Case Study 1: Evidence Based Practice Report

Theme: School/setting Based Interventions for Learning.

Is video modelling an effective academic intervention for school aged students with Autism Spectrum Condition (ASC)?

Summary

Autism Spectrum Condition (ASC) is a social communication and behavioural difficulty as outlined in DSM V (American Psychiatric Association [APA], 2013; Baron-Cohen et al., 2009). Interventions to support ASC vary from Lego Therapy to improve interactions (LeGoff, Krauss, & Levin, 2010), social stories to improve interpersonal communication (Litras, Moore, & Anderson, 2010) and Video Modelling to increase socialising (Alzyoudi, Sartawi, & Almuhiri, 2015). Video modelling is the use of video to display a target behaviour by a model to elicit that behaviour in response from participants (Rayner, 2010). However, little is known about the effectiveness of Video Modelling as an intervention to improve academic performance. This systematic literature review aims to determine the effectiveness of academic based video modelling interventions for students with ASC. This will be established by examining whether the video modelling intervention leads to an increase in the targeted academic outcome. This systematic literature review searched three databases (Web of Science, PsychINFO and ERIC) and five studies were reviewed. The academic interventions varied widely from functional maths skills, handwriting proficiency and unprompted answers given in class. The Weight of Evidence Framework (Gough, 2007) and the Quality Indicators Protocol for Single Case Experimental design (Horner et al., 2005) evaluated the quality of each study. The review concludes that video modelling is an effective intervention to improve the academic performance of school-aged students with ASC and that future research should aim to investigate this topic further.

Introduction

Autism Spectrum Condition

The term autism spectrum condition (ASC) refers to a neurodevelopmental disorder that presents itself as a difficulty with social communication and repetitive behaviour (Baron-Cohen et al., 2009). A diagnostic criterion must be met in order to be classified as "autistic" (DSM-V, (APA), 2013). Baron-Cohen et al., (2009) proposed the term "ASC" instead of the term Autism Spectrum Disorder (ASD). This decision was made due to concerns around the stigma attached to the term "ASD" (Baron-Cohen et al., 2009). Furthermore Baron-Cohen et al., (2009) wished to draw attention to the cognitive strengths that accompanied the difficulties associated with autism and the label of having a "disability". The prevalence of children and young people with a diagnosis of ASC is estimated to be between 1-2% of the population in the United Kingdom (UK) (Russell, Rodgers, Ukoumunne, & Ford., 2014).

To be clinically diagnosed as autistic, children need to display persistent deficits in both social interactions and communication. This pattern of behaviour needs to be observed over multiple contexts (APA, 2013). Similarly, there needs to be a controlled repetitive area of interest or behaviour pattern displayed (APA, 2013). Daniels and Mandell (2014) highlighted how a diagnosis can be made as young as 24 months but most students do not receive a diagnosis until they are attending education. Early diagnosis is more prevalent, however issues with a diagnosis include the severity of symptoms, level of parental concern and the socioeconomic status of parents (Daniels & Mandell, 2014). Therefore, the estimation of how many children and young people have ASC may not be a true reflection of the actual figure.

In order to support students in school to manage the difficulties that accompany ASC, interventions are implemented in various settings. This may focus on difficulties to form friendships, understand non-verbal meaning and manage unstructured situations. Interventions such as Lego Therapy (LeGoff et al., 2010) has led to improvement in interactions with peers. Social stories can also be used to teach skills such as handwashing, initiating play and expressing emotions (Hagiwara, Smith, & Miles, 1999).

Video Modelling

Video modelling (VM) and video self-modelling (VSM) are based on the work of Creer and Miklich (1970) who introduced the term "self-modelling". Their work began by videotaping an asthmatic child in hospital who was role playing appropriate social skills (Hitchcock, Dowrick, & Prater, 2003). This was based on the theory of Bandura (1969; 1977) who emphasised the importance of observation to receive instruction, in contrast to experiencing the behaviour itself. This research emphasised that children develop skills through observing the performance of those skills, rather than personal life experience (Bandura, 1977). A key factor in the social learning theory is that children will imitate a behaviour, given they are attending and motivated, without the existence of a reinforcement and will repeat this behaviour in a variety of setting (Bandura 1969; 1977). The basis of VM is to record a video displaying a target behaviour by a model and then show it to the participant to elicit that behaviour in response (Hitchcock et al., 2003). This is based on the ideas of social learning theory, that if a student attends to a video of a target behaviour, then they will repeat the behaviour in a different setting. Video Self Modelling is considered a version of VM that includes the "self' performing the target behaviour rather than another person (Gelbar, Anderson, McCarthey & Buggey, 2011).

Video modelling and VSM have been used in a variety of contexts with students with ASC. For example, to increase the language skills of children to improve unprompted requesting (Wert, 2002). Video Modelling and VSM have been heavily researched in the area of behaviour and social skills and has a strong evidence base. Bellini, Akullian and Hopf, (2007) demonstrated how VSM can be used to increase the socialisation of students with ASC in preschool which included unprompted social engagement. Buggey (2005) showed how VSM reduced aggressive behaviours in five students with ASD and increased their socialising and language production. Buggey (2005) suggested VSM is a positive behaviour modification intervention for students with ASC and should be investigated in multiple settings. Litras et al., (2010) used VSM as a medium to teach social stories to a preschool child with ASC. They found the three skills studied (initiating play, greeting people and responding) all increased following the intervention. There was a rapid onset of initiating play and responding compared to greeting (Litras et al., 2010). This suggests that VM is an effective medium to present already successful interventions, such as social stories. Alzyoudi et al., (2015) showed how VSM was used cross-cultural in the United Arab Emirates with five students to increase correct social responses.

Bellini and Akullini (2007) in their metanalysis of VSM, emphasised the evidence base of VSM as an effective intervention for students with ASC. Prater, Carter, Hitchcock and Dowrick (2012) conducted research into the effectiveness of VSM as an intervention in school. They found VSM is an effective intervention for both behavioural and academic skills. Their research suggested further investigation should be done within the population of Special Educational Needs and Disabilities (SEND) students as a way to promote inclusion in mainstream classrooms (Prater et al., 2012).

Rationale and relevance

Educational psychologists have a duty to support inclusive practice in schools and develop interventions for children and young people (CYP) with SEND, as outlined in the Code of Practice (Department for Education & Department for Health [DfE & DoH] 2015). Research has shown that students with ASC can achieve their academic outcomes with inclusive classrooms and provisions in place (Koegel, Matos-Freden, Lang, & Koegel, 2012). There is an increase in the use of technology in everyday life and in school. Therefore, it would be beneficial to investigate the evidence base for VM and VSM as an academic intervention for students with ASC. Some students with ASC have comparable cognitive abilities to their typically developing peers, but struggle with the day to day aspect of school (Koegel et al., 2012). This effects their academic achievement. Therefore, there is the scope for Educational Psychologists to use VM to develop these skills. Educational Psychologists are well placed to deliver this intervention as they have the training to run the intervention themselves or to upskill staff to deliver the intervention in school. Using VM to develop academic skills is not an area that is heavily researched and published so there is the scope to develop an evidence base within schools. Therefore, this review will investigate the strength of Video Modelling and Video Self Modelling as an academic intervention.

Review question

Is video modelling an effective academic intervention for school aged students with Autism Spectrum Condition (ASC)?

Critical Review

In January 2020 an in-depth literature search of electronic databases was conducted. The following databases were searched, Web of Science, ERIC and PsychInfo.. The search terms are outlined in table 1.

Table 1.

Database search terms and results

Database	Search terms Used	Total Results
Web of Science	"Video Self Model*" OR "video self modelling" OR "video model" OR "video based intervention *" OR "video intervention" *AND* "autism" OR "Autism spectrum disorder" OR "asd" or "aspergers"	97
PsychInfo	"Video Self Model*" or "video self modelling" or "video model" or "video intervent*" or "video intervention" AND "autism" or "Autism spectrum disorder" or "Aspergers"	111
ERIC (EBSCO)	"Video Self Model*" or "video self modelling" or "video model" or "video intervent*" or "video intervention" AND "autism" or "Autism spectrum disorder" or "Aspergers"	68

 *Denotes wildcard

As shown in Figure 1, the search identified 276 initial studies. There were 165 duplicates. The remaining 111 articles were screened by title and 78 articles were excluded. Then the remaining articles were screened by abstract. Of these 111 studies, 102 were excluded from the review as they did not meet the inclusion criteria (see Table 2). One study was identified through ancestral searches. The outstanding 10 articles were read in full. A further 5 were excluded with reason (see

Appendix A). The details of included studies can be seen in Table 3 (see Appendix

B).

Table 2.

Criteria for Inclusion in Systematic Literature Review

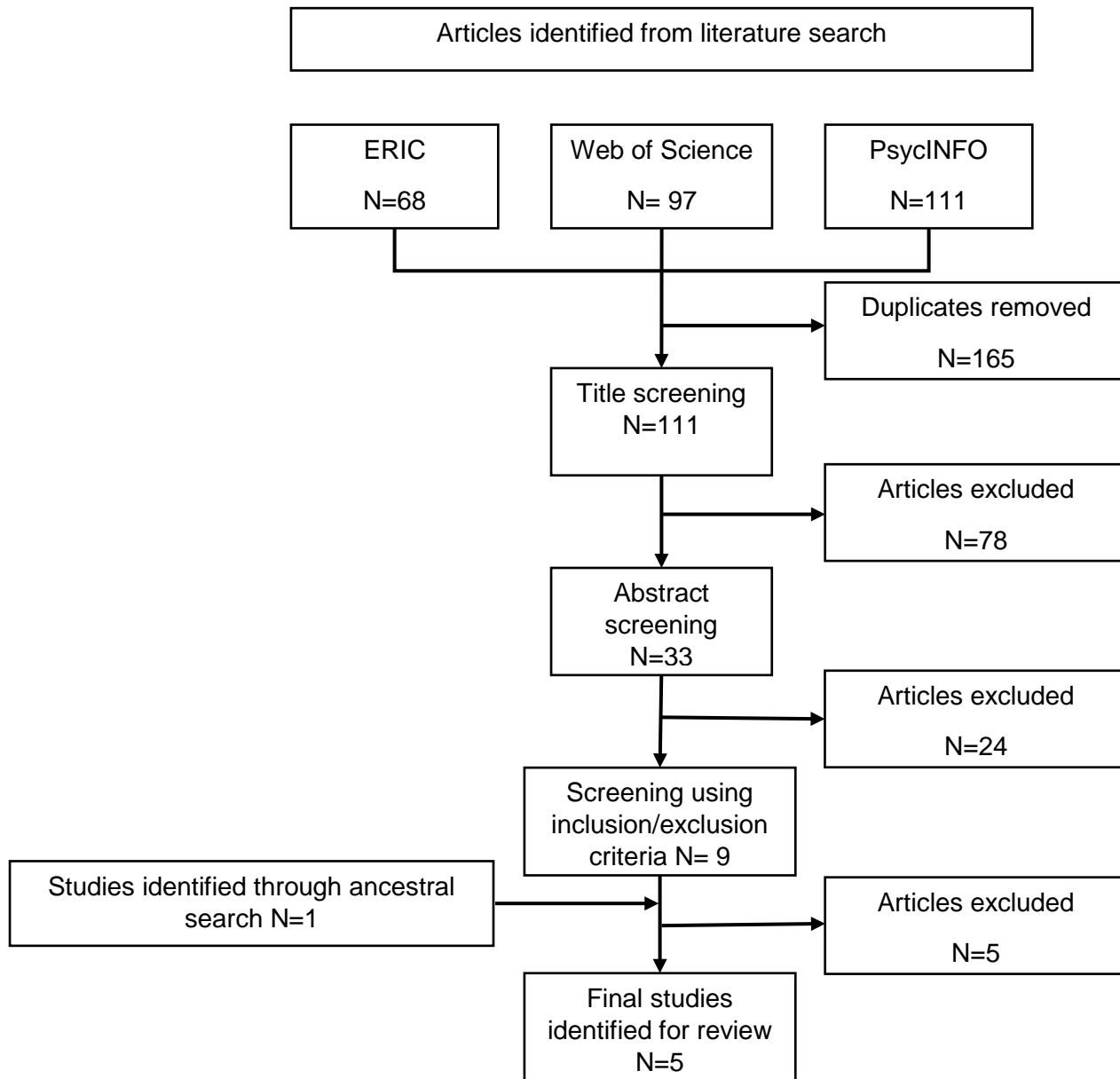| Criteria	Inclusion	Exclusion	Rationale
1. Intervention	Intervention includes video modelling	Intervention does not include video modelling	This review aims to explore the effect of VM interventions.
2. Outcomes	Study includes quantitative data on academic achievement	Study does not include quantitative data on academic achievement	This review is evaluating VM and its effect on to academic achievement.
3.Population	Study includes school aged children (between the ages of 4-18). At least one student in the study has a diagnosis of ASC.	Study includes children under the age of 4, adults over the age of 18 or all school aged children without an ASC diagnosis.	This study aims to focus on school-based interventions for children with ASC.
4. Setting	Study is set in an academic setting	Study is in a non-academic setting e.g. home setting	No review has investigated VM and its effectiveness for school aged students with ASC in an academic setting
5. Study design	Study must be an empirical study with quantitative data	Systematic literature reviews, fmeta-analyses and qualitative data	To evaluate the impact of video modelling as rigorously as possible studies need to be quantitative
6. Date	From 2000 to 2020	Prior to 2000 or after January 2020	To ensure studies are applicable to current society.
7. Language	Study published in English	Study not published in English	To guarantee reviewer understanding.
8. Publication	Indexed in PsychINFO, ERIC or WebofScience Or published journal article or thesis	Not indexed in PsychINFO, ERIC or WebofScience Literature Is not a published journal article or thesis	Published journals and theses have undergone rigorous ethical approval.

Figure 1

Literature Search Process


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┌─────────────────────────────────────────────────────────┐
│         Articles identified from literature search         │
└─────────────────────────────────────────────────────────┘

┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│    ERIC      │   │ Web of Science│   │   PsycINFO   │
│    N=68      │   │    N= 97      │   │    N=111     │
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                                    ┌──────────────────┐
                                    │ Duplicates removed│
                                    │     N=165        │
                                    └──────────────────┘
          ┌──────────────┐
          │ Title screening│
          │    N=111      │
          └──────────────┘
                                    ┌──────────────────┐
                                    │ Articles excluded │
                                    │      N=78        │
                                    └──────────────────┘
          ┌──────────────┐
          │   Abstract   │
          │  screening   │
          │    N=33      │
          └──────────────┘
                                    ┌──────────────────┐
                                    │ Articles excluded │
                                    │      N=24        │
                                    └──────────────────┘
          ┌──────────────┐
          │ Screening using│
          │inclusion/exclusion│
          │ criteria N= 9 │
          └──────────────┘
┌────────────────────────────┐
│ Studies identified through │
│   ancestral search N=1     │
└────────────────────────────┘
                                    ┌──────────────────┐
                                    │ Articles excluded │
                                    │      N=5         │
                                    └──────────────────┘
          ┌──────────────┐
          │ Final studies │
          │identified for review│
          │    N=5        │
          └──────────────┘
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Table 3.

Details of Included Studies

Study	Included studies
Joey Aaron Ryan William	Burton, C. E., Anderson, D. H., Prater, M. A., & Dyches, T. T. (2013). Video self-modeling on an iPad to teach functional math skills to adolescents with autism and intellectual disability. *Focus on Autism and Other Developmental Disabilities*, *28*(2), 67–77.
Alan Peter Justin	Delano, M. E. (2007). Improving written language performance of adolescents with Asperger syndrome. *Journal of Applied Behavior Analysis*, *40*(2), 345–351.
Participant 1 Participant 2 Participant 3	Harris, G. M. (2017). Evaluating the efficacy of video self-modeling for remediating dysgraphia in children with autism spectrum disorders. *Dissertation Abstracts International: Section B: The Sciences and Engineering*, *78*(5-B(E)),
Austin	Hart, J. E., & Whalon, K. J. (2012). Using video self-modeling via iPads to increase academic responding of an adolescent with autism spectrum disorder and intellectual disability. *Education and Training in Autism and Developmental Disabilities*, *47*(4), 438–446. Retrieved
Dan Jane	Kagohara, D. M., Sigafoos, J., Achmadi, D., O'Reilly, M., & Lancioni, G. (2012). Teaching children with autism spectrum disorders to check the spelling of words. *Research in Autism Spectrum Disorders*.

Weight of Evidence (WoE)

The Gough (2007) Weight of Evidence (WoE) framework was used and each of the

five papers were evaluated in the following areas: methodological quality (WoE A);

methodological relevance (WoE B); and topic relevance (WoE C). Table 4 outlines the WoE scores for each paper.

WoE A was judged using a version of the Horner et al., (2005) coding protocol guidelines for Single Case Experimental Design studies (SCEDS) (see Appendix C). This codes each study against a set of coding protocol. The score is then averaged to give an average score. The criteria for methodological relevance (WoE B) was created from Petticrew & Roberts' (2003) hierarchy of evidence to assess the strength of the methodology of the studies researched. The judgement on topic relevance (WoE C) was created by the reviewer to judge the topic relevance of each paper and how well they were able to answer the systematic literature review question (WoE C). The overall Weight of Evidence (WoE D) was determined by finding the mean of the WoE A, WoE B and WoE C.

Table 4. WoE for each of the papers

Authors	WoE A Methodological Quality	WoE B Methodological Relevance	WoE C Relevance to Review Question	WoE D Overall Weight of Evidence
Burton et al., (2013)	2.7 (High)	2	3	2.6 (High)
Delano (2007)	2.1 (Medium)	2	2.7	2.3 (Medium)
Harris (2017)	2.1 (Medium)	2	2.7	2.3 (Medium)
Hart & Whalon. (2012)	2.3 (Medium)	2	3	2.4 (Medium)
Kagohara et al., (2012)	2.4 (Medium)	2	2.8	2.4 (Medium)

Where High – 2.5 and above, Medium 1.5-2.5 and Low 1.4 and below.

Participant

The design of each study was a Single Case Experimental Design (SCED) and this is reflected in the WoE A and B rating. There were thirteen participants in total and Table 5 outlines the participants' demographics in further detail. As outlined, there are eleven males and two females between the ages of 7 and 17 years, with the mean age being 12.5 years. This emphasis the high male to female diagnosis ratio for ASC (Masi, DeMayo, Glozier, & Guastella, 2017). Five of the thirteen participants had additional needs (Intellectual disability and Attention Deficit Hyperactivity Disorder [ADHD]).

Table 5. Participant demographics

Name	Gender	Age	Additional Need	Language	Country
Joey	Male	13 years	-	English	USA
Aaron	Male	13 years	Intellectual disability	English	USA
Ryan	Male	15 years	Intellectual disability	English	USA
William	Male	14 years	-	English	USA
Dan	Male	12 years	Attention Deficit Hyperactivity Disorder	English	New Zealand
Jane	Female	12 years	Attention Deficit Hyperactivity Disorder	English	New Zealand
Alan	Male	13 years	-	English	USA
Peter	Male	15 years	-	English	USA
Justin	Male	17 years	-	English	USA
Austin	Male	16 years	Intellectual Disability Hearing Impairment	English	USA
P1	Female	7 years	-	English	USA
P2	Male	7 years	-	English	USA
P3	Male	8 years	-	English	USA

All of the studies were conducted in either the USA (Burton, Anderson, Prater, & Dyches, 2012; Hart & Whalon 2012; Harris 2017; Kagohara Sigafoos, Achmadi, O'Reilly, & Lancioni, 2012) or New Zealand (Delano 2007). Due to structure of these school systems and the diverse nature of these countries, these studies can be

applied to the UK Education system which is a multicultural society. The location of the studies were reflected in WoE C scores, with studies in OECD English speaking countries being given the highest rating. The rational is that these countries are most comparable socially and economically to the UK.

All the students in these studies had a clinical diagnosis of ASC and were attending full or part time education. Three of the participants were of primary school age (Kagohara et al., 2012) nine of the participants were of secondary school age (Burton et al., 2013; Delano, 2007; Hart & Whalon, 2012; Kagohara et al., 2012) and one participant was of sixth form college age (Delano, 2007). The studies that were conducted within the UK compulsory school age of 5-16 received the highest WoE C score. This is because this study is focusing on school aged participants. The variety of studies in this systematic review demonstrates this intervention could be implemented across all education settings.

The population of children and young people with ASC is especially heterogeneous and includes a high comorbidity with other disorders such as anxiety, ADHD, intellectual disabilities and medical conditions (Masi et al., 2017). The additional needs of each student varied greatly. For example, Dan and Jane also had ADHD and Austin, Aaron and Ryan were deemed to have an intellectual disability. Alan, Peter and Justin were classified in the category of "Aspergers" when this was part of the diagnosis scale of ASC (Delano, 2007). Therefore, it is difficult to compare the participants as their IQs vary greatly and will therefore impact their access to the intervention. This heterogeneous nature of the population samples makes it difficult to compare participants across studies as their profiles vary so greatly

Study Design

This review includes five studies that are SCEDs. This design is a valid methodology intended to compare an intervention to the baseline measured (Kratochwill & Levin,

2011). This design is particularly useful with rare interventions populations such as those with ASC and atypical interventions for these populations. Therefore, the WoE B for all of the studies yielded a score of two.

Intervention content

The content of the intervention is explained in more detail in Table 6. The table below summarises the content of each of the interventions.

Table 6.

Academic Intervention outline

Study	Academic intervention
Burton et al., (2013)	Functional Maths Skills
Delano (2007)	Amount of words written and amount of functional essay elements
Harris (2017)	Handwriting legibility
Hart & Whalon (2012)	Unprompted correct responses and prompted correct responses in Science lesson
Kagohara et al., (2012)	Using spell check to check the spelling of words

The content of each intervention varies as VM and VSM are used as individualised tools to increase target behaviours. Interestingly, all but one of the studies (Kagohara et al., 2012) used a VSM element in order to increase the target behaviour of the students. Kagohara et al., (2012) did not make explicit if there is a VSM or VM in the intervention.

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Intervention duration and intensity

The information provided regarding the duration and intensity of the academic interventions reviewed varied between studies. In Burton et al., (2013) students received their intervention twice a day for four days, Hart and Whalon (2012) ran 20 sessions over five weeks, Kagohara et al., (2012) ran weekly sessions for six weeks and Harris, (2017) had five sessions over five weeks. Whereas in Delano (2007) the duration of the session was dependent on the students with two interventions taking place over a nine week period. Therefore Burton et al., (2013) received the highest WoE A rating as the duration and intensity of the intervention was described clearly. Whereas Delano, (2007) received the lowest rating as the duration and intensity of the interventions were dependent on individualised needs.

Intervention Setting

The interventions were conducted and assessed in one setting. For all but one of the studies, this was conducted in the setting where the students were educated (Burton et al., 2012; Hart & Whalon, 2012; Harris, 2017 & Kagohara et al., 2012). For the students in Harris (2017) this was a day centre where student learned and received therapy and in the other studies the students' schools. Whereas, in Delano (2007) the intervention and follow up sessions were conducted in an office, not school. This may be due to the three different students attending three different schools. This review is evaluating VM interventions to improve the academic achievement of students with ASC and this is reflected in WoE C ratings.

The intervention was either facilitated by teaching staff (Burton et al.,2013; Hart & Whalon 2012; Harris 2017 & Kagohara et al., 2012) or carried out by the researcher alone (Delano, 2007, Kagohara et al., 2012). In Kagohara et al., (2012) a Teaching Assistant facilitated for one student and the researcher for another. However, in

Burton et al., (2013) it was noted the support staff's involvement decreased during the study, leading to the assumption the researcher continued the research.

Baseline and control

All of the studies used multiple baseline as outlined by Horner et al., (2005). This is to ensure accurate comparison from the baseline to the intervention. The measurements continued during the intervention stage and during the follow up period.

To demonstrate experimental control most papers included follow up sessions to demonstrate change over time as outlined in Horner et al., (2005). Studies used between two (Kagohara et al., 2013), three (Burton et al., 2012; Kagohara et al., 2012), four (Delano, 2007) and five (Harris, 2007) follow up sessions. This variation may be due to limited access to students, the complexity of the tasks or the availability of staff to run the intervention. Hart and Whalon (2012) conducted the only study that did not included follow up data but instead used an ABAB experimental design.

Measures

In every study the dependent variable was outlined with replicable precision and this was reflected in their WoE A scores. This review focuses on academic achievement and each study measured varying aspects of this. For example, in Burton et al., (2013) the measure was correcting steps when answering functional maths questions. These questions were based on the government outlines for what students should achieve at this age. This was measured by the teacher according to the seven individual steps needed to solve the problems. In Delano (2007) there were two measures, the amount of words written and the amount of functional essay

elements. The number functional essay elements included the "TREE" component as outlined by Graham and Harris, (2005). The term "TREE" means communicating the topic sentence, providing a reason, explaining the reason and communicating an appropriate ending (Graham & Harris, 2005). These are quantitative objective measures, therefore there is no need for inter-rater or inter-observer reliability (Graham & Harris, 2005).

In contrast Hart and Whalon (2012), Harris (2017) and Kagohara et al., (2012) were measured using observable behaviour. In Hart and Whalon (2012) the unprompted and prompted correct responses were measured by an observer. In order to obtain an inter observer reliability rating a second observer was present for 30% of the study (Hart & Whalon, 2012). Similarly, Kagohara et al., (2012) observed the use of five steps in order to correctly spell check words. In order to obtain inter-observer agreement, similar to Hart and Whalon (2012), a second observe was used 34% of the time. Using a second observer enables for a higher WoE A rating as it increases how sound the methodology is. Harris, (2017) observed handwriting legibility using the Woodcock-Johnson III Tests of Achievement (WJIII) Handwriting Legibility Scale. This was done through two therapists scoring the students and comparing scores. It is reported that there was significant improvement from baseline to treatment. All of the studies measured the academic achievement change over time, this provides a holistic understanding of the students learning and achievement. This is reflected in the WoE A scores.

Outcomes

The Percentage of Non-Overlapping Data (PND) is outlined in Table 7. Percentage of Non-Overlapping Data refers to the percentage the intervention, that are more extreme than the highest measure of the baseline (Parker Hagan-Burke, & Vannest, 2007).

Table 7. Percentage of Non-Overlapping Data (PND) for each student

Study	Student	Variable	Baseline	Outcome	Effect Size
Burton et al., (2013)	Joey	Functional Maths Skills	16-28% correct	91-100% correct	100% PND
Burton et al., (2013)	Aaron	Functional Maths Skills	14% correct	84.5-86.5% correct	100% PND
Burton et al., (2013)	Ryan	Functional Maths Skills	0% correct	97-100% correct	100% PND
Burton et al., (2013)	William	Functional Maths Skills	14% correct	86-100% correct	100% PND
Delano (2007)	Alan	Average word written	100 words	384	100% PND
		Function essay elements	2 average	11 average	
Delano (2007)	Peter	Average word written	52 words	102	100% PND
		Function essay elements	3 average	17 average	

Study	Student	Variable	Baseline	Outcome	Effect Size
Delano (2007)	Justin	Average word written	17 words	46	100% PND
		Function essay elements	2 average	10 average	
Harris (2017)	P1	Handwriting legibility	9-11 average	23-26 average	100% PND
Harris (2017)	P2	Handwriting legibility	14-17 average	25-29 average	100% PND
Harris (2017)	P3	Handwriting legibility	4-8 average	16 average	100% PND
Hart & Whalon (2012)	Austin	-	-	-	-
Kagohara et al., (2012)	Dan	5 steps to spell check	Consistently below 30%	75% correct	100% PND
Kagohara et al., (2012)	Jane	5 steps to spell check	Consistently below 40%	100% correct	100% PND

The reviewer calculated the PND percentage for each study. As outlined previously the academic outcomes measured vary significantly. Therefore, this makes it difficult to make comparisons across studies of data. Four of the five studies have 100% PND. This implies that the interventions were effective in increasing the targeted academic skill. This is supported by evidence that emphasises the value of targeted intervention to improve skills of students with ASC (Koegel et al., 2012).

Hart and Whalon (2012) completed an ABAB multiple baseline design therefore a PND score could not be calculated for this study. Therefore, it is difficult to compare this study to the other ones in the systematic literature review.

Delano, (2007) showed VSM was effective at improving academic achievement. This study found a consistent improvement in words written and amount of functional essay elements used during the intervention and during a 1 and 12 week follow up. This finding was consistent across all three participants. Harris, (2007) also supported these findings. Their study showed an improvement in handwriting during intervention and during the 5 weeks follow up. This finding was also consistent across all three participants. However, Hart and Whalon (2012) only has one participant in their study. Therefore, it is difficult to compare this to the other studies in the systematic literature review. One strength of the outcomes being varied is that it shows an effect across participants in varying age groups, schools, ethnicities and interventions. Overall, the PND suggests that VM is an effective intervention to improve the academic achievement of students with ASC. However, using PND as a measure of effect size can be difficult as if the baselines are at a ceiling or floor then this will skew the results. This makes the effect size difficult to interpret.

External Validity

The external validity of the studies varied according to the Horner et al., (2005) framework. Horner et al., (2005) outlined how external validity is a central issue for SCEDs. This is because studies need to demonstrate they are applicable across participants, settings behaviours and materials and not just constrained to that particular study. Horner et al., (2005) outlines ways that studies can do this is through replication or multiple participants, settings and measures.

All of the studies scored low external validity as they were constrained to one setting with specific interventions. The three strongest studies (Burton et al., 2013, Delano, 2007 & Harris, 2017) provided effects across three participants which adds to their external validity and increased their WoE A scores. The study with the lowest external validity was Hart and Whalon (2012). This is because this study contained only one participant which makes it difficult to compare effects across participants. This is reflected in the WoE A score.

Social Validity

All of the studies had varying levels of social validity. Most studies did not include information about the cost and therefore could not be judged to be cost effective. This is reflected in the WoE A rating. Other studies were cost effective and implemented by school staff in the school. All of the studies were socially important

Conclusions and Recommendations

The current review aimed to assess the effectiveness of VM and VSM as an intervention to improve academic achievement for student with ASC. The research presented in this paper provides evidence to support the claim that video modelling

can be used to improve academic achievement for students with Autism Spectrum Condition.

However, it must be noted the evidence presented in this review is limited due to the Single Case Experimental Design of the studies. All evidence was given a WoE rating of medium, with the exception of Burton et al., (2013) which was given a large weight. Therefore, this research should be considered the beginning of an evidence base to support the claim VM can be used to improve academic achievement with students with ASC. One area of development is for the studies to replicated (Burton et al., 2013; Delano, 2007; Hart & Whalon, 2012; Harris 2017 & Kagohara et al., 2011). This would provide the studies with a stronger external validity and the ability to generalise the effectiveness of the interventions to other participants and settings. Finally, out of thirteen participants only two were female. Therefore, in order for the findings to be generalised across genders more studies would need to be completed with female students.

In addition, the reviewer cannot determine the amount of VM that is required to see the largest effect of improvement in academic outcomes. All papers demonstrated that VM is effective, however the interventions vary greatly. Burton et al., (2013) provided two interventions daily for four weeks and Hart and Whalon (2012) provided 20 sessions of interventions over five weeks. Therefore, future research should aim to investigate the length of intervention session and duration of intervention needed to see the greatest improvement in academic achievement.

Recommendations for Educational Psychology

The evidence base at present for VM and VSM is limited, however this review indicates scope for Educational Psychologists to use technology as an aid to model

academic behaviours for students with ASC. Most schools now have iPads and computers readily available. Therefore, this research is part of the future of incorporating technology in schools. This could be a low-cost intervention to implement in schools. This is particularly useful in the current social and political climate, where austerity had led to the cut of local authorities and therefore EPS's. Therefore, an intervention such as Burton et al., (2013) would be relatively low cost to roll out in schools with the ability for school staff to implement and maintain this intervention. Although this review focused on interventions in school this research also has the scope to be extended to different environments. For example, this intervention could be continued at home by parents or carers.

References and Appendices

References

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Appendix A: Excluded Studies

Table 8.
References of Excluded Studies and Reason for Exclusion

Study	Reason for Exclusion
Lang, R., Shogren, K. A., Machalicek, W., Rispoli, M., O'Reilly, M., Baker, S., & Regester, A. (2009). Video self-modeling to teach classroom rules to two students with Asperger's. *Research in Autism Spectrum Disorders*, *3*(2), 483–488.	2. Study did not measure academic achievement
Ohtake, Y., Kawai, M., Takeuchi, A., & Utsumi, K. (2013). Effects of video self-modelling interventions on reducing task avoidance behaviours of students with autism spectrum disorders. *International Journal of Disability, Development and Education*, *60*(3), 225–241.	2. Study did not measure academic achievement
Schatz, R. B. (2018). Combining readers theater, story mapping and video self-modeling interventions to improve narrative reading comprehension in children with high-functioning autism. *Dissertation Abstracts International Section A: Humanities and Social Sciences*, *78*(12-A(E)),	4. Study conducted in the student's home
Schatz, R. B., Peterson, R. K., & Bellini, S. (2016). The use of video self-modeling to increase on-task behavior in children with high-functioning autism. *Journal of Applied School Psychology*, *32*(3), 234–253. https://doi.org/http://dx.doi.org/10.1080/15377903.2016.1183542	2. Study did not measure academic achievement
Spriggs, A. D., Knight, V., & Sherrow, L. (2015). Talking picture schedules: Embedding video models into visual activity schedules to increase independence for students with ASD. Journal of Autism and Developmental Disorders, 45(12), 3846–3861.	2. Study did not measure academic achievement

Appendix B Summary of Included studies.
Table 9.
Summary of included studies

Authors	Context	Aim	Setting	Details	Duration	No. of Sessions
Burton et al., (2013) *Joey* *Aaron* *Ryan* *William*	Students who have an ASC diagnosis and an intellectual disability. Chosen to participate in the study based on criteria: a) enrolled in high school b) disability meets eligibility requirement c) maths assessment met d) Individual Education Plan (IEP) has a maths section e) parental permission f) no hearing or vision loss g) some functional reading skills.	To examine the effect of VSM on functional maths skills in students during and post intervention.	The study was conducted in a junior High School in the United States. Sessions were delivered in classroom of 10 students with intellectual disabilities. Students took part in the study in a separated section of classroom.	The study used a multiple baseline across participants design. It was delivered by classroom teacher or paraeducator.	The baseline was conducted with a 20-30 minutes session, four to eight times a week. The intervention was delivered twice daily for 4 days a week. The post intervention had 6 phases.	Each student had 8 sessions.
Delano (2007) *Alan* *Peter* *Justin*	Three students with ASC (noted in the study as Asperger) who met the criteria a) clinical diagnosis of Asperger Syndrome b) writing	This study aimed to evaluate the use of self-regulated strategy development via VSM to improve written words and	The study was conducted in a conference room near the office of the researcher in Florida, United States. Each	The study used a multiple baseline design across participants was used. .	The duration of the sessions varied across students. The average	The baseline for each student was 4 sessions The intervention included 9

	highlighted as a key area of difficulty.	functional essay element.	study attended a different school.		session length at baseline for Alan, Peter and Justin were 52, 22 and 12. During intervention it was 82, 15 and 23.	sessions focused on word written and 5 on functional essay elements.
Harris (2017)	The study included three participants with a diagnosis of ASC. The inclusion criteria was a) diagnosis of ASC b) between the age of 7 and 9 c) able to watch a video for 2 minutes d) verbal communication e) able to recognise self in a video f) imitation skills and g). handwriting difficulties.	This study was conducted in a day treatment centre that cared for children and young people with ASC.	The study was conducted in a day treatment centre for CYP with ASC.	The study used a multiple baseline design across participants was used.	Information not given.	Each student received 5 session of intervention in total
Hart and Whalon (2012) *Austin*	The study included one student with ASC and intellectual disability. The student's IEP indicated additional needs (speech and language and hearing impairment). The student spent over 60% of school day spent out of	This study aimed to teach responding correctly to a teacher academic discussion to a student through VSM.	This study was conducted in a public high school in a "resource room" during Science lessons. The participant was in the room with 18 students. All parts of the study	The study used single subject ABAB reversal design. Delivered by classroom teacher.	There were 6 instructional sessions for 1.5 weeks. Austin received 20 sessions of intervention over 5 weeks.	There were 26 sessions of intervention in total.

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	classroom. The curriculum delivered was functional with his reading age estimated at 2nd grade. The teaching staff noted the biggest concern was responding to questions during academic activities.		were conducted in the same room.		There were 8 further baseline sessions and 6 intervention sessions.
Kagohara et al., (2012) *Dan* *Jane*	The study included two students diagnosed with ASC attending a mainstream school. They were chosen to participate in the study as they met the following criteria a) learning needs b) individual targets to develop spelling and develop use of word processing.	This study aimed to use VSM teach two students with ASC to use the spell check function on a word processor.	The study was conducted in a mainstream school in New Zealand. Dan's sessions were conducted in detached classroom corner during lessons. Jane's sessions were conducted either in classroom or separate room. This was to ensure she was the only student present during the intervention.	The study used a delayed multiple baseline across participants. This was done as Jane was unavailable during Dan's baseline.	Dan had one session per week and Jane had two sessions per week. The intervention length was not specified Information not given

Appendix C: Weight of Evidence Ratings

WoE A Methodological Quality

Coding Protocol; Quality Indicators within Single Subject Research (using the

Horner et al., 2005 Coding Protocol). Coding for each study is outlined in Table 10.

Table 10.

Methodological Coding Protocol for each included study

	Burton et al., (2013)
Description of Participants and Setting	
Setting Participants are described with sufficient detail to allow others to select individuals with similar characteristics; (e.g., age, gender, disability, diagnosis)	X
The 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
Total	3
Dependent Variable	
Dependent variables are described with operational precision 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 inter-observer 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	3
Total	3
Independent Variable	
Independent variable is described with replicable precision	X

Independent variable is systematically manipulated and under the control of the experimenter	X
Overt measurement of the fidelity of implementation for the independent variable is highly desirable	X
Total	3

Baseline

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
Total	3

Experimental Control / Internal Validity

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
Total	3

External Validity

Experimental effects are replicated across participants	X
Experimental effects are replicated across settings	-
Experimental effects are replicated across materials	-
-Total	1

Social Validity

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

	Total	3

Overall Total	19

Table 11.

Weight of Evidence A Calculations for each study included

Author (Ppt.)	Overall Total	WoE A (average across 7 criteria)
Burton et al., (2013)	19	2.7 (High)
Delano, (2007)	15	2.1 (Medium)
Hart and Whalon, (2012)	16	2.3 (Medium)
Harris, (2017)	15	2.1 (Medium)
Kagohara et al., (2912)	17	2.4 (Medium)

Guide for weighting Low - < or equal to 1.4, Medium 1.5 to 2.4 and High > 2.5

Weight of Evidence B.

The WoE B of each study was calculated using the Petticrew and Roberts' (2003) hierarchy of evidence. This hierarchy proposes that Randomised Control Studies are the most effective study design to answer questions on the effectiveness of interventions, therefor being awarded 3 points. Experimental design including SCEDS are awarded 2 points, Qualitative research including surveys and case studies are deemed to be the lowest quality for effectiveness questions and therefore awarded 1 point.

Table 12.

Coding Protocol for Methodological Relevance

	3 points	2 points	1 point
Study Design	Randomised control trial studies (RCT)	Experimental or quasi experimental designs. For example, Single Case Experimental Designs (SCED)	Qualitative research including surveys and case studies
Rationale	RCT control the variables in the experiment. Therefore, effectiveness of interventions can be investigated	Single subject designs are a valid methodology intended to compare an intervention to the baseline measured (Horner et al., 2005; Kratochwill & Levin, 2011), especially. when the experience studied is rare.	Case studies are subjective to the context (participant, setting etc) and lack experimental control. Therefore, they are less useful to measure effectiveness.

Table 13.

Weight of Evidence B ratings for each included study

Study	Study Design	WoE B
Burton et al., (2013)	SCED	2
Delano, (2007)	SCED	2
Harris, (2017)	SCED	2
Hart and Whalon, (2012)	SCED	2
Kagohara et al., (2012)	SCED	2

Weight of Evidence C

The WoE C criteria were created by the reviewer to determine how relevant and appropriate the studies were in answering the review question. This review was to evaluate whether video modelling is an effective intervention to increase academic performance in school aged students with ASC. The reviewer considered the country, age of participants, setting, outcome variable and intervention length to make this judgement. The WoE C criteria are listed in Table 14 and the WoE C scores for each study are listed in Table 15.

Table 14.

WoE C Criteria

	3	2	1	Rationale
Country	OECD English speaking country	Non-English-speaking OECD country	Non-OECD country	In order to compare studies to the UK Education System countries that can be compared to the UK economically and socially are preferred. Therefore, OECD countries that speak English primarily receive the highest score and countries that are not part of the OECD receive the lowest.
Age of Participants	5-16	16-18	3-4	School age participants are more relevant when considering VM as an intervention for academic performance
Intervention Setting	School – continual setting	Office or school non continual setting	Home	This review looks at academic performance therefore studies performed in academic settings provide greater generalisability.

	3	2	1	Rationale
Outcome variable	Academic performance	Skill that will enable academic performance	Behaviour	This review looks at academic performance therefore outcomes that measure academic performance are the most relevant.
Intervention	Intervention is provided weekly with 10+ session	Intervention is provided weekly with 5+ session	Intervention is performed as and when with up to 4sessions	Interventions that are performed regularly are evidenced to be the most effective
	3	2	1	Rationale

Table 15.

Overall WoE C Scores.

	Burton et al., (2013)	Delano (2007)	Harris (2017)	Hart & Whalon (2012)	Kagohara et al., (2013)
Country	3	3	3	3	3
Age of Participants	3	2	3	2	3
Intervention Setting	3	2	2	3	3
Outcome variable	3	3	3	3	3
Intervention	2	2	2	3	2
Total	14	12	13	14	14
Average	2.8 (High)	2.4 (Medium)	2.6 (High)	2.8 (High)	2.8 (High)

Guide for weighting Low - < or equal to 1.4, Medium 1.5 to 2.4 and High > 2.5