

The Effectiveness of Social Skills Training Groups for Individuals with Autism Spectrum Disorder

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Abstract Autism spectrum disorder (ASD) is characterised by social difficulties that can have a negative impact on an individual's psychological and social wellbeing. To date, reviews of social skills training groups have mainly focussed on children, rather than adolescents and adults. This review aimed to critically evaluate studies published in the past 20 years that had used group-based social skills training to improve the social skills of adults and/or adolescents with ASD. Thirteen studies were identified, and group-based social skills training was generally effective at improving social skills, with some studies observing transfer effects to improvements in wider psychological wellbeing. Future research should focus on comparing different social skills training protocols in real-world clinical settings.

Keywords Autism spectrum disorder · Social skills training · Asperger syndrome · Social interaction · Social communication · Review

Introduction

The Nature of Social Difficulties in Autism Spectrum Disorder

The *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5) proposes 'impaired social interaction and communication' as key criteria for the diagnosis of autism spectrum disorder (ASD; American Psychiatric Association 2013). This reflects the combined nature of social interaction and communication difficulties in ASD. Social skills can be thought of as the behaviours involved in initiating and maintaining interpersonal relationships (Elliot and Gresham 1987) and are linked to peer-acceptance, psychological wellbeing and academic achievement (Hartup 1989). There is variation in the degree to which individuals with ASD are motivated to interact with peers, with some individuals desiring social interaction, but lacking the skills to negotiate social situations, while others show minimal interest in social interactions (Reichow et al. 2012).

The social interaction and communication difficulties of individuals with ASD span a range of skills (Weiss and Harris 2001). Research indicates difficulties with recognising and discriminating facial emotional expressions (Harms et al. 2010), using eye gaze to scan social information (Pelphrey et al. 2002) and engaging in joint attention (Dawson et al. 2004). These skills are considered important for the interpretation of the intentions of others, putting individuals with ASD at a disadvantage during social interactions (Leppänen and Nelson 2006). People with ASD can also have difficulties identifying appropriate greetings (Reichow and Sabornie 2009) and understanding humour (Samson and Hegenloh 2010). Social difficulties predict a lower number of peer relationships and reduced participation in recreational

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activities (Orsmond et al. 2004), as well as reduced ability to form romantic relationships (Stokes et al. 2007), factors known to lead to a significant reduction in psychological wellbeing (Whitehouse et al. 2009).

There are multiple theories which conceptualise the social difficulties of people with ASD and although a comprehensive discussion of these is beyond the scope of this review, some will be briefly described. One such theory is impairments in theory of mind (ToM; Vrticka et al. 2013), defined as the ability to conceive the mental states of others (Baron-Cohen et al. 1985), can lead individuals with ASD to initiate fewer social interactions for fear of ‘getting it wrong’, thus perpetuating their social difficulties (Shtayermman 2007). Cognitive neuroscientists claim a link between mirror neuron deficiency and ASD (Dapretto et al. 2006; Perkins et al. 2010). Furthermore, anatomical differences have been found in the mirror neuron related brain areas in adults with ASD, compared with controls. Cortical areas were thinner, and the degree of thinning was correlated with ASD symptom severity, a correlation mostly restricted to these brain regions (Hadjikhani et al. 2006). Based on these results, some researchers claim that ASD is caused by impairments in the mirror neuron system, leading to disabilities in social skills, imitation, empathy and theory of mind. However, other researchers argue that this theory alone cannot account for these deficits, links are tentative and that further research in this area is required (Heyes 2010). Another prominent theory of ASD is that there are underlying deficits in executive functions (Russell 1997). Executive dysfunction, for example, difficulties in planning, flexibility, and organising, has been linked with the theory of mind difficulties associated with impaired social behaviour (Fisher and Happe 2005). Likewise, Weak Central Coherence, a processing bias for local rather than global information, has been posited as a further factor that can contribute to social difficulties (Happé and Frith 2006). For example, Happé and Frith argued that weak central coherence may lead to poor processing of facial emotion or the interpretation of social behaviour in a specific context. A more recent theory accounting for the social impairments of people with ASD is the social motivation theory of Chevallier et al. (2012), which argues that the reduced social motivation of individuals with ASD can lead to their social difficulties.

The Implications of Poor Social Skills for Psychological Wellbeing

Although a comprehensive discussion of the psychiatric implications of poor social skills is beyond the scope of this review, it is notable that poor social skills appear to contribute to reduced psychological wellbeing for individuals with ASD. Individuals with ASD often display higher levels of depression than the general population (Stewart et al. 2006). For

example, Lugnegard et al. (2011) study reported that 70 % of adults with ASD met the criteria for having experienced at least one episode of major depression, as categorised by the DSM-4 (American Psychiatric Association 2000). It is hypothesised that this increased prevalence is partly related to difficulties with social interaction leading to feelings of incompetence and low self-esteem (Hillier et al. 2011). Sterling et al. (2008) purport that increased prevalence of depression in adults with ASD who are ‘higher functioning’ may be as a result of insight into their own social difficulties. This is because individuals who perceive themselves as being socially isolated experience higher levels of loneliness and depression (Cacioppo and Hawkley 2009). Individuals with ASD also experience high rates of anxiety, particularly social anxiety (Bellini 2004), with an estimated 50 % of adults with ASD experiencing an anxiety disorder (Lugnegard et al. 2011). Heightened levels of anxiety and physiological arousal make social interactions more overwhelming and leads to social withdrawal. This restricts an individual’s opportunity to develop social skills and can produce more social *faux pas* and consequently a higher number of negative social interactions and embarrassment (Bellini 2006). Therefore, not only does increased anxiety lead to social difficulties, but these difficulties can often lead to greater anxiety, indicating a bidirectional relationship (White et al. 2014). The significant mental health consequences of social skills difficulties highlights the importance of improving social skills with targeted interventions as this may in turn lead to improvements in mental health.

Despite the discussion of the social difficulties of individuals with ASD, it is important to consider an alternative representation: that of ASD as a difference. It has been argued that individuals with ASD only become socially ‘disabled’ due to a lack of accommodation of this difference by society (Brownlow 2010). SST groups may perpetuate this lack of accommodation, training people with ASD on how to appear ‘Neurotypical’, rather than acknowledging neurodiversity and the strengths of individuals with ASD.

Social Skills Training Groups

The implications of poor social skills demonstrated by individuals with ASD highlight the importance of supporting individuals to develop their social interaction and communication abilities. One of the most commonly used interventions that aims to achieve this end are Social Skills Training (SST) groups. Different groups follow different protocols, but generally contain two to six participants, are led by multiple therapists and run for around 12 weeks (Reichow et al. 2012). The aim of such groups is to teach specific skills within a setting where they can be immediately rehearsed and reinforced, thus providing a positive social experience.

Review Objectives

Reviews of the SST literature to date have only explored research focusing on children and adolescents (e.g. Rao et al. 2008; Reichow et al. 2012; Miller et al. 2014). These reviews have shown how SST groups may improve the social skills of some children and adolescents with ASD, but highlight the need for further research measuring broader outcomes, such as quality of life. However, people with ASD do not grow out of their social difficulties and they persist into adulthood, along with the associated psychosocial consequences discussed above. This makes it of great importance to identify any interventions which may support adults to develop their social skills. This review therefore aims to identify and critically evaluate studies that have investigated the effectiveness of SST groups at improving social interaction and communication in adolescents and adults with ASD.

Methods

Scope of Review and Inclusion Criteria

This review considered all research published in peer-reviewed journals focusing on group interventions for improving social skills and/or peer relationships in adolescents and adults with a diagnosis of an ASD from 1994 to 2014. A variety of study designs were included, such as: randomised controlled trials (RCTs), single-case multiple baseline designs and quasi-experimental designs.

Search Strategy

A literature search was carried out using online databases (PsychINFO, EMBASE, Medline) through an National Health Service (NHS) Healthcare search engine. The search strategy and search terms are shown in Appendix 1.

Exclusion Criteria

Studies were excluded if they:

- Did not include individuals with an ASD
- Recruited participants with a mean age of younger than 13 years of age
- Were not written in English
- Were not published in a peer-reviewed journal
- Did not include information about a relevant outcome (e.g. social skills or peer relationships)
- Were not empirical research (e.g. they were reviews or commentaries)
- Were not a group-based SST intervention

Study Selection

The eligibility of studies was determined by an initial screening by the first author based on the titles and abstracts of articles. This was followed by the full text of the remaining shortlist being screened in agreement with inclusion and exclusion criteria. Reference lists of included studies were also read to indicate other applicable studies. The second author double-checked included studies to ensure they met inclusion criteria.

Data Items

Information was extracted from each study on (1) characteristics of participants (including age, gender and diagnosis); (2) study design (including sample sizes and number of groups); (3) type of SST intervention; (4) type of outcome measures used; (5) type of control group (if applicable); and (6) training effects.

Results

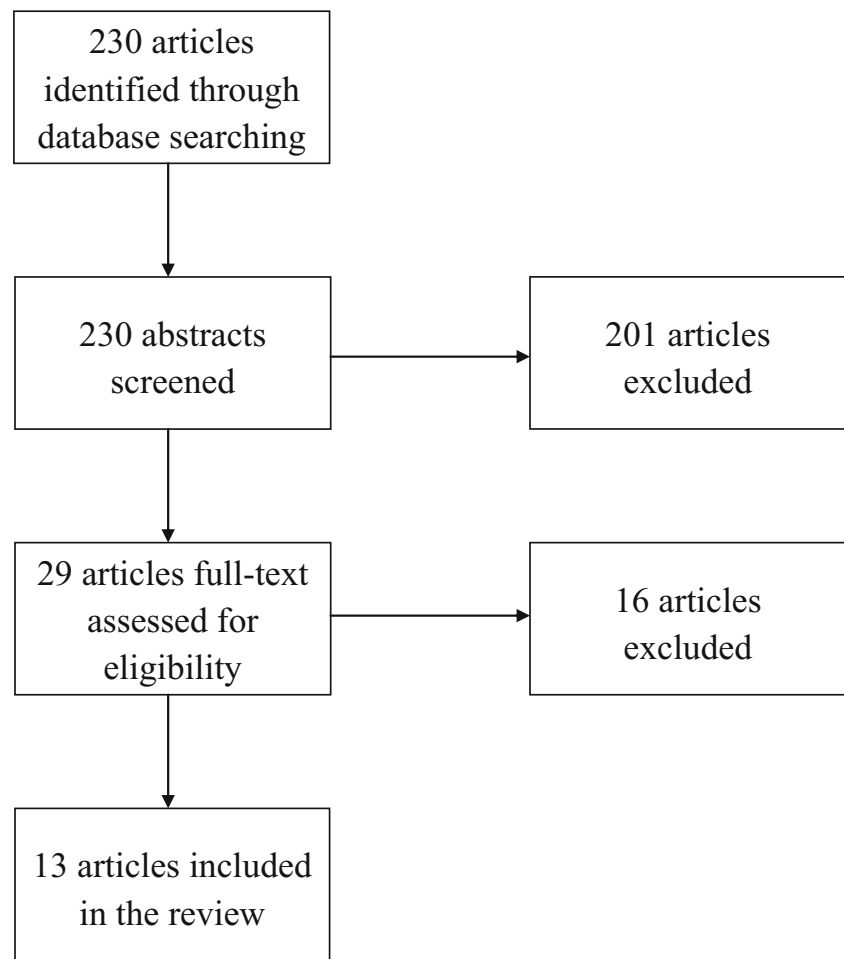
Study Selection

The search identified 230 studies. The titles and abstracts of these studies were reviewed, and 29 studies were identified to be suitable for this review, with the remaining 201 studies clearly not meeting criteria. Upon further inspection of the full text of the remaining 29 studies, 16 of these studies did not fulfil criteria, leaving 13 studies to meet the inclusion criteria for the current review. The phases of selection are shown in Fig. 1 in line with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (Liberati et al. 2009).

Study Characteristics

Four RCTs (Gantman et al. 2012; Laugeson et al. 2009; Schohl et al. 2014; Yoo et al. 2014), three quasi-experimental pre-post designs with a control group (Laugeson et al. 2012; Ozonoff and Miller 1995; Turner-Brown et al. 2008), four quasi-experimental pre-post designs without a control group (Hillier et al. 2007, 2011; Liu et al. 2013; Tse et al. 2007), one randomised complete block design study (Mandelberg et al. 2014) and one single-case multiple baseline study (Mitchell et al. 2010) were identified.

The included studies came from only four countries (USA, 9; Canada, 2; Hong Kong, 1; South Korea, 1), with five of the studies involving the same research group at the University of California, Los Angeles (UCLA; Table 1). Six different SST interventions were investigated; however, no study compared

Fig. 1 Study selection process

different interventions against each other. The majority of studies only recruited participants without an intellectual disability (defined as an IQ below 70, as well as impairment in adaptive and social functioning, present before the age of 18; Department of Health 2001); however, there was heterogeneity with regards to the autism diagnoses of included participants, as well as how they were described. Different studies use different terminology; for example, high-functioning autism and Asperger syndrome have both been used historically to describe adults with ASD who do not have an intellectual disability.

Evaluation by SST Type

Programme for the Education and Enrichment of Relational Skills

The UCLA Programme for the Education and Enrichment of Relational Skills (PEERS) aims to address a range of social skills. PEERS involves 12–14 weekly sessions, with each session lasting 90 min and typically includes a parent or caregiver. Four studies evaluating PEERS used

an RCT design (Laugeson et al. 2009; Gantman et al. 2012; Schohl et al. 2014; Yoo et al. 2014), and each of these included a wait-list control group. One study employed a quasi-experimental pre-post design in which participants were not randomly assigned to their conditions and there was no control group (Laugeson et al. 2012). This study followed a similar protocol to Laugeson et al. (2009) but with two additional sessions and a follow-up period, something not present in the other studies. A further study by Mandelberg et al. (2014) was described as a randomised complete block design. They assessed adolescents with ASD at three time points: pre-PEERS intervention; post-intervention and 1- to 5-year follow-up. Thus, participants can be considered as ‘blocks’ and the different time points as ‘treatments’.

The protocol was described thoroughly in all six studies. PEERS was translated and modified for a Korean population in the Yoo et al. study. Only the Schohl et al. study was independent of UCLA, which reduces the risk of investigator bias compared with the other studies. One study (Gantman et al. 2012) evaluated PEERS in adults between the ages of 18 to 23 years,

Table 1 Characteristics of studies using SST groups in adolescents and/or adults with ASD

Study	Study location	Study design	Number of participants (%)	Male Sample age range	Autism diagnosis	IQ?	Intervention	Outcome measures	Main Findings
Ozonoff and Miller (1995)	USA	Quasi-experimental pre-post (control)	9	11–16	All autistic disorder or PDD-NOS	Mean FSIQ=93, range=73–107	SST Programme	Specifying measures: M&Ms false belief, 2nd-order belief attribution, overcoat, and prisoner stories. Impact measures: SSRS	(Non-significant) improvements in ToM in treatment group vs. control group. No significant changes on parent or teacher ratings of social competence
Hillier et al. (2007)	USA	Quasi-experimental pre-post (no control)	13	18–23	1 autism, 4 PDD-NOS, 8 AS	Mean FSIQ=108, range=83–133	The Aspirations Programme	Adapted EQ, AQ, IPR, observations of interactions by trained observers	Significant increase in EQ score and the number of social interactions; no significant increase in ratings of peer relations
Tse et al. (2007)	Canada	Quasi-experimental pre-post (no control)	46	13–18	All ASD	N/A	SST group. Adapted from 'Skillstreaming the Adolescent' (Goldstein and McGinnis 2000). Social and cognition interaction training	SRS, ABC, N-CBRF	Significant reduction in problem behaviours and increase in social competence
Turner-Brown et al. (2008)	USA	Quasi-experimental pre-post (control)	11	25–55	All HFA	Mean FSIQ=112		FEIT, hinting task, SCSQ, SSPA	Significant improvement in ToM and (non-significant) improvement in social communication skills (improvements not shown by control group)
Laugeson et al. (2009)	USA	Randomised controlled trial	33	13–17	23 HFA, 9 AS, 1 PDD-NOS	Mean verbal IQ=92	UCLA PEERS	SSRS, PQQ, TASSK, FQS	Significant difference between treatment and control with regard to improvements on knowledge of social skills, frequency of get-togethers and parent-reported social skills
Mitchel et al. (2010)	Canada	Single-case multiple baseline	3	15–19	2 AS, 1 HFA	N/A	Training based on 'Navigating the Social World' (McAfee 2002) The Aspirations Program	SSRS, training and generalisation probes, quality of life questionnaire	Increased generalised targeted social skills, maintained at 3-month follow-up
Hillier et al. (2011)	USA	Quasi-experimental pre-post (no control)	49	18–28	42 AS, 6 HFA, 1 PDD-NOS	Mean FSIQ=99, range=75–135		BDI, STAI, IPR	Non-significant improvements in peer relationships, significant reduction in anxiety and depression
Gantman et al. (2012)	USA	Randomised controlled trial	17	18–23	4 autistic disorder, 11 AS, 2 PDD-NOS	Mean FSIQ=102	UCLA PEERS	Primary: SRS, SSRS, SELSA Secondary: EQ, OSQ, SSI, TYASSK	Treatment group improved significantly more than controls on all outcome measures
Laugeson et al. (2012)	USA	Quasi-experimental pre-post (control)	28	12–17	7 ASD, 6 AS, 1 PDD-NOS	Mean FSIQ=99	UCLA PEERS	SSRS, SRS, PQQ, TASSK	Compared with controls, treatment group significantly improve social skills knowledge, social responsiveness, communication, awareness and motivation. Greater peer interactions. Improved teacher ratings of social skills.

Table 1 (continued)

Study	Study location	Study design	Number of participants (%)	Male (%)	Sample age range	Autism diagnosis	IQ?	Intervention	Outcome measures	Main Findings
Liu et al. (2013)	Hong Kong	Quasi-experimental pre-post (no control)	14	71	18–40	All 'formal diagnosis of autism'	Mean non-verbal IQ=73 range=65–83 Verbal IQ >70	Workplace training programme	WPP, SIB-R, OEI-R	Significant improvements in socialisation and social communication skills
Mandelberg et al. (2014)	USA	Randomised complete block design (no control) (1–5-year follow-up)	53	81	12–18	All ASD	Verbal IQ >70	UCLA PEERS	SCQ, SSRS, SRS, QPO, TASSK, FII	Treatment gains maintained on SRS and SSRS, as well as frequency of peer interactions and social skills knowledge
Schohl et al. (2014)	USA	Randomised controlled trial	58	81	11–16	All ASD	Mean verbal IQ=100	UCLA PEERS	TASSK, OSQ, FQS, SIAS, SRS, SSRS	Compared with controls, significant increase in get-togethers, higher ratings of friendship skills, fewer reported problem behaviours and lower social anxiety
Yoo et al. (2014)	South Korea	Randomised controlled trial	55	95	12–18	All ASD	Mean verbal IQ=100	UCLAS PEERS	Primary: ADOS, TASSK, QPO, SSRS, SCQ, SRS, ASDS Secondary: CDI, STAI-C, CBCL Parent: BDI, STAI	Compared with controls, significant improvement in social knowledge, communication and interaction. Young people displayed decreased depression and mothers displayed decreased anxiety. Only gains in social knowledge were maintained at 3-month follow-up.

See Appendix 2 for summary of interventions and Appendix 3 for summary of outcome measures (including author information)

Note: *FSIQ* Full-Scale IQ, *AS* Asperger syndrome, *HFA* high-functioning autism, *PDD-NOS* pervasive developmental disorder—not otherwise specified, *ABC* aberrant behaviour checklist, *ADOS* Autism Diagnostic Observation Scale, *AQ* Autism Spectrum Quotient, *ASDS* Asperger Syndrome Diagnostic Scale, *BDI* Beck Depression Inventory, *CBCL* Child Behaviour Checklist, *CDI* child depression inventory; *EQ* empathy quotient, *FETT* face emotion identification task, *FII* friendships and interventions interview, *FQS* Friendship Qualities Scale, *IPR* Index Of Peer Relations, *OEL-R* Observational Emotional Inventory Revised, *N-CBRF* Nisonger child behaviour rating form, *QPO* Quality-of-Play Questionnaire, *QSQ* Quality-of-Socialisation Questionnaire, *SCQ* Social Communication Questionnaire, *SCSQ* Social Communication Skills Questionnaire, *SELSA* Social And Emotional Loneliness Scale For Adults, *SIAS* Social Interaction Anxiety Scale, *SIB-R* Scale of Independent Behaviour Revised, *SRS* Social Responsiveness Scale, *SSI* social skills inventory, *SSPA* Social Skills Performance Assessment, *SSRS* Social Skills Rating System, *STAI* State-Trait Anxiety Inventory, *STAI-C* State-Trait Anxiety Inventory for Children, *TASSK* Test of Adolescent Social Skills Knowledge; *TYASSK* Test of Young Adult Social Skills Knowledge, *WPP* Work Personality Profile

while the other five studies investigated adolescents between the ages of 11 to 18 years.

The six studies used a variety of outcome measures. All six studies used the Social Skills Rating System to assess cooperation, assertion, self-control and social responsibility (SSRS; Gresham and Elliott 1990). Gresham and Elliot found the SSRS to have an internal consistency of 0.75, test-retest reliability for teacher ratings between 0.84 and 0.93 and test-retest reliability for parent ratings between 0.65 and 0.80. However, this measure is yet to be validated in an ASD population. The SSRS was completed by parents, caregivers and/or teachers apart from in the study by Yoo et al. (2014) where it was answered by the participants, with no significant condition-time interaction being observed. Indeed, this was the only study to fail to observe significant improvements by participants on the SSRS. This was attributed to the participants' limited insight regarding their difficulties and differences between participants' and parents' metacognitive abilities with regards to social behaviour, rather than the group not being effective. This raises questions regarding whose idea it was to attend the group and what expectations parents and participants had for taking part in the group. This is not reported on in the study.

The administration of the Social Responsiveness Scale (SRS; Constantino 2005) by all studies apart from Laugeson et al. (2009) allowed for the assessment of change through the use of an ASD-specific measure of social skills, with Yoo et al. (2014) being the only study not to observe significant change on this measure. A further assessment of changes in ASD-related symptoms was administered by Yoo et al., who observed significant improvements in social interaction and communication. Gains in both the SSRS and SRS were maintained at follow-up in the studies of Laugeson et al. (2012) and Mandelberg et al. (2014).

While Laugeson et al. (2009) and Schohl et al. (2014) both assessed friendship quality, only Laugeson et al. found significant time-condition interaction, which was in fact due to a reduction of the controls' scores. Mandelberg et al. (2014) also assessed post-intervention improvements in friendship and observed an increase in the number of get-togethers organised with peers after PEERS, and this was maintained at follow-up.

In terms of mental health-related outcomes, Yoo et al. (2014) investigated the effect of the intervention on anxiety and depression, for both the young people and their parents. They found reductions in maternal anxiety and the depressive symptoms of participants. Gantman et al. (2012) assessed loneliness, observing a significant improvement.

Improvements in social skills knowledge, as measured by the Test of Adolescent Social Skills Knowledge

(TASSK; Laugeson and Frankel 2006) or the Test of Young Adult Social Skills Knowledge (TYASSK; Gantman et al. 2012), were found in all six studies. This suggests that PEERS is successful in improving the social skills knowledge of people with ASD.

Critique

All four RCT studies can be thought of as randomised wait-list controlled designs, as no studies included a no-treatment control. This has the advantage of all participants receiving treatment; however individuals in the treatment group may have had higher expectations of improvement. By not including a third arm to their designs involving a separate intervention, these studies were unable to evaluate whether treatment effects were specific to PEERS. There were no significant differences in participant demographics or baseline social skills between groups at baseline in all studies which included a control group.

By not randomising participants, Laugeson et al. (2012) and Mandelberg et al. (2014) increased the risk of selection bias; however by employing a control group Laugeson et al. were able to reduce the risk of bias due to non-intervention-related events or maturation. The study of Mandelberg et al. (2014) is perhaps more appropriately thought of as a quasi-experimental design without a control group and as such is susceptible to multiple sources of bias, such as that caused by previous testing, or natural improvements over time. However, as participants had originally been randomised to the treatment group, this reduced the risk of selection bias.

Across studies, many of the measures were administered to parents and/or caregivers, who were not blind to the treatment status of the individual with ASD. This introduced risk of detection bias, especially since parents were involved in the interventions. Yoo et al. (2014), Laugeson et al. (2012) and Mandelberg et al. (2014) were the only studies to have a follow-up period, which allowed for observation of the development of skills and whether post-intervention improvements were sustained or generalizable outside of the group. All six studies had similar inclusion and exclusion criteria, including the exclusion of people with an intellectual disability, meaning that findings may not be generalizable to all individuals with ASD.

The use of behavioural, in vivo measures may have improved the ecological and construct validity of these studies, something which was acknowledged by Gantman et al. (2012) and Schohl et al. (2014) and addressed by Yoo et al. (2014) who used the Autism

Diagnostic Observation Schedule (Lord et al. 2008) to observe social interaction, communication and play.

Aspirations Programme

Two studies employed a quasi-experimental design without a control group to evaluate the Aspirations programme for adults with ASD (Hillier et al. 2007; Hillier et al. 2011). This programme runs for 1 h/week, for 8 weeks, has a discussion-based format and was designed to help adolescents or young adults with ASD to develop social and vocational skills. Topics covered included: social communication, relationships, independence and employment.

Participants had an average age of 19 years in the study of Hillier et al. (2007) and 21 years in the study of Hillier et al. (2011). Participants completed a variety of outcome measure pre-and-post the Aspirations programme. Both studies used the Index of Peer Relations to assess attitudes and feelings towards peers, and neither found peer relations to improve. In addition, Hillier et al. (2007) focused on constructs related to ASD, administering the Autism Spectrum Quotient (AQ; Baron-Cohen et al. 2001) and the Empathy Quotient (EQ; Baron-Cohen and Wheelwright 2004), but only found significant improvement on the EQ. Hillier et al. (2011) observed the effects of training on anxiety and depression and found significant, but small, self-reported improvements for both of these on the Beck Depression Inventory (Beck et al. 1996) and State-Trait Anxiety inventory (Spielberger et al. 1983).

Critique

Neither study included a control group or randomised participants to their conditions. Participants were generally self-selecting and therefore perhaps more motivated to demonstrate a positive change, especially since participants had to pay to participate in the programme. Since neither study included a follow-up period, it was not possible to assess whether positive effects were sustained. As described above, since all the measures used in these studies were self-report. The inclusion of more objective measures of peer relations or ASD symptoms may have indicated whether improvements in participants' awareness of other people's perspectives, thoughts and feelings, as indicated by improvements in the EQ, led to behavioural change.

Group Skills Training

Mitchel et al. (2010) conducted a single-case multiple baseline design, and also measured social skills and

quality of life pre-intervention, post-intervention and at 3-month follow-up. Three participants with a diagnosis of Asperger syndrome or high-functioning autism, labels historically used to describe individuals with ASD without an intellectual disability, aged between 15 and 19 years took part in the 12-week intervention, which was adapted from 'Navigating the Social World' by McAfee (2002).

Unlike the group designs discussed thus far, this study offers an idiographic perspective of SST. The authors used participants' lowest baseline scores on the SSRS to choose three areas to target for training: introducing self to others; joining in activities and problem-solving (Mitchel et al. 2010) and developed appropriate training (in a setting with trainers, e.g. role plays) and generalisation (in a setting without trainers, e.g. not in the training room) probes to measure these target behaviours. These probes were observations of target behaviours that were identified and rated by a facilitator. A video coder, blind to the study purpose, rated 20 % of the probes and high inter-observer agreements for training (89 %) and generalisation (87 %) probes were reported.

Social skills and quality of life improved for all participants and improvements were maintained at 3-month follow-up. The intervention was generally associated with increased generalisation of targeted social skills.

Critique

One of the strengths of single-case designs is to monitor baselines; however, baselines were observed as little as once for some target behaviours before training was delivered and scores were highly variable when more baseline observations occurred. Single-case designs often have limited generalisability. However, the authors attempted to address these issues by testing three participants, thus identifying sources of variability. However, Mitchel et al. (2010) acknowledged that their design was weakened because they did not have the time to ensure previously trained skills had improved before training a new skill. Furthermore, there is the important consideration that target behaviours were identified based on SSRS scores, rather than participant choice, which may have reduce participants' motivation to improve those behaviours.

Social Skills Training Programme

Ozonoff and Miller (1995) evaluated a Social Skills Training Programme consisting of 14 weekly 90-min sessions. The first 7 weeks focussed on conversational and interactional skills, with the second 7 weeks

focussing on ToM skills. They employed a pre-post-design in which participants were not randomly assigned to their conditions, placing participants in a treatment or no-treatment control group based on practical constraints which were not specified.

Ozonoff and Miller (1995) administered multiple measures designed to assess ToM; however, only found marginally significant improvements when the treatment and control groups were compared. No significant main effects or interactions were observed on assessments of social functioning, as measured by the SSRS.

Critique

By not randomising participants, this study was at increased risk of selection bias. However, by employing a control group, there was reduced risk of bias due to non-intervention-related events or maturation. The training methods provided by the authors used examples very similar to the false belief tasks used as outcome measures and the authors acknowledged that their intervention may have only served to teach participants how to pass these tasks, rather than actually improve ToM.

Social Skills Training Group

Tse et al. (2007) evaluated a Social Skills Training Group which consisted of 60- to 90-min sessions once a week for 12 weeks. The group consisted of a mixture of psychoeducation and experiential exercises and included both role-play and didactic elements. The content of the group was based on 'Skillstreaming the Adolescent' by Goldstein and McGinnis (2000). The design of the study was quasi-experimental, without a control group and participants had a mean age of 14.60 years. Participants' parents completed three questionnaires pre- and post-group: the Social Responsiveness Scale (Constantino 2005), the Aberrant Behaviour Checklist (ABC; Aman et al. 1985) and the Nisonger Child Behaviour Rating Form (N-CBRF-PS; Aman et al. 1996). The authors observed small but significant improvements in social competence, as measured by the SRS and N-CBRF-PS. Effect sizes were greater for the significant reduction in problem behaviours, as measured by the ABC.

Critique

As with other studies with a similar design (e.g. Liu et al. 2013; Hillier et al. 2007; Hillier et al. 2011), the lack of control group reduced the authors ability to identify whether changes in social skills were greater

than they would have been had participants not received an intervention or whether improvements were simply due to group participation. By not randomising, there was increased risk of selection bias.

As a service-oriented study, it had increased external and ecological validity and offered insight into how interventions apply to clinical practice. However, without a follow-up period, it was not possible to assess whether positive effects were sustained.

Social Cognition and Interaction Training for Adults

Turner-Brown et al. (2008) evaluated a Social Cognition and Interaction Training for Adults (SCIT-A) programme, which consists of three core components: emotion training; figuring out situations and integration of principles. The programme consisted of 18 weekly sessions, lasting 50 min each and participants were 25 to 55 years of age. This study had a quasi-experimental pre-post-design with a control group which involved treatment as usual. Authors had attempted to randomise participants; however, they were not able to carry out a true RCT as two participants declined the SCIT-A programme and therefore were assigned to the treatment as usual control group. This control group continued to receive interventions, such as medication and individual therapy. Unfortunately, further information about these interventions are not discussed in this article. A variety of questionnaire and behavioural measures were used to assess improvements as a result of the group. Participants who completed SCIT-A showed significant improvements in ToM but not in the identification of facial emotions, compared with controls. No significant improvements were observed for social functioning. Importantly, five out of six of the participants rated the group as either 'useful' or 'very useful'.

Critique

This study's internal validity was reduced by all the factors discussed above that are associated with a lack of true randomisation. This study demonstrated increased risk of a selection-maturation interaction bias due to significant age differences at baseline. A potential reason why Turner-Brown et al. (2008) did not observe improvements in outcomes was that they did not administer measures which were designed for people with ASD and therefore they may not have been sensitive to change. The use of behavioural measures of social functioning during role-play increased the ecological and external validity of this study. A further benefit of this study was that it directly assessed the acceptability of the group for participants, something lacking from the majority of other studies.

Workplace Training Programme

Liu et al. (2013) used a quasi-experimental pre-post-design without a control group to evaluate a workplace training programme which lasted for 6 h a day, 5 days a week, for 6 months. This made it the most rigorous SST programme and most demanding of participant time. The programme had a focus on social communication and emotions, as well as psychoeducation about workplace principles. Participants had ASD and a mild to moderate intellectual disability and had a mean age of 24.60 years. The intervention led to significant improvements in some workplace social behaviour: appearance, self-control and level of supervision. There were also significant improvements in social communication skills and emotional control.

Critique

By not including a control group or randomisation, this study was at risk to many sources of bias. Like the study of Tse et al. (2007), this was a service-oriented study with increased external and ecological validity. However, the lack of follow-up means that longer term or maintenance effects of the intervention cannot be assessed.

Discussion

This review highlights the promising potential of SST groups as being an effective intervention for improving the social skills of adolescents and adults with ASD. Much research to date has focussed on evaluating UCLA PEERS. The quality of these studies was generally higher than studies evaluating other interventions and majority of PEERS studies reviewed observed improvements in social interaction, social skills knowledge and friendship quality. Furthermore, Yoo et al. (2014) and Gantman et al. (2012) found significant improvements in mental health outcomes, suggesting that the effects of SST transferred to wider psychological factors. This highlights the important relationship between social skills and mental health (White et al. 2014), and the valuable role that SST can play in improving these factors.

Positive mental health outcomes were also found by Hillier et al. (2007) and Hillier et al. (2011) following the Aspirations programme for adults with ASD; however, participants did not feel that their peer relations had improved as a result of the group. Future evaluations of the Aspirations programme may benefit from more direct observations of changes in social skills.

Mitchel et al. (2010) found significant improvements in social skills and quality of life following their Social Skills Training. Although adults with ASD rated SCIT-A (Turner-Brown et al. 2008) as being useful, significant improvements in social functioning were not observed. Similar social functioning outcomes were observed for the programme of Ozonoff and Miller (1995), and only small improvements in social competence after attending a Social Skills Training Group were found by Tse et al. (2007). Taken together, these findings indicate that SST group interventions vary with regards to their effectiveness at improving the social skills of adults and adolescents with ASD. The most compelling evidence for SST comes from the PEERS literature, which also suggests that improvements in social skills can lead to improvements in wider psychosocial factors, such as friendships and mental health.

To date, only one study (Liu et al. 2013) exclusively investigated training of individuals with an intellectual disability. Interestingly, Liu et al.'s intervention was by far the most time-consuming, lasting 30 h a week for 6 months. Although Liu et al. observed many positive social, emotional and workplace-related outcomes, it may be beneficial for future research to examine whether shorter groups are equally effective for a population with an intellectual disability, as a shorter SST group may provide a more cost-effective intervention.

The majority of studies included in this review were not truly experimental and most had small sample sizes and this limits our ability to draw conclusions from them. It is also important to consider what is indicated by a lack of significant improvement on outcome measures. Interventions may have helped participants to develop insight into their own social difficulties and therefore a lack of improvement may reflect greater social understanding (Hillier et al. 2011; Posavac and Carey 1992). It is also important to note that the included studies rarely made reference to participants' views regarding social difficulties or whether the goals of the group for participants matched the goals of facilitators, researchers or family members. An unfortunate consequence of this was that SST groups included in this review generally failed to customise their content to provide individualised, person-centred interventions based on participants' goals.

There is data from research to suggest that there are common factors that in some part determine the effectiveness of any intervention: client hope, expectations, therapist allegiance and relationship between client and therapist (Wampold and Budge 2012; Blow et al. 2007). Little information was provided in the reviewed studies about the quality of the relationship between group

members and facilitators, and it is unclear how important these factors might have been in producing positive outcomes for people with ASD.

Implications for Clinical Practice and Future Research

Studies varied in the level of detail they provided about their curricula, with manualised approaches such as PEERS and SCIT-A providing more detailed descriptions, increasing their usability in clinical settings. Only a small number of studies investigated the effectiveness of SST groups in a community setting indicating a need for larger studies focussing on this. This review is also perhaps a timely reminder of the need of more research investigating SST groups for individuals with ASD and an intellectual disability, so that services can best support this population.

The effectiveness of different SST interventions should be compared in the future using RCTs. Furthermore, stepped treatments and experimental therapeutics, whereby mediating mechanisms are assessed, may help determine the ‘active ingredient’ involved in any improvements. The 13 included studies implemented 37 different outcome measures, which reduces our ability to compare different interventions and develop guidelines of what should be included in curricula. Research should be consistent in terms of outcome measures used, while at the same time assessing a wide range of outcomes beyond social competence. Research could also move away from utilising self-report measures or ensure that measures are designed for people with ASD, due to these measures increased sensitivity and this population’s difficulties accessing their own mental states (Baron-Cohen 1989). This highlights the need for triangulation of data, using multiple methods of evaluation, such as objective behavioural measures, alongside self-report measure and assessments of participants’ experiences of SST groups. Longitudinal studies will provide greater knowledge of the time-course and sustainability of intervention-related gains, as well as the individual differences involved in successful training, and the potential to generalise what was learnt in the group to real life situations.

Ethical Considerations

Information about participant satisfaction was only collected in three studies (Hillier et al. 2007; Tse et al. 2007; Turner-Brown et al. 2008) and only five studies clearly indicated that they had obtained consent from the participant and/or a parent (Hillier et al. 2007, 2011; Liu et al. 2013; Mandelberg et al. 2014; Yoo

et al. 2014). It is important this information is indicated, given the vulnerability of many people with ASD.

Limitations of the Current Review

The current review was limited by only including group interventions. Many other interventions, such as intensive interaction, individual SST and Cognitive Behavioural Therapy (e.g. Sze and Wood 2007) have been designed for this population and future reviews could seek to compare different modalities of interventions. A further limitation is the low number of studies which included participants with an intellectual disability. By reviewing adolescents and adults together, this review may have obscured important differences between interventions for these two age groups. Once sufficient research has been published, future articles may benefit from reviewing SST interventions for adults alone.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest

Appendix 1—Search Strategy

1. EMBASE, MEDLINE, PsycINFO and *autis*.ti*, 39,491 results.
2. EMBASE, MEDLINE, PsycINFO and *PDD.ti*, 239 results.
3. EMBASE, MEDLINE, PsycINFO and *‘pervasive developmental disorder*’.ti*, 1500 results.
4. EMBASE, MEDLINE, PsycINFO and *asperger*.ti*, 2725 results.
5. EMBASE, MEDLINE, PsycINFO and *kanner.ti*, 49 results.
6. EMBASE, MEDLINE, PsycINFO and *1 OR 2 OR 3 OR 4 OR 5*, 42,835 results.
7. EMBASE, MEDLINE, and PsycINFO (*social AND (skills OR competence OR engagement OR relationship* OR interaction*)*).ti, 23,261 results.
8. EMBASE, MEDLINE, and PsycINFO (*group* OR intervention* OR treatment* OR program* OR train* OR therap**).ti, 2,317,576 results.
9. EMBASE, MEDLINE, PsycINFO and *7 AND 8*, 3537 results.
10. EMBASE, MEDLINE, PsycINFO and *6 AND 9*, 312 results.
11. EMBASE, MEDLINE, PsycINFO and *10 (limit to: English language and publication year 1994–2014 and (age groups all adult 19 plus years or adolescent 13 to 18 years or young adult 19 to 24 years or adult 19 to 44 years or young adult and adult 19–24 and 19–44 or middle age 45 to 64 years or middle aged 45 plus years or all aged 65 and over or aged 80 and over))*, 230 results.

Appendix 2—Summary of SST interventions

Table 2 Summary of SST Interventions

Study/studies	SST	Duration	Facilitators	Overview
Ozonoff and Miller (1995)	Social skills training programme	90 min, weekly for 14 weeks	1 leader and 3 helping staff (no indication of profession)	First 7 weeks focusing on interactional and conversational skills Second 7 weeks focusing on ToM skills
Hillier et al. (2007, 2011)	Aspirations programme	1 h, weekly for 8 weeks	Authors of study (not clear of their profession)	Discussion based format Developing social and vocational skills Covered social communication, relationships, independence and employment
Tse et al. (2007)	Social skills training group	60–90 min, weekly for 12 weeks	A social worker and a psychologist working with adolescents in a psychiatric setting	Mixture of psychoeducation and experiential exercises Included role-play and didactic elements Based on skillstreaming the adolescent (Goldstein and McGinnis 2000)
Turner-Brown et al. (2008)	SCIT-A	50 min, weekly for 18 weeks	Not stated	Focuses on emotion training, figuring out situations and integration
Laugeson et al. (2009), Gantman et al. (2012), Laugeson et al. (2012), Mandelberg et al. (2014), Schohl et al. (2014), Yoo et al. (2014)	PEERS (and Korean version—Yoo et al. 2014)	90 min, weekly for 12–14 weeks	Recommends 2 clinical psychologists, assisted by at least 2 coaches (psychology graduate students)	Focused on making friends, managing rejection and resolving conflict Parent assistance throughout adolescent intervention Mixture of didactic elements, role-play and rehearsal Parent's support weekly socialisation homework
Mitchel et al. (2010)	Group social skills training	120 min, weekly for 12 weeks	Members of the research team (behaviour consultants)	Curriculum adapted from 'Navigating the Social World' (McAfee 2002) Psychoeducation, modelling and role-play of targeted social skills
Liu et al. (2013)	Workplace training programme	6 h a day, 5 days a week for 6 months	2 registered occupational therapists and 2 rehabilitation assistants	Social, communication and emotion focus Psychoeducation about workplace principles

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