A
Cue & Taylor (2020)	**Academic** GPA	.84	.93	N/A	N/A	0.05 (Small)	0.03 (Small)
N = 64							
WoE D: 2.47 (High)	**Attributions** 1.Lack of effort	.22	.05*	N/A	N/A	0.31 (Small)	0.5 (Moderate)
	2.Lack of ability	.23	.94	N/A	N/A	0.31 (Small)	0.03 (Small)
	3. Discrimination	.71	.09	N/A	N/A	0.09 (Small)	0.44 (Small)
	4.External attributions	.32	.63	N/A	N/A	0.25 (Small)	0.12 (Small)
Kolic-Vehovec (2002)	**Academic** 1.Reading fluency	> .05	N/A	N/A	N/A	N/A[b]	N/A
N = 60	2.Reading accuracy	< .05*	N/A	N/A	N/A	N/A[b]	N/A
WoE D: 2.14	3.Text comprehension	> .05	N/A	N/A	N/A	N/A[b]	N/A

Study	Outcome measures	*p*-value		Reported effect size and descriptor		Converted effect size (Cohen's *d*) and descriptor	
		Post-test	**Follow-up**	**Post-test**	**Follow-up**	**Post-test**	**Follow-up**
(Medium)							
	Attributions 1.Reading comprehension: good	< .01*	N/A	N/A	N/A	N/A[b]	N/A
	2. Reading comprehension: bad	> .05	N/A	N/A	N/A	N/A[b]	N/A
	3. Reading grade: good	> .05	N/A	N/A	N/A	N/A[b]	N/A
	4. Reading grade: bad	>.05	N/A	N/A	N/A	N/A[b]	N/A
Toland & Boyle (2008) N = 29 WoE D: 1.69 (Low)	**Academic** 1.BAS: Reading	.001*	N/A	**d** = 0.22[c] (Small)	N/A	N/A	N/A
	2.BAS: Spelling	.07	N/A	**d** = 0.12[c] (Small)	N/A	N/A	N/A
	Attributions 1.Attitude towards work	N/A[a]	N/A[a]	N/A[a]	N/A[a]	N/A[a]	N/A[a]

Note. For studies that included more than two experimental conditions (i.e., Berkeley et al. and Kolic-Vehovec), *p*-values and effect sizes relate to interaction effects between the AR group and the control group rather than the AR group and the alternative intervention group. All effect sizes have been rounded to two decimal places.

[a] No statistical analyses were conducted.

[b] Insufficient data in paper to calculate effect size.

[c] Effect size refers to within-group effects (i.e., pre- and post- measures).

* The results reached statistical significance.

Berkeley et al. (2011) found a significant and large effect of AR on reading comprehension skills post-intervention and at a six-week follow-up, compared to the control group. However, this effect was only found for the summarisation test and not the passage test. Additionally, there was no difference in reading comprehension skills between the AR intervention group and the Reading Comprehension Strategy (RCS) group. Therefore, it is not possible to draw conclusions about the specific effects of AR on reading comprehension. The researchers found a significant change in attributions for success both at post-test (large effect) and follow-up (moderate effect), compared to the control and RCS group. This suggests that the effects of AR on attributions can be maintained for up to six weeks. The study's 'high' WoE D rating and large effect sizes suggest that it should be given considerable weighting when drawing conclusions. That said, AR was combined with strategy instruction and this should also be considered.

Bosnjak et al. (2017) found a significant and large effect of AR on reading achievement but not on mathematics, spelling or attributions. This study received a 'medium' WoE D rating. However, the sample size was small and this should be considered when drawing conclusions.

Cue and Taylor (2020) did not find a significant effect of AR on academic achievement, perhaps due to how the outcome was measured. The researchers did find a moderately significant effect of AR on attributions towards effort, but only at a six-week follow-up. The study's 'high' WoE D rating suggests it should be given due weight in the conclusions.

Kolic-Vehovec (2002) found a significant effect of AR on reading accuracy but it was not possible to determine whether these effects were over and above those

of the other intervention groups, nor was it possible to calculate effect sizes due to insufficient data. The paper claims that AR had a significant effect on improving attributions but again, no statistical evidence was provided. Despite receiving an overall 'medium' WoE D rating, the results section of the report is limited so no strong conclusions can be drawn.

Toland and Boyle (2008) found that AR had a small but significant effect on reading but not spelling achievement. Additionally, 47% of teachers reported a significant change in students' attitudes towards work following the intervention, but this data was only collected post-intervention and no statistical analyses were conducted. As the study was conducted over a long time period and no control group was used, it is possible that results were due to attention and/or maturation effects alone. The study's 'low' WoE D weighting and small effect size suggest that it should not be given considerable weighting when drawing conclusions.

4.1 Conclusion and Recommendations

4.2 Conclusions

The current review evaluated the efficacy of AR at improving the attributional style and subsequently, the academic achievement of school-aged children who are struggling with their learning. Five studies met the inclusion criteria for the review and were evaluated using Gough's (2007) WoE framework. Of these, two received a 'high' WoE rating, two a 'medium' rating and one a 'low' rating.

All but one of the studies found a significant effect of AR on academic achievement. However, effect sizes ranged from small to large. The study which did not find a significant effect, may be explained in part by the tool used to measure academic achievement. It must be noted that only reading outcomes reached significance. As only five studies were included in the review, with only three exploring academic performance beyond reading, it is not possible to draw conclusions about the effectiveness of AR on other academic domains. Future research should explore the impact of AR on a broader range of academic outcomes. That said, Toland and Boyle (2008), suggested that AR may be most effective at improving reading as it can be practised with relative ease both at home and school in comparison to other subjects. Other researchers have supported this view (Horner & Gaither, 2004; Robertson, 2000).

Regarding attributional style, three out of the four studies which conducted statistical analyses showed a significant and positive change in attributions post-intervention. Effect sizes ranged from moderate to large. However, only two studies found an improvement in both attributions and academic outcomes. Consequently, it is difficult to determine whether academic performance

improved due to changes in attributional style, or whether other factors played a role. Future research should seek to clarify whether the impact of AR on academic performance is mediated by changes in attributional style.

4.3 Limitations and Recommendations

The review is not without fault and there are a number of limitations to note. Firstly, there was large variability between studies in the way that AR was delivered, making it difficult to draw strong conclusions about its overall effectiveness. Future research should investigate the optimal duration, frequency and group size of AR for children who are underachieving.

A second limitation is that four out of five studies combined AR with another intervention, potentially confounding the results. There is a clear rationale for this, with researchers suggesting that students require subject specific skills in order to succeed, regardless of whether they have adaptive attributional styles (Ziegler & Heller, 2000). That said, it would be helpful for future research to further compare the effectiveness of AR when delivered with and without other interventions.

A third limitation is that only two studies collected follow-up data. Despite findings suggesting that the effects of AR can be maintained, further research is required to determine the length of this maintenance period, so that 'booster' sessions can be planned accordingly. It would also be interesting to determine whether the positive effects of AR can be generalised to the classroom context.

A final limitation concerns the ecological validity of the findings. As only one study was conducted in the UK, it is difficult to generalise the results to children within UK schools. Additionally, only one study used a trained staff member to

administer the intervention, which is more reflective of how AR would be carried out within schools. Further research is required to explore the efficacy of AR when conducted by school staff.

Taking into consideration each study's quality, relevance and effect size, this review gives promise that AR can address some of the issues experienced by struggling learners. Additionally, the ease at which the intervention can be implemented, alongside its flexible and economical nature, make it a feasible intervention for use within schools. EPs should play a key role in promoting the use of AR in schools, and providing appropriate training and guidance for staff on its delivery.

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6.1 Appendices

6.2 Appendix A: Studies Excluded via Full Text screening

Excluded studies	Reason for exclusion and criteria number
1. Boese, G. D. B., Stewart, T. L., Perry, R. P., & Hamm, J. M. (2013). Assisting failure-prone individuals to navigate achievement transitions using a cognitive motivation treatment (attributional retraining). *Journal of Applied Social Psychology*, *43*(9), 1946–1955. https://doi.org/10.1111/jasp.12139	4 – participants are not school-aged.
2. Matteucci, M. C. (2017). Attributional retraining and achievement goals: An exploratory study on theoretical and empirical relationship. *European Review of Applied Psychology*, *67*(5), 279–289. https://doi.org/10.1016/j.erap.2017.08.004	4 - participants are not school-aged.
3. Hall, N. C., Perry, R. P., Goetz, T., Ruthig, J. C., Stupnisky, R. H., & Newall, N. E. (2007). Attributional retraining and elaborative learning: Improving academic development through writing-based interventions. *Learning and Individual Differences*, *17*(3), 280–290. https://doi.org/10.1016/j.lindif.2007.04.002	4 - participants are not school-aged.
4. Hamm, J.M., Perry, R.P., Stewart, T.L., Dubberley, K.M.A., & Boese, G.D. (2011). Attributional retraining: A cognitive treatment to assist failure prone individuals in achievement settings. *Canadian Journal of Experimental Psychology, 65(4), 299-299.*	4 - participants are not school-aged.
5. Hamm, J. M., Perry, R. P., Clifton, R. A., Chipperfield, J. G., & Boese, G. D. (2014). Attributional Retraining: A Motivation Treatment With Differential Psychosocial and Performance Benefits for Failure Prone Individuals in Competitive Achievement Settings. *Basic and Applied Social Psychology*, *36*(3), 221–237. https://doi.org/10.1080/01973533.2014.890623	4 - participants are not school-aged.
6. Haynes Stewart, T. L., Clifton, R. A., Daniels, L. M., Perry, R. P., Chipperfield, J. G., & Ruthig, J. C. (2010). Attributional Retraining: reducing the likelihood of failure. *Social Psychology of Education*, *14*(1), 75–92. https://doi.org/10.1007/s11218-010-9130-2	4 - participants are not school-aged.

Excluded studies	Reason for exclusion and criteria number
7. Matteucci, M. C. (2012). Attributional retraining: The mediating role of mastery and performance motivation among college students. In *Proceedings of the 5th international conference of education, research and innovation (ICERI 2012)* (pp. 1238-1242).	4 - participants are not school-aged.
8. Perry, R. P., Stupnisky, R. H., Hall, N. C., Chipperfield, J. G., & Weiner, B. (2010). Bad Starts and Better Finishes: Attributional Retraining and Initial Performance in Competitive Achievement Settings. *Journal of Social and Clinical Psychology*, *29*(6), 668–700. https://doi.org/10.1521/jscp.2010.29.6.668	4 - participants are not school-aged.
9. Tavakolizadeh, J., & Ebrahimi Qavam, S. (2017). Effect of teaching of self-regulated learning strategies on attribution styles in students. *Electronic Journal of Research in Education Psychology*, *9*(25). https://doi.org/10.25115/ejrep.v9i25.1470	5 – participants have not been identified as having learning difficulties/low-achieving.
10. Simonton, K. L., & Garn, A. C. (2020). Emotion and Motivation Consequences of Attributional Training During a Novel Physical Task. *Research Quarterly for Exercise and Sport*, 1–11. https://doi.org/10.1080/02701367.2020.1817836	4 - participants are not school-aged.
11. Hall, N. C., Perry, R. P., Chipperfield, J. G., Clifton, R. A., & Haynes, T. L. (2006). Enhancing Primary and Secondary Control in Achievement Settings Through Writing–Based Attributional Retraining. *Journal of Social and Clinical Psychology*, *25*(4), 361–391. https://doi.org/10.1521/jscp.2006.25.4.361	4 - participants are not school-aged.
12. Koh, C. (2008). Group work as a strategy for attribution retraining in the Asian educational context of Singapore. *Asia Pacific Education Review*, *9*(2), 81–93. https://doi.org/10.1007/bf03026489	5 – participants have not been identified as having learning difficulties/low-achieving.
13. Dresel, M. (2000). Impacts of student's motivational orientation on the effectiveness of attributional retrainings in the classroom. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie,* 32(4) 192-206.	1 – article is not published in English.

Excluded studies	Reason for exclusion and criteria number
14. Ruthig, J. C., Perry, R. P., Hall, N. C., & Hladkyj, S. (2004). Optimism and Attributional Retraining: Longitudinal Effects on Academic Achievement, Test Anxiety, and Voluntary Course Withdrawal in College Students1. *Journal of Applied Social Psychology*, *34*(4), 709–730. https://doi.org/10.1111/j.1559-1816.2004.tb02566.	4 - participants are not school-aged.
15. Haynes, T. L., Ruthig, J. C., Perry, R. P., Stupnisky, R. H., & Hall, N. C. (2006). Reducing the Academic Risks of Over-Optimism: The Longitudinal Effects of Attributional Retraining on Cognition and Achievement. *Research in Higher Education*, *47*(7), 755–779. https://doi.org/10.1007/s11162-006-9014-7	4 – participants are not school-aged.
16. Yahyaee, M., Pourmohamad Reza-Tajrishi, M., Sajedi, F., & Biglarian, A. (2014). The effect of attribution retraining group program on depression of students with learning disabilities.	1– article is not published in English.
17. Lavasani, M. G., Sharifian, M. S., Naghizadeh, S., & Hematirad, G. (2012). The Effect of Attribution Retraining on Academic Achievement. *Procedia - Social and Behavioral Sciences*, *46*, 5845–5848. https://doi.org/10.1016/j.sbspro.2012.06.526	5 – participants have not been identified as having learning difficulties/low-achieving.
18. Sukariyah, M. B., & Assaad, G. (2015). The Effect of Attribution Retraining on the Academic Achievement of High School Students in Mathematics. *Procedia - Social and Behavioral Sciences*, *177*, 345–351. https://doi.org/10.1016/j.sbspro.2015.02.356	5 – participants have not been identified as having learning difficulties/low-achieving.
19. Eskandari, E., Amiri, S., & Ghamarani, A. (2020). The effect of optimistic attributional style training on self-efficacy of normal and dyslexic boys. *Advances in Cognitive Science*, *22*(3), 123–136. https://doi.org/10.30699/icss.22.3.123	1 – article is not published in English.
20. Nelson, J. M., & Manset-Williamson, G. (2006). The Impact of Explicit, Self-Regulatory Reading Comprehension Strategy Instruction on the Reading-Specific Self-Efficacy, Attributions, and Affect of Students with Reading Disabilities.	3 – intervention does not include attribution retraining.

Excluded studies	Reason for exclusion and criteria number
Learning Disability Quarterly, *29*(3), 213–230. https://doi.org/10.2307/30035507	
21. Hall, N. C., Hladkyj, S., Perry, R. P., & Ruthig, J. C. (2004). The Role of Attributional Retraining and Elaborative Learning in College Students' Academic Development. *The Journal of Social Psychology*, *144*(6), 591–612. https://doi.org/10.3200/socp.144.6.591-612	4 - participants are not school-aged.
22. Chodkiewicz, A. R., & Boyle, C. (2016). Promoting positive learning in Australian students aged 10- to 12-years-old using attribution retraining and cognitive behavioral therapy: A pilot study. *School Psychology International*, *37*(5), 519–535. https://doi.org/10.1177/0143034316667114	5 – participants have not been identified as having learning difficulties/low-achieving.
23. Berkeley, S., Larsen, A., Colburn, A., & Yin, R. (2019). Self-Regulation of Middle School Students With Learning Disabilities During a Complex Project-Based Science Activity. *Journal of Educational and Developmental Psychology*, *9*(2), 1. https://doi.org/10.5539/jedp.v9n2p1	8 – research is not empirical.
24. Mitnick, E. S. (2009). *Self-beliefs in high school students with learning disabilities: Interaction and intervention* [Doctoral dissertation, Columbia University].	3 – intervention does not include attribution retraining.
25. Stevens, B. E. (2005). *Just Do It: The impact of a summer school self-advocacy program on depression, self-esteem, and attributional style in learning disabled adolescents.* [Doctoral dissertation, The Claremont Graduate University].	3 – intervention does not include attribution retraining.

6.3 Appendix B: Mapping the Field

Author(s), date and title	Research aim(s)	Location	Sample	Research design	Intervention type, delivery and administrator	Outcome measures	Key findings
Berkeley et al. (2011): Reading comprehension strategy instruction and attribution training.	To investigate the effects of reading comprehension strategy (RCS) instruction, with and without AR, on the reading outcomes for seventh, eighth, and ninth graders with learning and other mild disabilities.	USA: a middle and high school located in a metropolitan school district on the East coast.	**Size:** 59 **Gender:** 40 males, 19 females **Age:** mean age = 14.7 years (7th and 9th graders) **Ethnicity:** 29 African American, 23 Hispanic and 7 White. **Nature of need:** Reading skills far below grade level on the Stanford Diagnostic Reading Test.	**Design:** Randomised controlled trial. **Data collection points:** Pre-test, post-test and 6-week follow-up. **Conditions:** RCS (n=19), RCS + AR (n=20) and 'Read Naturally' control group (n=20).	**Type:** AR intervention combined with RCS. Instruction included: teaching students to recognise positive and negative thoughts, how to use positive self-talk and providing specific feedback to teach them to attribute outcomes to strategy use and effort. **Delivery:** 12x sessions over a 4-week period with a total of 360 minutes of instruction. Groups of approximately 7 participants. **Administrator(s):** 5 special	**Academic outcome(s)** <u>Reading comprehension</u> 1.Summarisation test 2.Passage-specific content **Attributions** <u>Attributional scale</u> 1.Attributions for success 2.Attributions for failure	Students in the RCS+AR condition showed improved performance on the reading summary measure in comparison to the control group at post-test and delayed follow-up. No improved performance on the passage-specific content test was observed following intervention. Additionally, there was no statistically significant difference between the effects of the RCS+AR group and the AR group

Author(s), date and title	Research aim(s)	Location	Sample	Research design	Intervention type, delivery and administrator	Outcome measures	Key findings
			Of these, 45 also had a learning difficulty.		education reading teachers, a reading specialist and a trained researcher.		on reading comprehension. Students in the RCS+AR condition displayed higher attributions for success immediately following the intervention and at a six-week follow-up. These effects were over and above that of the control and RCS groups.
Bosnjak et al. (2017): An Intervention to Retrain Attributions Using CBT: A Pilot Study.	To investigate the effects of an AR program abridged with CBT principles on academic achievement, self-concept and attributional styles.	Australia: a school in Melbourne.	**Size**: 16 **Gender:** 3 females, 13 males **Age**: 9-11 years old **Ethnicity:** Mixed backgrounds including	**Design:** Randomised controlled trial. **Data collection points**: Pre-test and post-test. **Conditions:**	**Type:** AR with CBT principles which aimed to teach children the link between their thoughts, feelings and behaviour. Used a combination of modelling, worksheets and roleplay to achieve this and each	**Academic outcome(s)** <u>WIAT-III</u> 1. Reading 2. Mathematics 3. Spelling **Attributions** 1.Children's Attributional Style Questionnaire	The AR intervention resulted in improved reading achievement in comparison to the control group but the intervention did not have an impact on mathematics of

Author(s), date and title	Research aim(s)	Location	Sample	Research design	Intervention type, delivery and administrator	Outcome measures	Key findings
			Australian, Indian, Albanian, Afghan, Somali, Samoan, and Chinese. **Nature of need**: Identified by student staff as having inadequate levels of academic performance.	AR (n=8) and a 'no intervention' control group (n=8).	session used the following structure: review, application and homework. **Delivery:** 6x weekly 75-minute sessions. **Administrator(s):** One researcher.		spelling achievement. The intervention did not have an effect on attributional style.
Cue & Taylor (2020): Modifying Harmful Beliefs About Academic Setbacks: An Attribution Retraining Intervention for African-American Middle School Students at Risk for Academic	To investigate whether maladaptive beliefs about the causes of academic failure can be altered through a brief culturally-adapted AR programme for	USA: 3 public middle schools situated within low-income urban settings in the greater Los Angeles area.	**Size**: 64 **Gender:** 37 males, 27 females **Age:** 6th graders **Ethnicity:** African American.	**Design:** Randomised controlled trial. **Data-collection points**: Pre-test, post-test and a 6-week follow-up.	**Type:** A brief culturally-adapted AR programme using a combination of instruction (on taking personal responsibility for achievement), practise using effort-based strategies (including goal-	**Academic outcome(s)** 1.GPA **Attributions** <u>Causal attributions questionnaire</u> 1.Lack of effort 2.Lack of ability 3.Discrimination 4. External attributions	The AR intervention group showed a statistically significant increase in attributions towards effort but only 6 weeks after the intervention had terminated. The intervention did

Author(s), date and title	Research aim(s)	Location	Sample	Research design	Intervention type, delivery and administrator	Outcome measures	Key findings
Failure.	a group of African-American students.		**Nature of need:** Low-achieving as identified by a Grade Point Average (GPA) of below the sample median.	**Conditions:** AR group (n=31) and a wait-list control group (n=33).	setting) and assignments to consolidate thinking. **Delivery:** 1x 20-minute sessions per week for 3 weeks. Groups of 8-10 participants. **Administrator(s):** Research assistants.		not appear to have an effect on any other type of attributions (ability, discrimination of external attributions), nor did the intervention appear to affect students' grades.
Kolic-Vehovec (2002): Self-monitoring and attribution training with poor readers.	To explore whether the attributional beliefs of poor readers can be changed through a combination of AR and self-monitoring training (SMT).	Croatia: 5 elementary schools in Rijeka.	**Size:** 60 **Gender**: 27 males, 33 females **Age:** 7-8 years **Ethnicity:** no details provided.	**Design:** Randomised controlled trial **Data-collection points:** Pre-test and post-test.	**Intervention type:** AR intervention. Children were provided with direct attributional feedback after completing a successful or unsuccessful reading task and asked to repeat these attributions.	**Academic outcome(s)** <u>Curriculum based</u> 1.Reading Fluency 2.Reading accuracy 3.Text comprehension **Motivational outcome(s)**	All of the intervention conditions produced a significant change in reading accuracy skills. However, it was not possible to determine from the results whether there

Author(s), date and title	Research aim(s)	Location	Sample	Research design	Intervention type, delivery and administrator	Outcome measures	Key findings
			Nature of need: Children with reading difficulties (word identification skills 1σ or more below the mean).	**Conditions:** SMT (n=15), AR (n= 15), SMT + AR (n=15) and reading practise control group (n= 15).	**Delivery:** Daily 15-minute training for a total of 20 days. **Administrator(s):** Trained graduate students of psychology.	Attributional scale 1.Reading comprehension (good score) 2.Reading comprehension (bad score) 3.Reading grade (good) 4.Reading grade (bad)	were any differences between intervention groups (i.e., AR and SMT). AR did not appear to have a significant impact on reading fluency or text comprehension. The results suggest that the participants in the two AR groups reported more positive attributions towards reading comprehension after the intervention. However, statistical data is missing from the report.

Author(s), date and title	Research aim(s)	Location	Sample	Research design	Intervention type, delivery and administrator	Outcome measures	Key findings
Toland and Boyle (2008): Applying Cognitive Behavioural Methods to Retrain Children's Attributions for Success and Failure in Learning.	To investigate whether an AR programme combined with CBT principles improves the attributional styles, motivation and attainment of school-aged children.	UK: 4 large primary schools in a large local authority in Scotland.	**Size:** 29 **Gender:** No details provided **Age:** 10-12 years old **Ethnicity:** No details provided **Nature of need:** Children identified by school personnel as having learning difficulties and/or poor self-esteem.	**Design**: one group pre-test post-test design. **Data-collection points**: pre-test and post-test for academic outcomes and post-test for attributions. **Conditions**: AR group (n=29).	**Type:** AR combined with CBT principles (same as in Bosnjak et al., 2017). **Delivery**: 12x30-minute sessions in groups of 5 every fortnight for 6 months. **Administrator:** An Educational Psychologist.	**Academic outcome(s)** <u>BAS</u> 1.Reading 2.Spelling **Attributions** 1. Teacher report of attitude towards work	There was a statistically significance increase in reading achievement following AR. However, AR had no significant effect on spelling achievement. 47% of teachers reported a significant change in attitude towards work following the intervention but 53% reported little to no change.

6.4 Appendix C: Adaptations to the Law et al. (1998) Coding Protocol

Broad section	Subsection	Adaptation(s)
Study purpose		Term 'occupational therapy' in question changed to 'educational psychology'.
		Additional response option of 'in part' added.
Literature		Additional response option of 'in part' added.
Sample	A) **Sample size justification**	Additional response option of 'in part' added.
Intervention	B) **Contamination**	'Occupational therapy' changed to 'educational psychology'.
	C) **Cointervention**	Fourth response option of 'N/A' removed as question is applicable for all studies.
Results	A) **Statistical significance**	'N/A' response changed to 'in part'.
	B) **Clinical importance**	Question removed as discussed in main body of review.
	C) **Dropouts**	Additional response option of 'reported without reason(s)' added.
Conclusions and clinical implications		'Occupational therapy' changed to 'educational psychology'.

6.5 Appendix D: Criteria and Rationale for WoE Ratings

WoE A: Methodological Quality

WoE was calculated using an adapted version of Law et al.'s (1998) coding protocol due to its relevance for use with quantitative research studies. The protocol aims to critically evaluate the methodological quality of each study in comparison to other studies of the same type. It looks at key features of the study's methodology including the purpose, design, sample, outcomes, intervention, results and conclusion. The protocol was slightly adapted to make it more relevant for use with the studies included in the review (see Appendix C). A completed example of each coding protocol can be seen in Appendix E.

Each study was assigned a rating based on the criteria outlined within the table below. These criteria were created by the reviewer and are based on Law et al's (1998) coding protocol and associated guidelines. Studies were provided with a rating of either '1', '2' or '3' for each dimension, with a rating of '1' being indicative of weak evidence and '3' being strong evidence. The ratings provided for each dimension were then averaged to provide an overall WoE A rating for each study.

Criteria for WoE A Ratings

Dimension	Criteria
Dimension 1: Study purpose	**3** – The purpose of the study has been clearly outlined. **2** - The purpose of the study has been partially outlined. **1** – The purpose of study has not been outlined.
Dimension 2: Literature	**3** - Relevant background literature has been reviewed and provides a strong justification for the study. **2** - Relevant background literature has been reviewed but provides a weak justification for the study.

Dimension	Criteria
	1 – Relevant background literature has not been appropriately reviewed and provides a weak justification for the study.
Dimension 3: Design	**3** - The study design has been clearly defined and is not likely to have been influenced by design bias (e.g., attention or selection bias). **2** - The study design has been clearly defined but is likely to have been influenced by design bias. **1** - The study design has not been clearly defined and is likely to have been influenced by design bias (e.g., attention or selection bias).
Dimension 4: Sample	**3** - Sample size and characteristics have been clearly defined, the sample selection process is less likely to be biased and ethical procedures have been outlined. **2** - Only part of the above criteria have been met. **1** - Little to none of the above criteria have been met.
Dimension 5: Outcomes	**3** - Outcome measures have been clearly described and have strong reliability and validity scores. **2** - Outcome measures have been clearly described but not all of the measures are reliable or valid. **1** - Outcome measures have not been clearly described and are not valid or reliable.
Dimension 6: Intervention	**3** - Intervention described in sufficient detail and is unlikely to have been confounded by cointervention/contamination. **2** - Intervention described in sufficient detail but cointervention/contamination likely or not addressed. **1** - Intervention described in insufficient detail and cointervention/contamination likely or not addressed.
Dimension 7: Results	**3** - Appropriate statistical analyses have been used, results are reported

Dimension	Criteria
	in terms of statistical significance, effect sizes provided and attrition rates recognised. **2** - Only part of the above criteria have been met. **1** - Little to none of the above criteria have been met.
Dimension 8: Conclusions and clinical implications	**3** - Conclusion is clearly outlined and appropriate given findings. **2** - Conclusion is clearly outlined but not appropriate given findings. **1** - Conclusion is unclear and not appropriate given findings.

Overall WoE A Ratings for Studies

Study	Study purpose	Literature	Design	Sample	Outcomes	Intervention	Results	Conclusions and clinical implications	WoE A
Berkeley et al. (2011)	3	3	3	3	2	2	3	3	2.75 (High)
Bosnjak et al. (2017)	3	3	2	1	2	2	3	2	2.25 (Medium)
Cue & Taylor (2020)	3	3	3	2	1	2	2	1	2.12 (Medium)
Kolic-Vehovec (2002)	3	3	2	2	2	1	1	1	1.88 (Medium)
Toland & Boyle (2008)	3	3	1	1	1	2	1	2	1.75 (Medium)

WoE B: Methodological Relevance

WoE B aimed to assess the methodological relevance of each study for answering the current review question. Petticrew and Roberts (2003) outlined randomised controlled trials as the most appropriate research design for answering effectiveness questions such as in the current review. Therefore, the below criteria are based on recommendations outlined within Petticrew and Roberts' (2003) paper. Each study was assigned a rating of either low (1), medium (2) or high (3) for the dimensions of: research design, comparison group and data collection points. The average rating for each study was calculated to give an overall WoE B rating.

Criteria for WoE B Ratings

Criteria	Low - 1	Medium - 2	High - 3
Research design	Single group design with no allocation to groups.	Non-random allocation to groups.	Random allocation of participants to groups.
Comparison group	No comparison/control group.	'No intervention' control group or wait-list control group.	Active control group (attention placebo or alternative intervention).
Data collection points	Outcomes are measures post-intervention.	Outcomes are measured pre-intervention and post-intervention.	Outcomes are measured post-intervention, pre-intervention and at a follow-up point.

Overall WoE B Ratings for Studies

Study	Research design	Comparison group	Data collection points	WoE B
Berkeley et al. (2011)	3	3	3	3 (High)
Bosnjak et al. (2017)	3	2	2	2.33 (Medium)
Cue &Taylor. (2020)	3	2	3	2.67 (High)
Kolic-Vehovec (2002)	3	3	2	2.67 (High)
Toland & Boyle (2008)	1	1	2	1.33 (Low)

WoE C: Topic Relevance

WoE C assessed how relevant the topic of each study is to the review question with regards to criteria developed by the reviewer. Studies were rated on eight different areas including the relevance of the intervention, participant sample selection process, participant sample type, scope of academic measures, measurement of attributions, setting, implementation and instructor. Ratings for each of these areas were averaged to give an overall WoE C rating for each study.

Criteria for WoE C Ratings

Criteria	Ratings	Rationale
Intervention	**3** – AR is the only intervention in the main intervention condition. **2** – AR is combined with another intervention in the main intervention condition but is the main component OR AR is the sole	Many studies combine AR with other interventions but the review question aims to explore the unique contribution of AR alone.

Criteria	Ratings	Rationale
	intervention in one of the secondary or tertiary experimental conditions. **1**– AR is combined with another intervention but is not the key component.	
Participant sample selection	**3** – Participants have been identified as having (specific or general) LDs or as low-achieving through scores on a well-established standardised test (e.g., the WIAT). **2** – Participants have been identified as having LDs or as low-achieving through performance on a school-based test (e.g., grades). **1** – Participants been identified as having LDs or as low-achieving through a more subjective selection process (e.g., teachers were asked to make referrals).	The review question is focused on children who have or are at-risk of developing learning difficulties therefore studies which have used well-established measures for identifying these participants are more likely to accurately represent the target audience.
Participant sample type	**3** – Every participant in the sample has been identified as having a general/specific learning difficulty or as under-achieving. **2** – More than 75% of the sample have been identified as having a general/specific learning difficulty or as under-achieving. **1** – Less than 75% of the sample have been identified as having a general/specific learning difficulty or as under-achieving.	The review question looks at the effectiveness of AR for children who are struggling with their learning. Therefore, the study must consist of children who have a learning difficulty or are under-achieving academically.
Scope of academic outcome measures	**3** – More than two areas of academic achievement have been targeted (e.g., maths, reading and spelling). **2** – More than one area of academic achievement has been targeted.	The research question focuses on the impact of academic achievement more generally. Therefore, studies which only focus on one area of academic achievement are less relevant to the topic.

Criteria	Ratings	Rationale
	1 – Only one area of academic achievement has been targeted.	
Measuring attributions	**3** – The tool used measures general attributional style. **2** – The tool used measures attributions within a specific academic context (e.g., reading). **1** – The tool does not accurately measure attributions.	The research question focuses on the impact of AR on attributional style. Therefore, the tool used to measure attributions must be a valid measure of attributional style in order to produce an accurate picture of the child's attributions across academic contexts.
Setting	**3** – The intervention was carried out in the UK. **2** – The intervention was carried out in another OECD country. **1** – The intervention was not carried out in an OECD country.	As the intervention is intended for use within schools in the UK, the study should take place in a country with a similar education system to the UK. Countries which are members of the Organisation for Economic Co-operation and Development are considered to be more similar to the UK and have education systems which are the most comparable to that of the UK.
Implementation	**3** – The intervention involves direct attributional feedback, instruction, practise and consolidation. **2** – The intervention involves direct attributional feedback. **1** – The intervention involves indirect attributional feedback through modelling, either face-to-face or via video.	There are large variations in how AR has been delivered and there are currently no clear implementation guidelines. However, there are some key elements which should be included. The level at which the studies include these key features is important as this is how AR should be implemented in practice.
Instructor	**3** – The intervention was delivered by a member of	As the intervention is intended to be carried out by school staff, studies

Criteria	Ratings	Rationale
	teaching staff with sufficient training. **2** – The intervention was delivered by a researcher with sufficient training. **1** – The intervention was delivered by a researcher or member of teaching staff without sufficient training.	whereby the intervention is delivered by a member of teaching staff provide a more accurate reflection of how the intervention will be implemented in practice. It is also important that the staff member has been trained so that the intervention is carried out effectively and consistently.

Overall WoE C Ratings for Studies

Study	Intervention	Participant sample selection	Participant sample type	Scope of academic outcome measures	Measuring attributions	Setting	Implementation	Instructor	WoE C
Berkeley et al. (2011)	1	3	3	2	2	2	2	3	2.25 (Medium)
Bosnjak et al. (2017)	2	1	2	3	3	2	3	2	2.25 (Medium)
Cue & Taylor (2020)	3	2	3	3	3	2	3	2	2.63 (High)
Kolic-Vehovec (2002)	2	2	3	1	2	1	2	2	1.88 (Medium)
Toland & Boyle (2008)	2	1	2	2	1	3	3	2	2 (Medium)

WoE D: Overall Weightings

WoE D ratings were calculated by taking an average of WoE A, B and C ratings for each study. WoE D provides an overall judgement regarding the strength of the evidence for answering the current review question. A score of < 1.7 is considered 'low', 1.7 – 2.4 is 'medium' and > 2.4 is 'high'.

Overall WoE D Ratings for Studies

Study	WoE A	WoE B	WoE C	WoE D
Berkeley et al. (2011)	2.7 (High)	3 (High)	2.25 (Medium)	2.65 (High)
Bosnjak et al. (2017)	2.25 (Medium)	2.33 (Medium)	2.25 (Medium)	2.28 (Medium)
Cue & Taylor (2020)	2.12 (Medium)	2.67 (High)	2.63 (High)	2.47 (High)
Kolic-Vehovec (2002)	1.88 (Medium)	2.67 (High)	1.88 (Medium)	2.14 (Medium)
Toland & Boyle (2008)	1.75 (Medium)	1.33 (Low)	2 (Medium)	1.69 (Low)

6.6 Appendix E: Example of Completed Coding Protocol for WoE A

Critical Review Form - Quantitative Studies

© Law, M., Stewart, D., Pollock, N., Letts, L., Bosch, J., & Westmorland, M., 1998
McMaster University

Citation:	
Berkeley, S., Mastropieri, M. A., & Scruggs, T. E. (2011). Reading comprehension strategy instruction and attribution retraining for secondary students with learning and other mild disabilities. *Journal of Learning Disabilities, 44(1), 18–32.*	
Comments	
Study purpose: Was the purpose stated clearly? ➢ (Yes) ➢ No ➢ In part	**Outline the purpose of the study. How does the study apply to Educational Psychology and/or your research question?** • Purpose of study is clearly defined: to investigate the impact of reading comprehension strategy (RCS) instruction alongside AR on reading outcomes for 7th, 8th and 9th graders with learning and other mild disabilities. • Relevance to research question discussed elsewhere in review.
Literature Was relevant background literature reviewed? ➢ (Yes) ➢ No ➢ In part	**Describe the justification of the need for this study.** • The justification for the study was clearly stated in the introduction and concerns the need to further investigate the combined effectiveness of AR alongside strategy instruction. • Previous literature into AR, RCS and the combined effectiveness of AR alongside strategy instruction was clearly outlined. • Methodological issues inherent within previous studies were identified and addressed in the current study (e.g., instructional time among comparison groups was carefully balanced so that students in the RCS group did not receive a greater amount of strategy practice than students who received AR in addition to RCS instruction).
Design: • (Randomized (RCT)) • Cohort • Single Case Design • Before and after • Case-control • Cross-sectional • Case Study	**Describe the study design. Was the design appropriate for the study question? (e.g., for knowledge level about this issue, outcomes, ethical issues, etc.)** • Effectiveness of RCTs for research question discussed elsewhere in review. • Intervention compared to attention placebo group ('read naturally') thereby eliminating any potential ethical issues. **Specify any biases that may have been operating and the direction of their influence on the results.** • Participants were selected from just one school, in just one area of the USA and therefore cannot be representative of the entire population. • Participants with reading difficulties were selected on the basis that their performance on the Stanford Reading

	Test was below grade level which is a more objective measure.
	• The reading attribution scale is based on student self-report therefore students may have been influenced by social desirability bias.
	• Some of the interventions were carried out by teachers, presumably from within the school which may have also increased the chance of bias.
	• The use of an 'attention control' group is likely to have reduced the chances of attention bias.
	• One of the researchers both administered the intervention and scored the outcome measures which may have introduced bias.
	• All of the participants were receiving special education services through the school LD program which may have confounded the findings.
	• The interventions were carried out by different instructors and this may have also have confounded the results.
Sample: N = 59 Was the sample described in detail? ➤ (Yes) ➤ No ➤ In part Was the sample justified? ➤ Yes ➤ (No) ➤ In part	**Sampling (who; characteristics; how many; how was sampling done?) If more than one group, was there similarity between the groups?** • The sample characteristics are included with the 'mapping the field' table. • All participant characteristics are clearly described in the paper. • Participants were identified by the school as having weaknesses in the area of reading (as measured by the • Stanford Reading Test). • More males (n=40) participated than females (n=19) but all intervention groups had a relatively similar numbers of participants (RCS =19, RCS + AR = 20 and RN =20). • Some reference is made to the sample size being 59 because this is the number of children who were identified as having difficulties with reading but no further justification is provided. • Sample size may have been too small – insufficient power to detect differences. • Participants relatively matched in terms of characteristics. **Describe ethics procedures. Was informed consent obtained?** • Some reference is made to gaining informed consent from the parent and student but this is minimal.
Outcomes: Were the outcome measures reliable? ➤ Yes ➤ (No) ➤ In part	**Specify the frequency of outcome measurement (i.e. pre, post, follow-up)** **Outcome areas:** • Reading comprehension • Attributions towards reading **List measures used:** • Passage content test

Were the outcome measures valid? ➢ Yes ➢ (No) ➢ In part	• Summarisation test • Adapted Reading Attribution Scale 2x reading comprehension tests were developed by researchers. Checked with social studies teacher for 'face validity' and inter-rater reliability also checked. No other reference to validity or reliability.
Intervention: Intervention was described in detail? ➢ (Yes) ➢ No ➢ Not addressed Contamination was avoided: ➢ Yes ➢ No ➢ (Not addressed) Cointervention was avoided: ➢ Yes ➢ (No) ➢ Not addressed	**Provide a short description of the intervention (focus, who delivered it, how often, setting). Could the intervention be replicated in Educational Psychology practice?** • Intervention described in detail in the study including an example lesson plan. • Details regarding intervention administration included within 'mapping the field' table in appendices. • Instructors received ongoing supervision plus initial training. • No reference to contamination - children and teachers all attend same school so contamination possible. • Co-intervention not avoided as participants also in receipt of SEND services from the school.
Results: Results were reported in terms of statistical significance? ➢ (Yes) ➢ No ➢ In part ➢ Not addressed Were the analysis method(s) appropriate? ➢ (Yes) ➢ No ➢ Not addressed	**What were the results? Were they statistically significant (i.e., $p < 0.05$)? If not statistically significant, was study big enough to show an important difference if it should occur? If there were multiple outcomes, was that taken into account for the statistical analysis?** • Results reported in terms of statistical significance at the 0.05 alpha level with effect sizes. • Results can be seen in 'mapping the field' and 'effect sizes' table. • Appropriate statistical analysis selected (ANOVA) for comparing 2+ intervention groups. • Size of sample is sufficient to shown an important difference.
Drop-outs were reported? ➢ (Yes) ➢ No	**Did any participants drop out from the study? Why? (Were reasons given and were drop-outs handled appropriately?)** • There were dropouts but reasons were provided. Overall, there was an attrition of 18 potential participants due to: - Refused consent by parent or student (n = 3) - Student moves in or out of the school district during the study (n = 4) - Excessive absences caused by suspensions (n = 3) - Other behaviour-related issues such as schedule changes based on student behaviour (n = 5) - Student disabilities that did not meet the study criteria: intellectual disability, autism, and traumatic brain injury (n = 3)

	- One student moved after completing the study, but prior to delayed post-testing.
Conclusions and clinical implications: Conclusions were appropriate given study methods and results ➢ Yes ➢ No ➢ (In part)	**What did the study conclude? What are the implications of these results for Educational Psychology practice? What were the main limitations or biases in the study?** • Conclusions are relevant and appropriate given the results. • Research taught a disproportionate number of RCS+AR groups. • Self-report was the only measure used.