Case Study 1: An Evidence-Based Practice Review Report

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

Is Covert Audio Coaching (CAC) An Effective Vocational Intervention for Adolescents and Young Adults with Autism Spectrum Condition (ASC)?

Summary

The UK government is committed to assisting children and young people (CYP) with special educational needs or disabilities (SEND) in their transition to adulthood. This is reflected in recent changes in key legislation and policies as well as availability of governmental funding (Department for Education & Department of Health, 2015; Department for Work and Pensions, 2022). Even so, there has been a paucity of research on vocational interventions for CYP with SEND, within which CYP with autism the lowest employment rate (21.7%) (Office for National Statistics, 2021). In this context, the current review aims to investigate the effectiveness of covert audio coaching (CAC) vocational intervention for CYP with autism. CAC involves the use of job coach(es) giving immediate audio prompts/cues and sometimes performance feedback covertly through a pair of two-way radios and headsets, smartphones or even online videoconferencing applications (Bennett et al., 2010). This review critically analysed six CAC intervention studies conducted between 2012 to 2021, and found CAC to be highly effective in training specific on-site job skills, and moderately effective in improving generic workplace social skills. Limitations, directions for future research and implications are discussed.

Introduction

Definition and prevalence of autism spectrum condition

The term *autism* was coined by Kanner in 1943 to draw attention to "an extreme aloneness" (p. 242) and "inborn disturbances of affective contact" (p. 250) that he observed in eleven children during his practice as a psychiatrist. It was not until a quarter of century later when Wing and Gould (1979) introduced the concept of the autistic spectrum. This considerably contributed to the current definition of autism being a neurodevelopmental condition with a spectrum of manifestations, and characterised by social-communication impairments as well as repetitive interests, behaviours and activities (American Psychiatric Association, 2013).

In the UK, there has been a dramatic increase in the prevalence rates of autism during the past decade (McConkey, 2020; Russell et al., 2021). Currently, there are approximately 700,000 people with a diagnosis of Autistic Spectrum Condition (ASC) (British Medical Association, 2020), with the prevalence rate being 1.76% and the male-to-female ratio being 4.32:1 among children aged 5 to 19 years (Roman-Urrestarazu et al., 2021).

Employment outcomes

If the aforementioned prevalence rate is notable, the employment rate, 21.7% people with ASC versus 52.1% disabled people versus 81.3% for non-disabled people (aged 16 to 64), only exacerbates the problems already facing

this population (Office for National Statistics, 2021). This is especially the case given that successful employment has been found to be positively correlated with better daily living skills (Hedley et al., 2019), and to significantly predict a higher subjective quality of life for adults on the spectrum (Mason et al., 2018).

Audio-based vocational interventions

Given such importance of vocational skills, it is surprising to see that, historically, there has been a paucity of research on vocational interventions for people on the spectrum. From 1980 to 2011, less than a dozen related studies were identified, according to various systematic review studies (Hume et al., 2021; Taylor et al., 2012). Within the past decade, however, more attention has been paid to this vocational aspect. From 2012 to 2017 alone, over 20 relevant empirical studies were conducted (Hume et al., 2021). In addition, at least three meta-analytical (Boles et al., 2019; Bross et al., 2021; Savage & Taber-Doughty, 2017) and over ten review studies (e.g., Kim et al., 2022) of ASC-related vocational interventions have been carried out within the last ten years.

Most of these interventions are behaviourally based programmes adopting and adapting a variety of applied behaviour analysis methods (Matson et al., 2012), with theoretical origins tracing back to Skinner's neo-behaviourism theory of learning (Morris et al., 2005). According to this theory, behaviour is developed through a process called selection by environmental consequences, in that behaviours which produce favourable outcomes are reinforced and continue to occur (Skinner, 1938).

Under this theoretical influence, audio-based cuing/coaching interventions

use audio cues to remotely prompt the participant to perform a target behaviour (Kim et al., 2022). Although vocational interventions have started to draw academic attention, audio-based programmes still remain understudied. The few reviews that briefly touch on audio-based interventions (e.g., Hedley et al., 2017; Seaman & Cannella-Malone, 2016; Walsh et al., 2017), have arrived at a consensus that it is 'the lack of research quantity, rather than quality' (Hong et al., 2015, p. 2812) that made audio-based vocational interventions inappropriate to be considered as evidence-based practice at the time the reviews were written. Indeed, a recent meta-analysis (Boles et al., 2019) reported a Tau-*U* score of 0.97, 95% *CI* [0.85, 1.00], for four audio-based interventions with 13 participants, suggesting that such interventions could be highly effective.

Covert audio coaching

This effect size is, however, not as promising and informative as it might look, since it was measured by analysing only four studies which, in fact, cover two separate types of audio-based vocational interventions. The first type is audio cuing/prompting which uses pre-recorded and self-operated audio prompts delivered through cassette tapes (Montgomery et al., 2011). In comparison, covert audio coaching (CAC) intervention, also termed Bug-in-Ear coaching, is more complex, as it involves the use of job coach(es) giving immediate audio prompts/cues and sometimes performance feedback covertly through a pair of two-way radios and headsets (Bennett et al., 2010), smartphones (Chezan et al., 2020) or even online videoconferencing applications such as Zoom (Joseph et al., 2021).

The lack of research is concerning, especially since fewer than five related studies were identified and evaluated in the majority of review studies (Hedley et al., 2017; Kim et al., 2022; Seaman & Cannella-Malone, 2016). Also, most of these reviews ended their literature search by 2015. Since then, an increasing number of studies on CAC have been published (e.g., Joseph et al., 2021). This indicates the need to revisit the subject (i.e., CAC) and re-evaluate the research findings.

Rationale and relevance

What adds to this particular research need is the UK government's commitment to assist children and young people (CYP), especially those with special educational needs or disabilities (SEND), in their transition to adulthood. Recent key legislation (Children and Families Act, 2014) and government policy (SEND Code of Practice) (Department for Education & Department of Health, 2015) has extended the statutory roles of educational psychologists to young people aged 16 to 25. To fulfil these roles, educational psychologists (EPs), long held to be the gatekeepers to special provision and Education, Health and Care (EHC) plans (Arnold & Hardy, 2013), need to pay special attention to this older group on the spectrum, given that autism is the most prevalent primary type of SEN among pupils (30%) with an EHC plan (Department for Education, 2021). In addition to this, EPs, according to the latest SEND Code of Practice need to work together with local authorities, education providers, young people (within the 16-25 age range) and their caregivers to support young people to make a better preparation and a successful transition into adulthood, within which

employment plays an integral role (Department for Education & Department of Health, 2015). On top of this, EPs whose training has moved into the doctoral level since 2006 have a scientist-practitioner dual role to play (Swinson & Stringer, 2019). This means EPs, even a Trainee EP such as the reviewer, can use their research skills and psychological knowledge to evaluate empirical studies conducted in an understudied area (vocational interventions) for an underrepresented group (adolescents and young adults with ASC).

Review question

Is covert audio coaching (CAC) an effective vocational intervention for adolescents and young adults with Autism Spectrum Condition (ASC)?

Critical Review

Literature search

In January 2021, the reviewer conducted a comprehensive literature search of the PsycINFO, ERIC and Web of Science databases to retrieve empirical studies of covert audio coaching for individuals with ASC. At the commencement of the search, no date limit was set. To identify as many related studies as possible, broad search terms, including many not limited to covert audio coaching, were used (see Table 1). It should be noted that the current review uses person-centred language (PCL) which places an individual before his or her condition (e.g., people with autism) (Roman-Urrestarazu et al., 2022), and which has been endorsed by the majority of relevant professionals and preferred by caregivers and parents (Kenny et al., 2016). Even so, to identify

more autism-related studies, publications which did not use PCL were also searched at this initial stage, given the consideration that half of autism-related publications in medical journals (i.e., *PubMed*) did not adhere to the use of PCL, but used identity-first language (e.g., autistic individuals) (Arnhart et al., 2022).

The initial search identified 184 studies within which 106 were duplicates. After removing duplicates, the reviewer screened the remaining 78 articles by title, and 51 articles were excluded. Then, the remaining 27 articles screened by abstract. Of these 27 studies, 17 were excluded from the review as they did not meet the inclusion criteria (see Table 2). The above database searches were further supplemented by forward and backward searches on each identified article as well as meta-analytical and review articles. One study was identified through ancestral searches. After this iterative study selection process (see Figure 1), the reviewer read the remaining 11 articles in full, and a further 5 were excluded with reason (see Table 7 in Appendix A). The details of included six studies can be seen in Table 8 (see Appendix B).

Table 1

Search Terms by Domain

Category	Search Terms
Population	autis*, asd, autism spectrum disorder*, asperger*, pervasive development* disorder*
Intervention	audio cu*, audio prompt*, auditory prompt*, audio coach*, covert audio coaching

Note. Connected with “OR” from each domain; with “AND” between domains.

Table 2

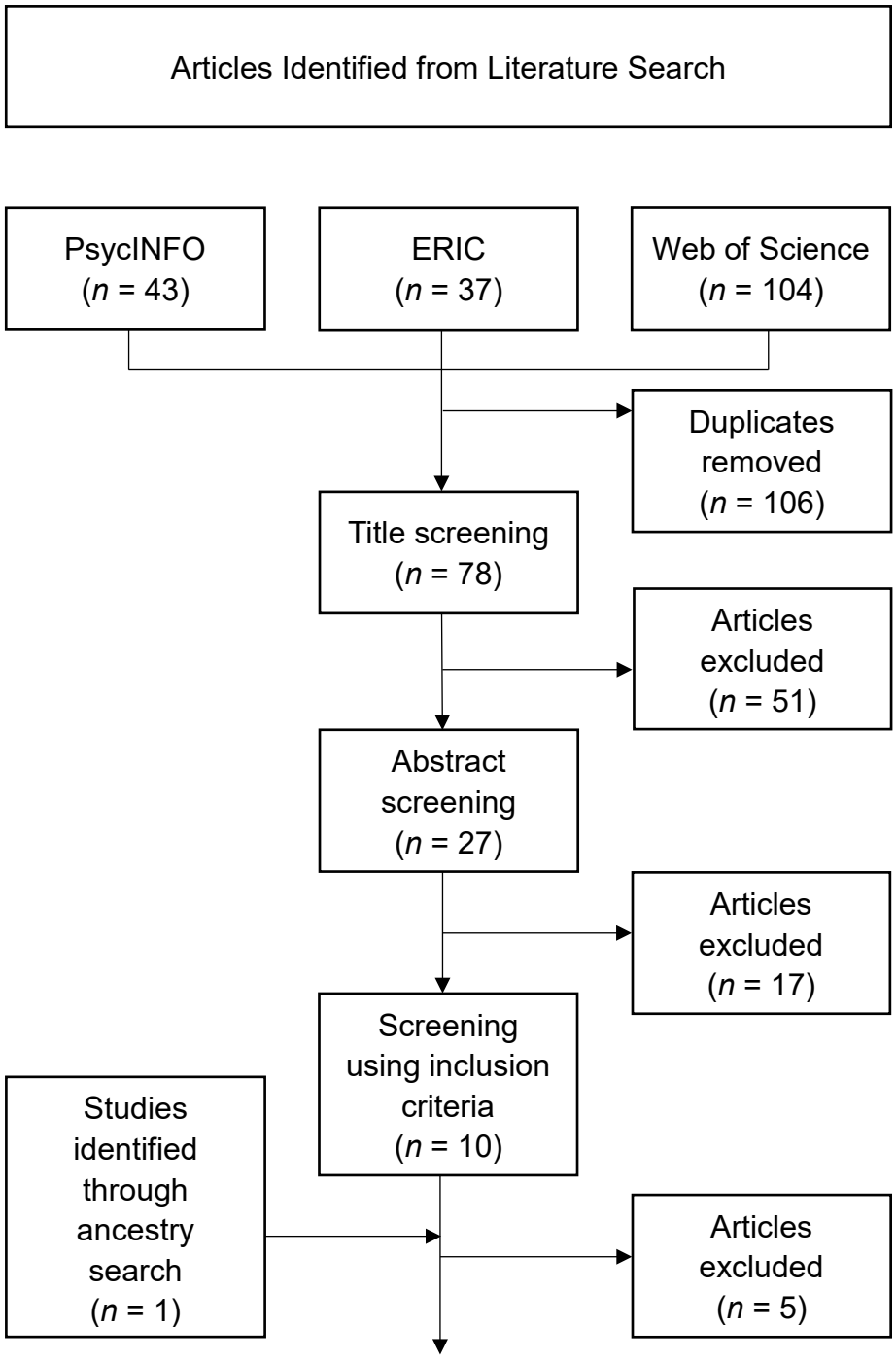
Criteria for Inclusion in Systematic Literature Review

Criteria	Inclusion	Exclusion	Rationale
Intervention	Intervention includes CAC	Intervention does not include CAC	This review focuses on the effect of CAC.
Outcomes	Study includes quantitative data on vocational behaviours/skills.	Study does not include quantitative data on vocational behaviours/skills.	This review explores the effectiveness of CAC on vocational behaviours/skills.
Population	Study includes adolescents and young adults aged 10 to 25.	Study includes children under the age of 10 or adults over the age of 25.	This study evaluates the effective of CAC for adolescents and young adults.
Diagnosis	Participants must have a diagnosis of ASC.	Participants do not have a diagnosis of ASC.	This study focuses on individuals with ASC.
Study Design	Empirical study with quantitative data	Meta-analysis, systematic review or qualitative study	For effect size calculation purposes
Date	From 2012 to January 2022	Prior to 2012	Taylor et al.'s (2012) review concluded that vocational interventions conducted between 1980 to 2011 were of poor quality. Therefore, this review aims to identify and analyse CAC vocational interventions from 2012 to January 2022, in the hope of updating Taylor et al.'s (2012) review.
Language	Study published in English	Study not published in English	To guarantee the understanding of the reviewer

Publication	Published journal articles; Indexed in PsycINFO, ERIC or Web of Science	Not published journal articles. Not indexed in Psych INFO, ERIC or Web of Science.	Published journals underwent rigorous ethical approval procedure and peer review process.

Figure 1

Literature Search Process



Final studies identified for review (*n* = 6)

Coding procedures

To evaluate whether the articles included met evidence standards, the reviewer used Gough's (2007) Weight of Evidence (WoE) framework in their research synthesis. All six studies were rated in terms of their generic methodological quality (WoE A), methodological relevance (WoE B) and topic relevance (WoE C) respectively. After this, the overall ratings (WoE D) were obtained by finding the mean of ratings in WoE A, B and C. The WoE scores for all studies reviewed are shown in Table 3.

To be more specific, to evaluate the generic methodological quality (WoE A), the reviewer used the research quality appraisal tool from Horner and colleagues (2005) (see Appendix C for detail). This is not only because Horner et al. (2005) provided the first explicit quality indicators for single-subject experimental designs (SSEDs), a quasi-experimental research category which all papers included in this review fall into. It is also because Horner et al.'s (2005) criteria include the largest set of quality evaluation items among other SSEDs appraisal tools, such as the What Works Clearinghouse (WWC) standards (Wendt & Miller, 2012). In fact, the Horner criteria have a broader focus on internal validity than the WWC standards adopted in some related review studies (e.g., Hong et al., 2015), and therefore are considered to be

more rigorous in the quality assessment of SSEDs (Wendt & Miller, 2012, p. 258).

As for the measurement of methodological relevance (WoE B), the reviewer selected Petticrew and Roberts (2003) in their recommended use of a typology of evidence to assess the relevance of the six SSEDs for answering the review question regarding the effectiveness of covert audio coaching. It is true that the golden standard for evaluating intervention effects is the use of randomised controlled trials (RCTs), followed by group design studies. However, both RCTs and group designs, according to the latest systematic reviews (Hume et al., 2021; Kim et al., 2022), have not yet been carried out to address the understudied vocational predicament of autistic individuals. In this sense, the SSEDs assessed in this review can be deemed to be the next best external evidence, and thus, were all given an equal rating of WoE B (see Appendix D).

To calculate the relevance to the topic (WoE C), the reviewer used eight criteria and evaluated each included study accordingly. Rationale behind five criteria (i.e., intervention, participant age, intervention description, outcome variable, maintenance outcome) is fairly straightforward (see Appendix E). However, rationale behind the other three criteria (i.e., participant number, intervention setting, interventionist) needs further explanation. All six studies were given a rating of two points in the participant number section, because three participants were only considered to be acceptable according to Horner et al. (2005), and more participants can enhance the external validity of the research. Also, studies conducted in naturalistic settings were rated higher than

those in school settings, because naturalistic settings better resemble the real-life competitive employment environment, and therefore better fit the focus of this review (vocational behaviours/skills). In addition, out of practical concerns, compared with job coaches who are hired for delivering CAC, other trained interventionists (e.g., teachers) were considered to be easier to gain access to, thus being rated higher in this regard.

Table 3

Weight of Evidence for Each of the Papers

Study	WoE A	WoE B	WoE C	WoE D
Allen et al., 2012	2.4 (Medium)	2 (Medium)	2.5 (High)	2.3 (Medium)
Bennett et al., 2013a	2.6 (High)	2 (Medium)	2.5 (High)	2.4 (Medium)
Bennett et al., 2013b	2.6 (High)	2 (Medium)	2.5 (High)	2.4 (Medium)
Chezan et al., 2020	2.6 (High)	2 (Medium)	2.5 (High)	2.4 (Medium)
Gilson & Carter, 2016	2.6 (High)	2 (Medium)	2.7 (High)	2.4 (Medium)
Joseph et al., 2021	2.6 (High)	2 (Medium)	2.5 (High)	2.4 (Medium)

Note. High = 2.5 and above; Medium = 1.5 to 2.4; Low = 1.4 and below.

Participants

A total of 18 participants were included in the six studies. All except one participant were adolescents or young adults (aged 13 to 25). The oldest participant, aged 30 in Joseph et al.'s (2021) study, was not included in the final quality synthesis, given consideration of the review focus. This left a total of 17 participants (14 males, 3 females). Among these participants, the median age was 18 years old, and the mean age, 18.41 (*SD* = 2.92). Across the

participants, the race/ethnicity information was not documented for the three participants in Bennett et al.'s (2013a) study. This information loss is considered to limit the ability for later review studies to evaluate the sample representation and research generalisability based on race/ethnicity (Zeng et al., 2021). Among the 14 participants with given racial information, the ethnic composition comprised of 8 (57.14%) Caucasian American and 6 (42.86%) African American participants. The representation of American participants was because all six studies were conducted in the United States. What deserves special attention is that the majority of participants (12 out of 17) had additional needs, within which intellectual disability (41.18%) was the primary additional need (see Table 4).

Table 4

Participant Demographics

Study	Name	Gender	Age	Ethnicity	Additional Need(s)
Allen et al., 2012	Ned	Male	18	Caucasian American	Mild ID
	Trace	Male	17	Caucasian American	ID
	Emma	Female	16	Caucasian American	Moderate ID
Bennett et al., 2013a	Jason	Male	13	-	-
	Shaun	Male	22	-	-
	David	Male	16	-	-
Bennett et al., 2013b	Kelly	Female	18	Caucasian American	Speech Impaired & Language Impaired
	Darnell	Male	15	African American	Language Impaired
	Matthew	Male	15	Caucasian American	Language Impaired
Chezan et al., 2020	Darius	Male	19	African American	Moderate ID
	Klaus	Male	18	African American	Moderate ID
	Cole	Male	19	African American	Moderate ID
Gilson & Carter, 2016	Braxton	Male	20	African American	ID
	Jeremy	Male	22	Caucasian American	-
	Noah	Male	21	Caucasian American	ADHD
Joseph et al., 2021	London	Male	20	Caucasian American	-

	Candice	Female	24	African American	Visual Impairment
	*Michael	Male	30	Caucasian American	-

Note. Intellectual Disability (ID), Attention Deficit Hyperactivity Disorder (ADHD).

Study design

Among the six SSED studies included, apart from one (Allen et al., 2012) which used ABCAC withdrawal design, all other studies used concurrent multiple baseline design, both of which are deemed to be scientifically valid to provide experimental control (Horner et al., 2005). To be more specific, across these five studies, the CAC intervention was introduced successively for each participant to demonstrate that change in target behaviours in one particular participant occurred after the introduction of CAC, while concurrent and untreated behaviours in other participants remained unchanged. In comparison, ABCAC withdrawal design has been considered to be even more rigorous (Rapoff & Stark, 2008). By introducing both CAC and another intervention after the initial baseline, removing both interventions, and then re-introducing CAC again, Allen et al. (2012) could better understand whether behaviour change was caused by CAC alone.

Intervention settings & Target skills

Half of the six studies were conducted in a school (either secondary or university) setting. Two were carried out in the local community. One was conducted online. These intervention settings were deliberately arranged in accordance to the target skills (see Table 5 for detail). In general, half of the

studies used CAC to train specific on-the-job skills, and the other half, generic social skills in the workplace.

Within each type of vocational skills, the complexity level of job tasks can vary greatly. Take on-the-job skill type as an example. The job task can be a relatively easy one, such as making photocopies (Bennett et al., 2013a) or folding T-shirts (Bennett et al., 2013b). It can also be as complicated as requiring participants to wear an air-inflated WalkAround costume to promote products in a real local retail store (Allen et al., 2012). As for the more recent studies which focus on workplace communication skills, the task either demanded the participant to involve in conversations with one person in structured online chats (Joseph et al., 2021), or with multiple individuals in a naturalistic school setting (Chezan et al., 2020; Gilson & Carter, 2016).

Table 5

Studies by Target Skills and Settings

Study	Target Skills	Settings
Allen et al., 2012	Promoting products in retail stores	A local discount retail store
Bennett et al., 2013a	Making photocopies	Faculty room in a special secondary school
Bennett et al., 2013b	Using a T-shirt folding board to fold T-shirts	Student lounge in a special secondary school
Chezan et al., 2020	Conversations and self-initiated interactions	University classroom & university recreation and wellness centre
Gilson & Carter, 2016	Social interactions & Task engagement	Participants' individual jobsites (i.e., university residential hall, preschool, clinic)
Joseph et al., 2021	On-topic small talk exchanges	Online via Zoom

Intervention duration and intensity

Given the various settings and target skills, it is not surprising that the six studies have different intervention duration and intensity. For intervention in a structured setting, one session could be as short as six minutes (Joseph et al., 2021). In comparison, interventions taking place in naturalistic settings needed longer sessions. For example, for the two studies that targeted conversations and social interactions, an intervention session took 20 (Chezan et al., 2020) to 30 minutes (Gilson & Carter, 2016). Compared to the three aforementioned studies, earlier studies, however, were vague in their description of intervention duration. In Allen et al.'s (2012) study, it was said that a coach provided audio prompts every 10s in about 6 minutes, but "the duration of the audio cuing condition was determined by the stability of the data" (p. 2414). Also, in the study conducted by Bennett and his colleagues (2013a), no such information was given.

Interventionist

Although all six studies used CAC, only half (Bennett et al., 2013a, 2013b; Joseph et al., 2021) actually used a professional job coach to deliver CAC. The other half used a doctoral student (Allen et al., 2012), a high school teacher (Chezan et al., 2020) or three female graduate or undergraduate students (Gilson & Carter, 2016). Within these, only in Gilson and Carter's (2016) study was information to train interventionists provided (i.e., 90-minute group training session provided by the researcher).

Measures

To evaluate the effectiveness of CAC, data on targeted skills on baseline,

intervention and maintenance sessions were collected by two observers. Following this, the interobserver agreement (IOA) percentage was calculated. The six studies included unanimously reported high IOA percentages (above 90%), thus meeting the inter-rater reliability criterion in Horner et al. (2005).

More specifically, to measure particular on-the-job skills, Allen et al. (2013) calculated the percent occurrence of target behaviours, and Bennett and his colleagues (2013a, 2013b) calculated the percentage and/or rate of task steps completed correctly. The other three studies, with their focus on workplace social skills, recorded the percentage or the total number of conversations and/or social interactions. This similarity in measures allowed the reviewer to compare research findings across studies that focused on the same type of vocational skills.

Intervention outcomes

To aggregate intervention outcomes, the reviewer used Percentage of Data Exceeding the Median (PEM), an appropriate metric to measure effect size in behaviour-change SSEDs (Ma, 2006, 2009). PEM was chosen over the Percentage of Non-Overlapping Data (PND), because compared with PND which relies on a single outlier data point in the baseline (Scruggs et al., 1987), PEM uses more data to calculate a median condition to determine the degree of nonoverlap (Ma, 2006). In other words, PEM is more appropriate in dealing with baseline data with the extreme scores present in two of the studies in this review (Chezan et al., 2020; Gilson & Carter, 2016). The reviewer followed Ma's (2006) procedures to calculate PEMs for each participant in a given study, then

to sum these, and finally yield a mean as the PEM for that study (see Table 6).

It was found that CAC showed a PEM of 100% in all three studies focusing on specific on-the-job skills, indicating CAC to be highly effective. In comparison, the PEM scores in the other three studies which looked at workplace social skills were not so consistent. In a structured conversation environment, such as a well-arranged Zoom meeting (Joseph et al., 2021), PEM were as high as 100%. In naturalistic settings, however, the PEM scores ranged from 59% to 96% even within one study that targeted two different behaviours (Chezan et al., 2020). Even so, the mean PEM score of 86% across these three studies still shows CAC to be moderately effective.

Table 6

Percentage of Data Exceeding the Median (PEM) by Participant and Study

Study	Participant	Target Behaviour	PEM	Overall PEM	WoE D
Allen et al., 2012	Ned	Promoting products	100%	100% (High)	2.3 (Medium)
	Trace		100%		
	Emma		100%		
Bennett et al., 2013a	Jason	Photo-copying	100%	100% (High)	2.4 (Medium)
	Shaun		100%		
	David		100%		
Bennett et al., 2013b	Kelly	T-shirt folding	100%	100% (High)	2.4 (Medium)
	Darnell		100%		
	Matthew		100%		
Chezan et al., 2020	Darius	Conversation	89%	96% (High)	2.4 (Medium)
	Klaus		100%		
	Cole		100%		
	Darius	Self-initiated interactions	56%	59% (Low)	
	Klaus		77%		
	Cole		43%		
Gilson & Carter, 2016	Braxton	Social interactions	100%	88% (High)	2.4 (Medium)
	Jeremy		88%		
	Noah		75%		
Joseph et al., 2021	London	On-topic small talk exchanges	100%	100%	2.4 (Medium)
	Candice		100%		

*Michael	100%

Note. * denotes the participant excluded given age consideration (age > 25). Excluding this participant did not result in change in overall PEM of this study. As for PEM, High = 90% and above; Medium = 70% to 89%; Low = 50% to 69%; Very Low = 50% below (Scruggs & Mastropieri, 1998).

Generalisation and maintenance

Equally important to the intervention outcomes, the maintenance outcomes were also measured across all six studies. In general, all studies reported promising maintenance outcomes, suggesting that even after the withdrawal of CAC, participants still displayed more targeted behaviours than they did during baseline sessions. The reviewer, however, is less optimistic. This is because, excepting Allen et al. (2012) who recorded 1-month and 3-month post-CAC follow-ups, the other five studies assessed maintenance data within a relatively short time (i.e., less than a month). Also, one third of the six studies (i.e., Chezan et al., 2020; Gilson & Carter, 2016) failed to include all their participants in maintenance assessments. Therefore, it was not clear whether the reported maintenance outcomes would persist in the long run, and whether the reported maintenance data were, in fact, inflated.

In addition to this, it needs to be mentioned that generalisation data across settings were only gathered in two studies (Allen et al., 2012; Bennett et al., 2013b), making it unlikely to draw definitive conclusions regarding the generalisability of the research findings.

Social Validity

In intervention studies, it is important for both interventionists and intervention recipients to believe that these interventions show positive evidence of their intended goals and outcomes (Carter, 2010). Except the two Bennett et al.'s (2013a, 2013b) studies, the other four studies (66.67%) all conducted social validity surveys and reported positive results. For example, all participants in these four studies either favourably rated CAC themselves (Chezan et al., 2020; Gilson & Carter, 2016; Joseph et al., 2021) or reported their satisfaction through parents/caregivers (Allen et al., 2012). Similarly, other stakeholders (e.g., supervisors, co-workers) also found CAC to be helpful and said that it did not distract participants from work engagement and productivity (Gilson & Carter, 2016). As for interventionists, the trained students or teachers in two studies (Chezan et al., 2020; Gilson & Carter, 2016), all found CAC to be easy to implement in school settings. However, there were concerns that in schools with limited resources, teachers may encounter technological difficulties in delivering CAC (Chezan et al., 2020).

Conclusions and recommendations

Conclusions and limitations

This current review is the first systematic literature review evaluating the effectiveness of CAC in improving vocational behaviours/skills for adolescents and young adults with ASC. CAC was found to be highly effective in training specific on-site job skills, and moderately effective in improving generic workplace social skills. This finding, however, needs to be interpreted with

caution, given the limited number of participants included (*n* =17), and give the low external validity inherent in SSEDs. More specifically, within the 17 participants, as almost half had ASC and co-occurring intellectual disability, and four-fifth were males, it is unsure to what extent CAC can be effective for autistic individuals with higher functioning profiles, or autistic females.

Despite the aforementioned limitations, the current review found CAC-related intervention studies to be of high research quality, which coincided with findings in previous reviews (e.g., Hong et al., 2015). Even if research quality were not of concern, quantity is. To evaluate whether an intervention can be deemed to be evidence-based, at least 20 participants across five or more studies conducted by three different researchers are needed (Horner et al., 2005). Judging by this 20-5-3 rule, the insufficient participant number (*n*=17) does not give the reviewer absolute confidence to conclude CAC as an evidence-based practice. Even so, if studies on audio cuing are considered along with those on CAC, the 20-5-3 rule would be followed and analysis might provide sufficient evidence to re-evaluate the conclusions in the existing literature (e.g., Boles et al., 2016; Walsh et al., 2017). That, however, is beyond the scope of the current review.

Implications

Although the effectiveness of CAC is not definitive at the moment, the gradually accumulating evidence does show promise. This is especially the case when considering that CAC can be delivered by trained teachers and university students, and can be implemented not only in traditional school

settings, but also in naturalistic community environments as well as through novel online platforms (i.e., Zoom). In this aspect, CAC promises hope for helping this already marginalised group to better cope with COVID-19 pandemic-related employment changes (e.g., remote work-from-home mode, virtual Zoom meetings) which can result in increased depression and anxiety (Oomen et al., 2021).

Recommendations and future research

Since quality synthesis results in the current review only present preliminary evidence of the effectiveness of CAC, further research is needed to explore whether and to what extent CAC can be implemented with fidelity in UK school settings. The reviewer is optimistic. This is not only because educational psychologists are well positioned to conduct future pilot studies, and to train appropriate interventionists (e.g., teachers, teaching assistants, SEN coordinators, emotional literacy support assistants) in school settings. It is also because Department for Education (2022) has recently announced official guidance for supported internships to help young people (aged above 16) with SEND to better transit into sustained, paid employment. Therefore, even in situations when professional job coaches are needed, the costs of hiring job coaches will be paid by the UK Government with Access to Work funding (Department for Work and Pensions, 2022).

The UK government envisions a society in which all CYP, regardless of their SEND, reach their fullest potential, succeed in their education and readily move into adulthood (Department for Education & Department of Health, 2015).

Therefore, all professionals working with CYP with SEND, including EPs, should be prepared to provide relevant career advice and support within their remit (Department for Education, 2022). This review, by evaluating the effectiveness of an understudied vocational intervention (CAC) for an underrepresented older autistic group, is the endeavour of a Trainee EP to contribute to this vision.

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Appendix A

Excluded Studies

Table 7

References of Excluded Studies and Reason for Exclusion

Study	Reason for Exclusion
Crocco, C., & Bennett, K. D. (2019). Effects of Covert Audio Coaching on the Attending Behavior of Children With Autism Spectrum Disorder. Focus on Autism and Other Developmental Disabilities, 34(3), 131-140. https://doi.org/10.1177%2F1088357618805083	Population Study did not include adolescent or young adult participants.
Randolph, K. M., & Brady, M. P. (2018). Evolution of covert coaching as an evidence-based practice in professional development and preparation of teachers. In *Handbook of research on human development in the digital age (pp. 281-299).* IGI Global.	Study Design This is a review study, not an empirical study.
Mays, N. M., & Heflin, L. J. (2011). Increasing independence in self-care tasks for children with autism using self-operated auditory prompts. Research in Autism Spectrum Disorders, 5(4), 1351-1357. https://doi.org/10.1016/j.rasd.2011.01.017	Outcomes Study focused on self-care skills, not vocational skills.
Montgomery, J., Storey, K., Post, M., & Lemley, J. (2011). The use of auditory prompting systems for increasing independent performance of students with autism in employment training. International Journal of Rehabilitation Research, 34(4), 330-335. https://doi/10.1097/MRR.0b013e32834a8fa8	Intervention Study used audio cuing intervention, not CAC intervention.
Oliver, P., & Brady, M. P. (2014). Effects of covert	Population

	audio coaching on parents' interactions with young children with autism. Behavior Analysis in Practice, 7(2), 112-116. https://doi.org/10.1007/s40617-014-0015-2	Study did not include adolescent or young adult participants.

Appendix B

Summary of Included Studies

Table 8

Summary of Included Studies

Study	Participants	Target Skills	Settings	Study Design	Interventionist	Duration Intensity
Allen et al., 2012	Three young adults with ASC and some level of ID	Promoting products in ret A local discount retail store ail stores	A local discount retail store	ABCAC withdrawal design	A doctoral student	One-off six-minute session
Bennett et al., 2013a	Two adolescents and one young adult with ASC	Making photocopies	Faculty room in a special secondary school	Multiple baseline design	A professional job coach	Individua session length unstated Session conducte d week for ove three weeks
Bennett et al., 2013b	Two adolescents and one young adult with ASC and speech/language impairment	Using a T-shirt folding board to fold T-shirts	Student lounge in a special secondary school	Multiple baseline design	A professional job coach	One t two minutes per session; Six sessions

Chezan et al., 2020	Three young adults with ASC and moderate ID	Conversations and self-initiated interactions	University classroom & university recreation and wellness centre	Multiple baseline design	A high school teacher	20 minutes per session; Number of sessions ranged from 7 t 9 and t 13.
Gilson & Carter, 2016	Three young adults with ASC, within which one with ID, and one with ADHD.	Social interactions & Task engagement	Participants' individual jobsites (i.e., university residential hall, preschool, clinic)	Multiple baseline design	Three female graduate or undergraduate students	30 minutes per session (other intervention strategies included Sessions conducted twic per wee for four t eight weeks
Joseph et al., 2021	Two young adults with ASC, within which one with visual impairment	On-topic small talk exchanges	Online via Zoom	Multiple baseline design	A professional job coach	Six minutes per session

Note. Intellectual Disability (ID), Attention Deficit Hyperactivity Disorder (ADHD),

Percentage of Data Exceeding the Median (PEM).

Appendix C

Weight of Evidence A: Methodological Quality

This review adopted the quality indicators from Horner et al., 2005 (p. 175) to calculate studies in their Weight of Evidence A ratings. The reviewer calculated a total score later divided by 7 (the number of categories in the Horner criteria). Table 9 to Table 14 gives specific coding protocols for each study included.

Table 9

Coding Protocols for Allen et al.'s (2012) Study

Quality Indicators Within Single-Subject Research	Ratings
Description of Participants and Settings	3
Participants are described with sufficient detail to allow others to select individuals with similar characteristics.	x
Process for selecting participants is described with replicable precision.	x
Critical features of the physical setting are described with sufficient precision to allow replication.	x
Dependent Variable	3
Dependent variables are described with operational precision.	x
Each dependent variable is measured with a procedure that generates a quantifiable index.	x

Measurement of the dependent variable is valid and described with replicable precision.	x
Dependent variables are measured repeatedly over time.	x
Data are collected on the reliability or interobserver agreement associated with each dependent variable, and IOA levels meet minimal standards (e.g., IOA = 80%, Kappa = 60%). *All criteria fulfilled = 3; three or four criteria fulfilled = 2; one or two criteria fulfilled = 1.*	x
Independent Variable	2
Independent variable is described with replicable precision.	-
Independent variable is systematically manipulated and under the control of the experimenter.	x
Over measurement of the fidelity of implementation for the independent variable is highly desirable.	x
Baseline	3
The study includes a baseline phase that provides repeated measurement of a dependent variable.	x
The baseline establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the independent variable did not occur.	x
Baseline conditions are described with replicable precision.	x
Experimental Control/Internal Validity	2
The design provides at least three demonstrations of experimental effect at three different points in time.	x
The design controls for common threats to internal validity (e.g., permits elimination of rival hypotheses).	-
The results document a pattern that demonstrates experimental control.	x
External Validity	1
Experimental effects are replicated across participants.	x
Experimental effects are replicated across settings.	-
Experimental effects are replicated across materials.	-
Social Validity	3

The dependent variable is socially important.	x
The magnitude of change in the dependent variable resulting from the intervention is socially important.	x
Implementation of the independent variable is practical and cost effective.	x
Social validity is enhanced by implementation of the independent variable over extended time periods, by typical intervention agents, in typical physical and social contexts.	x
All criteria fulfilled = 3; two or three criteria fulfilled = 2; one of the criteria fulfilled = 1.	
Overall Total	17

Note. X denotes that this criterion has been met. – indicates either this criterion not been met, or the lack of relevant information.

Table 10

Coding Protocols for Bennett et al.,'s (2013a) Study

Quality Indicators Within Single-Subject Research	Ratings
Description of Participants and Settings	3
Participants are described with sufficient detail to allow others to select individuals with similar characteristics.	x
Process for selecting participants is described with replicable precision.	x
Critical features of the physical setting are described with sufficient precision to allow replication.	x
Dependent Variable	3
Dependent variables are described with operational precision.	x
Each dependent variable is measured with a procedure that generates a quantifiable index.	x
Measurement of the dependent variable is valid and described with replicable precision.	x
Dependent variables are measured repeatedly over time.	x

Data are collected on the reliability or interobserver agreement associated with each dependent variable, and IOA levels meet minimal standards (e.g., IOA = 80%, Kappa = 60%).	x
All criteria fulfilled = 3; three or four criteria fulfilled = 2; one or two criteria fulfilled = 1.	
Independent Variable	2
Independent variable is described with replicable precision.	-
Independent variable is systematically manipulated and under the control of the experimenter.	x
Over measurement of the fidelity of implementation for the independent variable is highly desirable.	x
Baseline	3
The study includes a baseline phase that provides repeated measurement of a dependent variable.	x
The baseline establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the independent variable did not occur.	x
Baseline conditions are described with replicable precision.	x
Experimental Control/Internal Validity	3
The design provides at least three demonstrations of experimental effect at three different points in time.	x
The design controls for common threats to internal validity (e.g., permits elimination of rival hypotheses).	x
The results document a pattern that demonstrates experimental control.	x
External Validity	1
Experimental effects are replicated across participants.	x
Experimental effects are replicated across settings.	-
Experimental effects are replicated across materials.	-
Social Validity	3
The dependent variable is socially important.	x
The magnitude of change in the dependent variable resulting from the intervention is socially important.	x

Implementation of the independent variable is practical and cost effective.	x
Social validity is enhanced by implementation of the independent variable over extended time periods, by typical intervention agents, in typical physical and social contexts. *All criteria fulfilled = 3; two or three criteria fulfilled = 2; one of the criteria fulfilled = 1.*	x
Overall Total	18

Note. X denotes that this criterion has been met. – indicates either this criterion not been met, or the lack of relevant information.

Table 11

Coding Protocols for Bennett et al.,'s (2013b) Study

Quality Indicators Within Single-Subject Research	Ratings
Description of Participants and Settings	3
Participants are described with sufficient detail to allow others to select individuals with similar characteristics.	x
Process for selecting participants is described with replicable precision.	x
Critical features of the physical setting are described with sufficient precision to allow replication.	x
Dependent Variable	3
Dependent variables are described with operational precision.	x
Each dependent variable is measured with a procedure that generates a quantifiable index.	x
Measurement of the dependent variable is valid and described with replicable precision.	x
Dependent variables are measured repeatedly over time.	x
Data are collected on the reliability or interobserver agreement associated with each dependent variable, and IOA levels meet minimal standards (e.g., IOA = 80%, Kappa =	x

60%). *All criteria fulfilled = 3; three or four criteria fulfilled = 2; one or two criteria fulfilled = 1.*	
Independent Variable	2
Independent variable is described with replicable precision.	-
Independent variable is systematically manipulated and under the control of the experimenter.	x
Over measurement of the fidelity of implementation for the independent variable is highly desirable.	x
Baseline	3
The study includes a baseline phase that provides repeated measurement of a dependent variable.	x
The baseline establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the independent variable did not occur.	x
Baseline conditions are described with replicable precision.	x
Experimental Control/Internal Validity	3
The design provides at least three demonstrations of experimental effect at three different points in time.	x
The design controls for common threats to internal validity (e.g., permits elimination of rival hypotheses).	x
The results document a pattern that demonstrates experimental control.	x
External Validity	1
Experimental effects are replicated across participants.	x
Experimental effects are replicated across settings.	-
Experimental effects are replicated across materials.	-
Social Validity	3
The dependent variable is socially important.	x
The magnitude of change in the dependent variable resulting from the intervention is socially important.	x
Implementation of the independent variable is practical and cost effective.	x

Social validity is enhanced by implementation of the independent variable over extended time periods, by typical intervention agents, in typical physical and social contexts. *All criteria fulfilled = 3; two or three criteria fulfilled = 2; one of the criteria fulfilled = 1.*	x
Overall Total	18

Note. X denotes that this criterion has been met. – indicates either this criterion not been met, or the lack of relevant information.

Table 12

Coding Protocols for Chezan et al.'s (2020) Study

Quality Indicators Within Single-Subject Research	Ratings
Description of Participants and Settings	3
Participants are described with sufficient detail to allow others to select individuals with similar characteristics.	x
Process for selecting participants is described with replicable precision.	x
Critical features of the physical setting are described with sufficient precision to allow replication.	x
Dependent Variable	3
Dependent variables are described with operational precision.	x
Each dependent variable is measured with a procedure that generates a quantifiable index.	x
Measurement of the dependent variable is valid and described with replicable precision.	x
Dependent variables are measured repeatedly over time.	x
Data are collected on the reliability or interobserver	x

agreement associated with each dependent variable, and IOA levels meet minimal standards (e.g., IOA = 80%, Kappa = 60%). *All criteria fulfilled = 3; three or four criteria fulfilled = 2; one or two criteria fulfilled = 1.*	
Independent Variable	3
Independent variable is described with replicable precision.	x
Independent variable is systematically manipulated and under the control of the experimenter.	x
Over measurement of the fidelity of implementation for the independent variable is highly desirable.	x
Baseline	3
The study includes a baseline phase that provides repeated measurement of a dependent variable.	x
The baseline establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the independent variable did not occur.	x
Baseline conditions are described with replicable precision.	x
Experimental Control/Internal Validity	2
The design provides at least three demonstrations of experimental effect at three different points in time.	x
The design controls for common threats to internal validity (e.g., permits elimination of rival hypotheses).	-
The results document a pattern that demonstrates experimental control.	x
External Validity	1
Experimental effects are replicated across participants.	x
Experimental effects are replicated across settings.	-
Experimental effects are replicated across materials.	-
Social Validity	3
The dependent variable is socially important.	x
The magnitude of change in the dependent variable resulting from the intervention is socially important.	x
Implementation of the independent variable is practical and	x

cost effective.	
Social validity is enhanced by implementation of the independent variable over extended time periods, by typical intervention agents, in typical physical and social contexts.	x
All criteria fulfilled = 3; two or three criteria fulfilled = 2; one of the criteria fulfilled = 1.	
Overall Total	18

Note. X denotes that this criterion has been met. – indicates either this criterion not been met, or the lack of relevant information.

Table 13

Coding Protocols for Gilson and Carter's (2016) Study

Quality Indicators Within Single-Subject Research	Ratings
Description of Participants and Settings	3
Participants are described with sufficient detail to allow others to select individuals with similar characteristics.	x
Process for selecting participants is described with replicable precision.	x
Critical features of the physical setting are described with sufficient precision to allow replication.	x
Dependent Variable	3
Dependent variables are described with operational precision.	x
Each dependent variable is measured with a procedure that generates a quantifiable index.	x
Measurement of the dependent variable is valid and described with replicable precision.	x
Dependent variables are measured repeatedly over time.	x

Data are collected on the reliability or interobserver agreement associated with each dependent variable, and IOA levels meet minimal standards (e.g., IOA = 80%, Kappa = 60%).	x
All criteria fulfilled = 3; three or four criteria fulfilled = 2; one or two criteria fulfilled = 1.	
Independent Variable	3
Independent variable is described with replicable precision.	x
Independent variable is systematically manipulated and under the control of the experimenter.	x
Over measurement of the fidelity of implementation for the independent variable is highly desirable.	x
Baseline	3
The study includes a baseline phase that provides repeated measurement of a dependent variable.	x
The baseline establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the independent variable did not occur.	x
Baseline conditions are described with replicable precision.	x
Experimental Control/Internal Validity	2
The design provides at least three demonstrations of experimental effect at three different points in time.	x
The design controls for common threats to internal validity (e.g., permits elimination of rival hypotheses).	-
The results document a pattern that demonstrates experimental control.	x
External Validity	1
Experimental effects are replicated across participants.	x
Experimental effects are replicated across settings.	-
Experimental effects are replicated across materials.	-
Social Validity	3
The dependent variable is socially important.	x
The magnitude of change in the dependent variable resulting from the intervention is socially important.	x

Implementation of the independent variable is practical and cost effective.	x
Social validity is enhanced by implementation of the independent variable over extended time periods, by typical intervention agents, in typical physical and social contexts.	x
All criteria fulfilled = 3; two or three criteria fulfilled = 2; one of the criteria fulfilled = 1.	
Overall Total	18

Note. X denotes that this criterion has been met. – indicates either this criterion not been met, or the lack of relevant information.

Table 14

Coding Protocols for Joseph et al.'s (2021) Study

Quality Indicators Within Single-Subject Research	Ratings
Description of Participants and Settings	3
Participants are described with sufficient detail to allow others to select individuals with similar characteristics.	x
Process for selecting participants is described with replicable precision.	x
Critical features of the physical setting are described with sufficient precision to allow replication.	x
Dependent Variable	3
Dependent variables are described with operational precision.	x
Each dependent variable is measured with a procedure that generates a quantifiable index.	x
Measurement of the dependent variable is valid and described with replicable precision.	x

Dependent variables are measured repeatedly over time.	x
Data are collected on the reliability or interobserver agreement associated with each dependent variable, and IOA levels meet minimal standards (e.g., IOA = 80%, Kappa = 60%). *All criteria fulfilled = 3; three or four criteria fulfilled = 2; one or two criteria fulfilled = 1.*	x
Independent Variable	3
Independent variable is described with replicable precision.	x
Independent variable is systematically manipulated and under the control of the experimenter.	x
Over measurement of the fidelity of implementation for the independent variable is highly desirable.	x
Baseline	3
The study includes a baseline phase that provides repeated measurement of a dependent variable.	x
The baseline establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the independent variable did not occur.	x
Baseline conditions are described with replicable precision.	x
Experimental Control/Internal Validity	2
The design provides at least three demonstrations of experimental effect at three different points in time.	x
The design controls for common threats to internal validity (e.g., permits elimination of rival hypotheses).	-
The results document a pattern that demonstrates experimental control.	x
External Validity	1
Experimental effects are replicated across participants.	x
Experimental effects are replicated across settings.	-
Experimental effects are replicated across materials.	-
Social Validity	3
The dependent variable is socially important.	x

The magnitude of change in the dependent variable resulting from the intervention is socially important.	x
Implementation of the independent variable is practical and cost effective.	x
Social validity is enhanced by implementation of the independent variable over extended time periods, by typical intervention agents, in typical physical and social contexts.	x
All criteria fulfilled = 3; two or three criteria fulfilled = 2; one of the criteria fulfilled = 1.	
Overall Total	18

Note. X denotes that this criterion has been met. – indicates either this criterion not been met, or the lack of relevant information.

Table 15

Weight of Evidence A Calculations for Each Study Included

Study	Overall Total	WoE A
Allen et al., 2012	17	2.4 (Medium)
Bennett et al., 2013a	18	2.6 (High)
Bennett et al., 2013b	18	2.6 (High)
Chezan et al., 2020	18	2.6 (High)
Gilson & Carter, 2016	18	2.6 (High)
Joseph et al., 2021	18	2.6 (High)

Note. High = 2.5 and above; Medium = 1.5 to 2.4; Low = 1.4 and below.

Appendix D

Weight of Evidence B: Methodological Relevance

To calculate the weight of evidence B for each study, the reviewer selected Petticrew and Roberts's (2003) hierarchy of evidence. Compared with randomised controlled trials and cohort studies awarded 3 points, SSEDs, given their limitation in external validity, are given 2 points, a credit higher than qualitative studies (given 1 point) using surveys or observations.

Table 16

Coding Protocol for Methodological Relevance

	3 points	2 points	1 point
Study Design	Randomised controlled trials	Experimental or quasi-experimental	Qualitative research using surveys,

	(RCTs)	designs, such as Single Subject Experimental Designs (SSEDs)	observations and descriptive case studies
Rationale	RCTs randomly assign participants into control group and treatment group to ensure better control of the variables in the experiment. In this way, RCTs have greater power to investigate the effectiveness of interventions.	SSEDs are a valid methodology intended to compare an intervention to the baseline measured (Horner et al., 2005).	Qualitative studies are often used for exploratory and descriptive understanding of a given subject Merriam & 2015). Qualitative studies are subjective to the interpretation of the researcher, thus lacking external validity and objective measurement of dependent variables which are key in measuring effectiveness of interventions.

Table 17

Weight of Evidence B Calculations for Each Study Included

Study	Study Design	WoE B
Allen et al., 2012	SSED	2 (Medium)
Bennett et al., 2013a	SSED	2 (Medium)
Bennett et al., 2013b	SSED	2 (Medium)
Chezan et al., 2020	SSED	2 (Medium)
Gilson & Carter, 2016	SSED	2 (Medium)
Joseph et al., 2021	SSED	2 (Medium)

Note. Single-subject Experimental Designs (SSED).

High = 3; Medium = 2; Low = 1.

Appendix E

Weight of Evidence C: Topic Relevance

Relevant criteria for were determined by the reviewer to measure how each study included in the review is relevant and appropriate to be used to answer the review question. This review study aims to explore the effectiveness of CAC on vocational behaviours/skills of autistic adolescents and young adults. Therefore, the criteria listed in Table 18 were used. Table 19 provides score for each study.

Table 18

Weight of Evidence C Criteria

	3	2	1	Rationale
Intervention	CAC alone	CAC in combination with other intervention(s)	Audio cuing	Studies that only used CAC better allow effect evaluation.
Participant Age	10-25	26-30	Below 10; Above 30;	Adolescents and young adults are more relevant when considering CAC as a transition-stage vocational

				intervention.
Participant Number	Above 3	3	Below 3	Three participants are considered to be only acceptable according to Horner et al. (2005).
Intervention Setting	Naturalistic community settings	School settings	Other settings	Naturalistic settings better resemble real-life work settings.
Intervention Description	Description is very clear to allow future replication	Description is moderately clear, but still conveys key information necessary for replication purposes.	Key information (e.g., device, interventionist, intervention steps) is not given.	More detailed description better enables future replication studies.
Interventionist	Used trained members to deliver CAC (e.g., teachers, college students)	Used professional job coaches to deliver CAC	Relevant information is not provided.	Although job coaches are professionally prepared for CAC, other trained interventionists can be more easily used to deliver CAC.
Outcome Variable	Vocational behaviours/ skills	Domestic skills	Personal self-help skills	All three skills belong to functional living skills, but the research focus is on vocational

				skills.
Maintenance outcome	The maintenance of intervention effects was assessed after one month of CAC intervention, and for all participants involved.	The maintenance of intervention effects was assessed within one month of CAC intervention, and not all participants were included into maintenance assessments.	No analysis for maintaining intervention effects has been attempted.	To monitor intervention effects, it is important to collect and analyse whether outcome skills are still maintained after the withdraw of CAC intervention.

Table 19

Weight of Evidence C Calculations for Each Study Included

	Allen et al., 2012	Bennett et al., 2013a	Bennett et al., 2013b	Chezan et al., 2020	Gilson & Carter, 2016	Joseph et al., 2021
Intervention	2	3	3	2	2	3
Participant Age	3	3	3	3	3	3
Participant Number	2	2	2	2	2	2
Intervention Setting	3	2	2	2	3	1
Intervention Description	2	2	2	3	3	3
Interventionist	3	2	2	3	3	2
Outcome Variable	3	3	3	3	3	3

Maintenance Outcome	3	3	3	2	2	3
Total	21	20	20	20	21	20
Average	2.6 (High)	2.5 (High)	2.5 (High)	2.5 (High)	2.6 (High)	2.5 (High)

Note. High = 2.5 and above; Medium = 1.5 to 2.4; Low = 1.4 and below.

Table 20

Weight of Evidence D Calculations for Each Study Included

Study	WoE A	WoE B	WoE C	WoE D
Allen et al., 2012	2.4 (Medium)	2 (Medium)	2.6 (High)	2.3 (Medium)
Bennett et al., 2013a	2.6 (High)	2 (Medium)	2.5 (High)	2.4 (Medium)
Bennett et al., 2013b	2.6 (High)	2 (Medium)	2.5 (High)	2.4 (Medium)
Chezan et al., 2020	2.6 (High)	2 (Medium)	2.5 (High)	2.4 (Medium)
Gilson & Carter, 2016	2.6 (High)	2 (Medium)	2.6 (High)	2.4 (Medium)
Joseph et al., 2021	2.6 (High)	2 (Medium)	2.5 (High)	2.4 (Medium)