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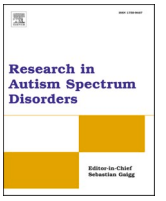

# Systematic review of the effectiveness and cultural adaptation of social skills interventions for adolescents with autism spectrum disorders in Asia

Nadlada Tawankanjanachot [a,b,*], Craig Melville [c], Abdullah Habib [c], Maria Truesdale [c], Lisa Kidd [d]

[a] School of Medicine, Dentistry & Nursing, College of Medical, Veterinary & Life Sciences, University of Glasgow, Glasgow G12 9LL, UK
[b] Ramathibodi School of Nursing, Faculty of Medicine Ramathibodi Hospital, Mahidol University
[c] School of Health and Wellbeing. College of Medical, Veterinary & Life Sciences, University of Glasgow, Glasgow G12 0XH, UK
[d] School of Health & Life Sciences, Research Centre for Health (ReaCH), Glasgow Caledonian University, Glasgow, G4 OBA, United Kingdom

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ABSTRACT

*Background:* Social skills interventions have been shown to improve social skills in adolescents with autism spectrum disorders (ASD). Because the majority of social skills interventions have been trialled in Western countries, they may not be generalisable to Asian countries with a different cultural background. The purpose of this review was to determine the efficacy and cultural adaptability of social skills interventions for adolescents with ASD (aged 10–19 years) in Asian countries.
*Method:* This review incorporated quantitative and mixed methods published, peer-reviewed research. Five electronic databases were searched. This review followed the PRISMA guidelines. A meta-analysis was conducted by using Revman 5.4 for 3 studies.
*Results:* In total, 15 studies were included in the review (n = 332), conducted across 7 Asian countries. Seven studies had undergone cultural adaptation in 3 countries (e.g., Hong Kong, South Korea, and Israel). Meta-analysis results for three comparable studies showed that the cultural adaptation of social skills interventions improved social skills knowledge of adolescents with ASD.
*Conclusion:* The review identified that social skills interventions for adolescents with ASD in Asian countries, particularly those which have been adapted to adolescents' cultural needs and preferences, are potentially effective for improving social skills. However, due to the study's limitations and the heterogeneity of included studies, further research is needed to provide strong evidence.

## 1. Introduction

Autism spectrum disorders (ASD) are neurodevelopmental disorders defined by impairments in social communication and social interaction, and restricted repetitive patterns of behaviours (American Psychiatric Association, 2017). The prevalence of ASD has been rising worldwide (Chiarotti & Venerosi, 2020; Onaolapo & Onaolapo, 2018). In Europe, the median rate rose from 0.18% in 2006 to

* Correspondence to: School of Medicine, Dentistry & Nursing, College of Medical, Veterinary & Life Sciences, University of Glasgow, 57-61 Oakfield Avenue, Glasgow G12 9LL, UK.
*E-mail address:* 2257897t@student.gla.ac.uk (N. Tawankanjanachot).

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0.61% in 2010 (Elsabbagh et al., 2012). In the United States of America, prevalence rates were 0.67% in 2000, 1.47% in 2012, and 2.24% in 2014 (Christensen et al., 2018; Zablotsky et al., 2015). Similarly, in some Asian countries, prevalence rates have also increased (Adak & Halder, 2017). For example, a recent systematic review and meta-analysis of epidemiological studies of ASD in Asia by Qiu et al. (2020) reported an estimated pooled mean prevalence in Asia of 0.36%. This prevalence rate is double the prevalence rate than that reported by Sun and Allison in 2010 (0.15%) (Sun & Allison, 2010). Given these rising prevalence rates, there is a need to ensure interventions meet the needs of this growing and diverse population across the globe.

People of all ethnics and socioeconomic groups are impacted by autism spectrum disorders. An impairment in social skill is the core characteristic in individuals with ASD which can manifest as poor social communication (Gibson et al., 2013, pp. 12079); difficulties in developing peer friendship (Kang et al., 2020; Orsmond et al., 2004); impaired social cognition (Barendse et al., 2018; Simmons et al., 2020); difficulties in expressing emotions and understanding the feelings of others and empathising (Baron-Cohen et al., 1985; Leekam, 2016), and difficulties in selecting and carrying out interpersonal goals (social competence) (Ke, Whalon, & Yun, 2017; Simmons et al., 2020). These impairments can lead to poorer relationships and mental health problems for both adolescents with ASD and their caregivers (DeFilippis, 2018; Itskovich et al., 2020; Papadopoulos et al., 2019). More specifically, for adolescents with ASD, problems associated with social skill impairments can include depression (DeFilippis, 2018; Whitehouse et al., 2009), low self-esteem and loneliness (Deckers et al., 2017; White & Roberson-Nay, 2009), risk of suicide (Hedley & Uljarević, 2018) and lower quality of life than adolescents without autism (van Heijst & Geurts, 2015). As a consequence of the social and clinical problems caused by social skills impairments, the past decade has seen a rise in the development of social skills interventions (Wilson et al., 2014; Wolstencroft et al., 2018), including some focussing specifically on adolescents with ASD (Karst et al., 2015; Vernon et al., 2018).

The importance of social skills interventions has been demonstrated by a number of systematic reviews which found that such interventions can improve social functioning and quality of life for ASD (Ke et al., 2017; Tobin et al., 2014). Such interventions have also been found in primary research studies across the world to enhance social skills such as social communication, social cognition, social comprehension, and social competence, which are important for successful social interactions in social situations with others (Elizabeth, 2013; Spence, 2003; Volkmar & van der Wyk, 2017). Different types of social skills interventions have been found to be effective (e.g., group-based, school-based, peer-based). A recent meta-analysis of *group-based* social skills interventions for individuals aged between 6 and 25 years found a large, positive effect size of social skills interventions. The effect size was larger in programmes that actively involved parents [(e.g., Program for the Education and Enrichment of Relational Skills; PEERS); (Wolstencroft et al., 2018)]. Another meta-analysis of *school-based* interventions which aimed to facilitate peer-related social competence of children with ASD aged between 3 and 12 years, showed peer-related social competence interventions delivered in school settings produced a moderate to high effect [(ES 0.83–0.95); (Whalon et al., 2015)], suggesting that children with ASD can benefit from social skills interventions implemented with peers in school settings. Another systematic review which aimed to critically evaluate studies investigating the effectiveness of *group-based* social skills training on social interaction and communication amongst adolescents and adults with ASD, showed that the interventions were focused on peer relationships led to significant improvements in social interaction, friendship quality and psychological wellbeing (Hotton & Coles, 2016). However, most of the interventions in these reviews originated in and had been tested in Western countries and the positive outcomes from these interventions may not be generalisable to Asian countries which are of a different culture (Kim, 2012).

Cultural adaptation is a systematic modification of an evidence-based treatment (EBT) or intervention which considers language, culture and context (Bernal et al., 2009). Several studies have found that culturally adapted psychological interventions are associated with greater effectiveness than non-culturally adapted interventions (Bangpan et al., 2019; Griner & Smith, 2006). Cultural adaptation of interventions for adolescents with ASD is important because different societies and communities have been found to hold different values towards social behaviour in children and adolescents (Chen, 2012; Hedegaard, 2009). Social behaviours such as eye contact, personal space, non-verbal communication, peer relationships, and facial expression are usually found to be lacking in individuals with ASD (American Psychiatric Association, 2017). These behaviours have different perspectives from both Eastern (e.g., China, South Korea) and Western (e.g., Europe, Canada, and the United States) cultures (Chen & French, 2008; Golson et al., 2022; Perepa, 2014; Rubin & Menzer, 2010), which might affect the interpretation and care for these individuals with ASD (Golson et al., 2022; Volkmar et al., 2014). For example, one study reported that peer relationships and the friendships of children in South Korea gave value for intimacy more than in North American children (French, Lee, & Pidada, 2006). A study of 152 college students in the United States (n = 61), Indonesia (n = 56), and South Korea (n = 35) found that Korean students reported more disclosures in friend interaction than American students. In contrast, Indonesian students showed they had less intimate disclosures and more interactions with people (French et al., 2006). In addition, some Asian cultures (i.e., Japan) prefer greater interpersonal space during communication than Western cultures (Sicorello et al., 2018). This difference may reflect a lack of engaging in social communication (Golson et al., 2022).

The reason for this is cultural diversity, as each culture has a different perspective. Therefore, cultural difference is important to consider when developing social skills interventions. Despite this growing acknowledgement of the need for further cultural adaptation to social skills interventions and the rising prevalence rate, little is known about how to culturally adapt social skills interventions and evaluate the evidence of such cultural adaptations specifically for adolescents aged 10–19 in Asian countries. The purpose of this systematic review, therefore, is to identify and synthesise evidence on the effectiveness and cultural adaptation of social skills intervention in adolescents with ASD in Asian countries and descriptive in summarising the state of the research.

## 2. Method

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline (Page et al., 2021). The study is registered in PROSPERO (International Prospective Register of Systematic Reviews), registration No.

CRD42019129997.

### 2.1. Search strategy

Five electronic databases were searched including EMBASE, MEDLINE, CINAHL, PsycINFO and ERIC. Hand searches of relevant medical journals including for example, the Journal of Mental Health of Thailand, and reference lists of included studies were also reviewed. Keyword and subject heading searches (where relevant) were undertaken for the following terms for intervention (i.e., "social skill intervention", "social skill training"), diagnosis (i.e., "autism spectrum disorder", "autism", "autistic disorder", "Pervasive development disorder" (PDD), "Asperger syndrome" and High-function autism"), age group (i.e., "adolescent", "Teenager" and "teen") and Asian countries (47 Asian countries were included in the review e.g., China, Korean). Studies published between 1999 and 2019 and in English language were included. The full search strategies are provided in Supplementary material 1.

### 2.2. Study selection

Studies identified in the searches of the electronic databases were exported into Endnote and then into COVIDENCE to help manage the screening and selection process. Duplicates were removed and then the titles and abstracts of search results were screened independently by two authors (NT, AH). The full text of all titles and abstracts (N = 38) that met the inclusion criteria were then screened independently by both authors. Any disagreements (N = 6) were resolved through consensus discussion by a third researcher (LK/CM).

### 2.3. Eligibility criteria

Eligible studies had to meet five inclusion criteria, as illustrated using the Population Intervention Comparison Outcome and study design (PICO(s)) criteria (Brown et al., 2006; McKenzie et al., 2019):

#### 2.3.1. Population

Participants were adolescents with a diagnosis of ASD as classified in DSM-IV or DSM-V or by ICD-10 based on physician-reported diagnosis or diagnosis instruments (at least 50% of the sample should have ASD) and included parents who are a caregiver of adolescents with ASD. Participants were adolescents aged between 10 and 19 years (World Health Organisation, 1989) (the sample had to consist of at least 80% of participants aged 10–19 years old)(Oppewal et al., 2018). Studies were conducted in Asian countries (the full list of countries is provided in supplementary material 1).

#### 2.3.2. Intervention

The intervention was social skills interventions (e.g., group-based intervention), which aims to enhance social skills for adolescents with ASD.

#### 2.3.3. Comparator

At this stage any comparator, including no comparator, was included.

#### 2.3.4. Outcomes

The interventions focussed on outcomes including 1) Social communication skill 2) Social cognition 3) Social comprehension 4) Social competence.

#### 2.3.5. Study design

Study designs were quantitative research studies consisting of experimental, quasi-experimental, observational studies (e.g., cohort and case control studies) and mixed-methods research (descriptive studies).

### 2.4. Data extraction

Data extraction was independently performed by two authors (NT, AH). NT carried out data extraction of all included papers (N = 15) and AH undertook extraction on 30% (N = 5) of the included papers (Higgins, 2011). Any disagreement (N = 2) in the extraction process was resolved by involvement of a third author (LK or CM). The data extraction used three coding frameworks to capture information on intervention content and structure (Template for Intervention Description and Replication [TIDieR] framework, (Hoffmann et al., 2014; Ke et al., 2017) and cultural adaptation [(Ecological Validity Model; EVM)(Bernal et al., 1995); (Supplementary material 2)]. The coding of the intervention structure was used to describe: Why (theoretical framework), What (research design, Intervention; development, type, component, collection method, outcome, and data collection time points), Who (participants, provider), How (mode of delivery, technology), Where (study setting, countries), When and how much (duration and result). The coding framework that was used for evaluating cultural adaptation was based on EVM model (Bernal et al., 1995). There are eight components including language, persons, metaphor, content, concepts, goals, methods, and context. Also, the questions to facilitate the process were adapted from study of [Al Maskari et al., (2018); (Table 1)].

#### 2.4.1. Quality assessment: risk of bias

Quality assessment was conducted by two researchers (NT and AH) and any disagreement was solved by a consensus discussion. Quality appraisal of included studies was undertaken using the tool of QualSyst (Kmet et al., 2004). Each study was assessed against 14 items. For each item that the study met the criteria for, "yes= 2; "partial" = 1; and "no" = 0. For some criteria, "not applicable" (n/a) was the rating given. A total score for each study is 28 [28- (number of "n/a"*2). Summary quality scores were reported as percentages of maximum total scores. The QualSyst scores were interpreted as strong quality (>80%), good quality (60–79%), adequate quality (50–59%), and poor methodology quality (<50%)(Kmet et al., 2004). The interrater agreement between two coders was calculated for 30% of studies and was assessed by using the weighted Cohen's kappa. The interobserver agreement for scoring the study quality was good (weighted Cohen's kappa = 0.72). No studies were excluded based on quality appraisal score. All studies were scored above 60% which acceptable level of sufficient quality (Kmet et al., 2004) (see Table 2).

### 2.5. Data analysis

Due to this high risk of bias in uncontrolled studies, we focussed solely on RCTs for the meta-analysis. Three RCT studies were eligible for inclusion in a meta-analysis (Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014), because that all reported pre- and post-intervention results for social skills knowledge, measured with the Test of Adolescent Social Skills Knowledge [(TAASK);(Laugeson et al., 2009)]. No other outcome measures were consistently reported in more than one RCT, The initial data were pooled in a statistical meta-analysis using Review Manager [(RevMan; version 5.4); (Higgins et al., 2022)]. The mean differences (MDs) and 95% confidence intervals (CIs) were estimated for a continuous outcome on social skills intervention, which was assessed by considering the similarities in the study design, setting, intervention, and outcome measurement. The statistical heterogeneity of studies was evaluated using $I^2$ which was interpreted as: 0–40%: may not be significant; 30–60%: may indicate moderate heterogeneity; 50–90%: may indicate substantial heterogeneity; 75–100%: substantial heterogeneity (Higgins et al., 2022).

The effect size estimates for each social skill were calculated and provided as only a descriptive indicator of an effect. The group design studies measured the effect size by calculating Cohen's *d* statistic (Cohen, 1977) using the effect size calculators [(https://lbecker.uccs.edu/)(Becker, 2000)]. The single-case design studies calculated effect size using the Tau-U statistic (Parker et al., 2011). WebPlot Digitizer 4.6 (Rohatgi, 2017) was used to extract the raw single-case data, which is reliable software (Moeyaert et al., 2016), and the effect size was calculated using web-based calculators [(http://singlecaseresearch.org)(Vannest et al., 2016)].

## 3. Results

### 3.1. Study selection

The database searches identified 332 potentially relevant papers and a further 9 papers were identified through hand and reference list searches. After duplicates were removed, 235 papers were excluded on reviewing the title and abstract. Study titles and abstracts were screened, and 38 papers were retained. The full text of these 38 papers was examined and checked against the inclusion criteria. A total of 32 papers were excluded; 19 papers did not fit with the age range criteria, 6 papers did not fit with the social skills intervention definition, 3 papers were unable to be accessed in full text, 1 paper did not fit the criteria for outcomes, 1 paper did not align with the criteria for study design, and 1 paper did not fit the criteria for Asian countries. In total, 15 eligible papers were identified. Fig. 1 shows the study selection process.

**Table 1**
Coding of cultural adaptation.

| Concept of EVM | Questions of Code |
|---|---|
| **1. Language** | Does the study report the use of a culturally appropriate language, idioms, regionalism words, and slang in both written and verbal forms while adopting intervention for autism? |
| **2. Persons** | Does the study highlight ethnic and interactional match considerations between the clients and accessors in the intervention process? |
| **3. Metaphors** | Does the study employ any verbal (e.g., folk sayings) and/ or visual forms (e.g., image, figure) of symbols that are shares with the population, while adopting instruments/ intervention for autism? |
| **4. Contents** | Does the study consider adapting the intervention' content to match the uniqueness culture of the study group? |
| **5. Concepts** | Does the study present any efforts to adapt clear and consistent constructs to the targeted culture? |
| **6. Goals** | Are the intervention goals constructed within the context of culture values, customs, and traditions? |
| **7. Methods** | Do the study methods facilitate smooth implementation for using intervention within the client's cultural context? |
| **8. Context** | Does the study consider the social, economic, historical, and political contexts of clients while using intervention? |

*Note:* EVM-Ecological Validity Model; adapted from "Systematic review: cultural adaptation and feasibility of screening for autism in non-English speaking countries", by T. S. Al Maskari, C. A. Melville, and D. S. Willis, 2018, *International journal of mental health systems,* 12, p. 22.

**Table 2**
Quality assessment.

| Authors | Question/objectivedescribed | Appropriatestudydesign | Appropriatesubjectselection | Characteristicssufficientlydescribed | Randomallocation | Researcherblinded | Subjectsblinded | Outcomemeasureswelldefinedandrobusttobias | Appropriatesamplesize | Analyticmethodswelldescribed | Estimateofvariancereport | Controlledforconfounding | Resultsreportedindetail | Conclusionsupportsbyresults | Totalscore | Percentage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rabin et al. (2018) | 2 | 2 | 2 | 2 | 2 | N/A | N/A | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 24 | 100 |
| Olcay-Gül and Tekin-Iftar (2016) | 2 | 2 | 1 | 1 | N/A | N/A | N/A | 1 | 0 | 1 | 1 | 1 | 2 | 2 | 14 | 63.63 |
| Chan et al. (2018) | 2 | 2 | 2 | 2 | N/A | N/A | N/A | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 20 | 90.90 |
| Shum et al. (2019) | 2 | 2 | 2 | 2 | 2 | N/A | N/A | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 24 | 100 |
| Yoo et al. (2014) | 2 | 2 | 2 | 2 | 2 | N/A | N/A | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 24 | 100 |
| Cheung et al. (2018) | 2 | 1 | 2 | 1 | N/A | N/A | N/A | 2 | 0 | 2 | 1 | 1 | 2 | 2 | 16 | 72.72 |
| Chung et al. (2016) | 2 | 2 | 2 | 2 | 1 | N/A | N/A | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 23 | 95.83 |
| (Hong et al., 2019) | 2 | 2 | 2 | 2 | N/A | N/A | N/A | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 21 | 95.45 |
| Crooke et al. (2016) | 2 | 2 | 2 | 1 | N/A | N/A | N/A | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 18 | 81.81 |
| Lee et al. (2016) | 2 | 2 | 1 | 1 | N/A | N/A | N/A | 1 | 0 | 2 | 1 | 1 | 2 | 1 | 14 | 63.63 |
| Hua et al. (2008) | 2 | 2 | 1 | 0 | N/A | N/A | N/A | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 15 | 68.18 |
| Lee et al. (2009) | 2 | 2 | 1 | 1 | N/A | N/A | N/A | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 15 | 68.18 |
| Chen et al. (2015) | 2 | 1 | 2 | 1 | N/A | N/A | N/A | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 14 | 63.63 |
| Lahiri et al. (2015) | 2 | 2 | 1 | 1 | N/A | N/A | N/A | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 15 | 68.18 |
| Hui et al. (2016) | 2 | 2 | 1 | 1 | N/A | N/A | N/A | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 16 | 72.72 |

*Note:* 2 =yes, 1 = Partial, 0 = No, N/A= Not applicable

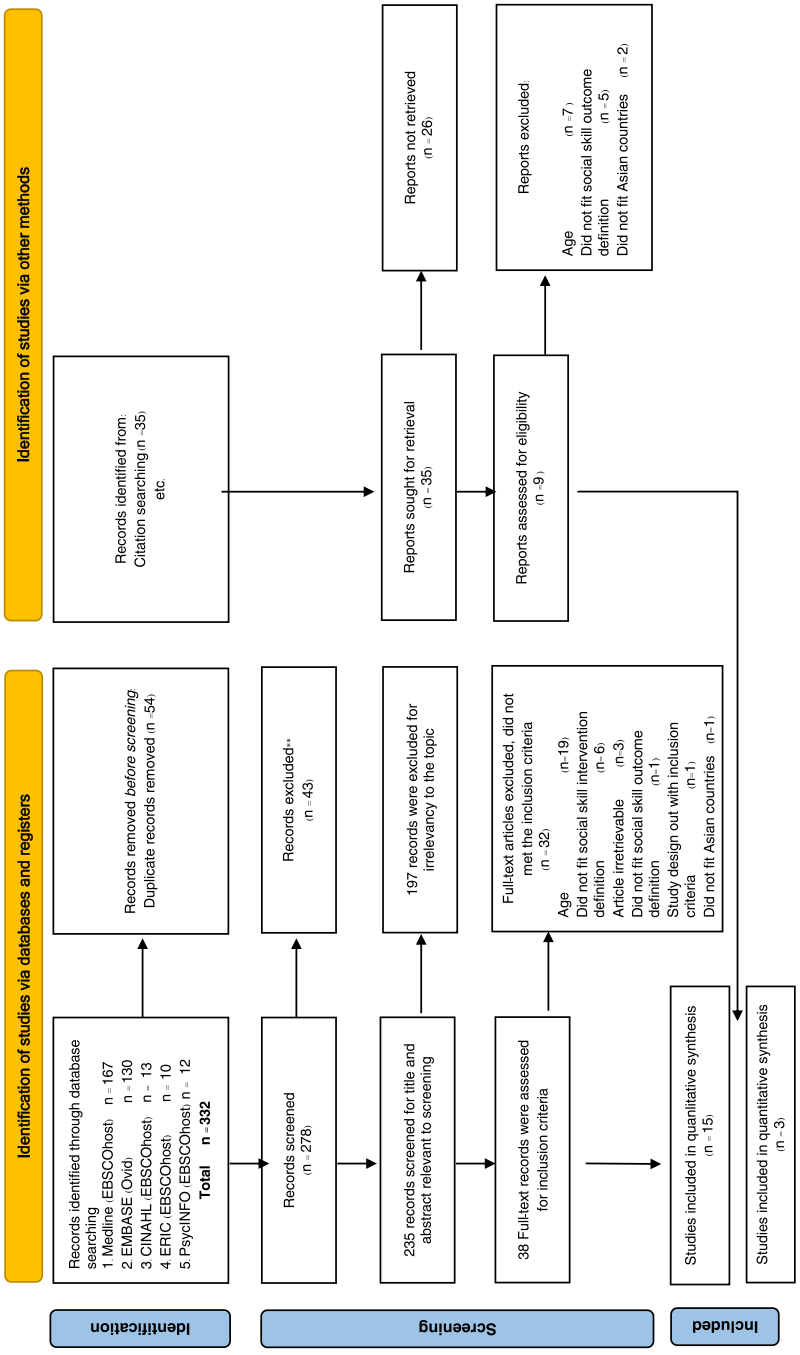


**Fig. 1. .** Selection process using PRISMA 2020 flow diagram.

### 3.2. Qualitative synthesis

#### 3.2.1. Study characteristics

*3.2.1.1. Country of origin.* This review included 15 papers which were conducted in Asian countries (comprising 7 nations), Hong Kong [(n = 5); (Chan et al., 2018; Cheung et al., 2018; Crooke et al., 2016; Lee et al., 2009; Shum et al., 2019)], South Korean [(n = 3); (Chung et al., 2016; Hong et al., 2019; Yoo et al., 2014)], Taiwan [(n = 3); (Chen et al., 2015; Hua et al., 2008; Lee et al., 2016)], Israel [(n = 1); (Rabin et al., 2018)], Turkey [(n = 1); (Olcay-Gül & Tekin-Iftar, 2016)], India [(n = 1); (Lahiri et al., 015)] and Singapore [(n = 1); (Hui, Schulze, Rudrud, & Leaf, 2016)]. The last 5 years (2015–2018), have seen an increased interest in social skills intervention in Asia, as demonstrated by the 14 studies that were published between 2015 and 2018, compared with one study published in 2008.

*3.2.1.2. Study design.* The majority of studies used quantitative designs (n = 13), including a multiple baseline design [(n = 5); (Chen et al., 2015; Hua et al., 2008; Hui et al., 2016; Lee et al., 2016; Olcay-Gül & Tekin-Iftar, 2016)], randomized controlled trials [(RCTS); (n = 3); (Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014)], quasi-experimental [(n = 2); (Chan et al., 2018; Lahiri et al., 2015)], pre-post test design [(n = 2); (Chung et al., 2016; Crooke et al., 2016)] and a retrospective cohort design [(n = 1); (Hong et al., 2019)]. Two were mixed method designs incorporating both qualitative and quantitative methods [(n = 2);(Cheung et al., 2018; Lee et al., 2009)]. A description of the fifteen studies included in the review is shown in Supplementary material 3 and the outcomes of these studies are reported in Supplementary material 4. The quality scores of the studies summary scores vary from 63 to 100. The following quality scores were obtained for studies: RCT (100%), pre-post test design (82–95%), quasi-experimental (68–90%), retrospective cohort design (72%), mixed method design (72%), and multiple baseline design (63–68%). Table 2 provides the quality assessment of these studies.

*3.2.1.3. Participant demographics.* The sample characteristics reported varied across studies, but information about the participants' diagnosis, gender, and intelligence quotient (IQ) was frequently reported. Across the 15 studies, a total of 397 participants were included. This sample included adolescents of both genders (male n = 347; 87.4%; female n = 50; 12.6%) aged between 9 and 19 years. In terms of diagnosis, 335 (85%) participants were identified as having ASD, 28 (7%) pervasive development disorders, and 15 (4%) Asperger syndrome, whilst 12 (3%) adolescents were described as having autistic features, and 4 (1%) adolescents were described as "typically developing" (i.e., without autism).

The majority of the studies recruited the participants by using IQ classification levels, such as a minimum IQ [ < 65–109,); (Chan et al., 2018; Chen et al., 2015; Chung et al., 2016; Crooke et al., 2016; Hong et al., 2019; Hua et al., 2008; Lahiri et al., 2015; Lee et al., 2016; Rabin et al., 2018; Yoo et al., 2014)]; an IQ above 70 (Chung et al., 2016; Crooke et al., 2016; Rabin et al., 2018; Shum et al., 2019); normal/average IQ level [ (90–109; (Lee et al., 2016)]; below average level [(80−89); (Chan et al., 2018; Chen et al., 2015; Hua et al., 2008; Lahiri et al., 2015)]; participants who have intellectual disabilities [(IQ<70; (Hong et al., 2019; Yoo et al., 2014)]; borderline intellectual disabilities [(70−79); (Chung et al., 2016; Crooke et al., 2016; Hui et al., 2016; Rabin et al., 2018; Shum et al., 2019)].

*3.2.1.4. Intervention characteristics.* Intervention coding was used to investigate the content and structure of social skills interventions in Asian countries. The characteristics of the type of intervention including the sample, setting, component of intervention, trainer and assistance role are summarised in Supplementary material 3.

The 15 studies are categorised into three intervention types based on who are involved in the delivery of the intervention (Ke et al., 2017).

***Parent-assisted interventions*** Six studies included a parent or caregiver as a co-therapist (Chan et al., 2018; Hong et al., 2019; Olcay-Gül & Tekin-Iftar, 2016; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). The interventions include PEERS, social story and CBT-Context-Based Social competence training (CBT-CSCA). A total of 326 adolescents and 3 caregivers reported outcome in these studies, with a wide range of sample sizes of 3 (Hua et al., 2008) to 110 (Hong et al., 2019), and participants ranged in age from 11 to 19 years. Twenty-five participants were described as having low-average intelligence (Chan et al., 2018), 113 participants had borderline intelligence (Rabin et al., 2018; Shum et al., 2019), 157 participants had low intelligence (Hong et al., 2019; Yoo et al., 2014). The cognitive of ability of 6 participants was not provided (Olcay-Gül & Tekin-Iftar, 2016).

All studies using parent-assisted interventions involved combining behaviour modification techniques, promoting generalisation by didactic teaching with a variety of stimuli, creating opportunities for adolescents with ASD to learn from a variety of environments and providing feedback and support for parents through coaching. All parents and adolescents received homework assignments and practised generalised skills outside of the session. However, the completion rate of homework in PEERS studies of Korean adolescents was less than 50% because these participants had extra activities [(e.g., sports practise, attending private tutoring institutions); (Yoo et al., 2014)].

Studies were conducted in a hospital (Hong et al., 2019; Rabin et al., 2018; Yoo et al., 2014), community service centre (Shum et al., 2019) and combination of settings including rehabilitation centres, houses and natural settings (Chan et al., 2018; Olcay-Gül & Tekin-Iftar, 2016). Interventions ranged in duration from 14 to 35 sessions and the components focussed on the maintenance of social skills ranged in duration from 4 weeks to 4 months. The Hebrew adaptation of PEERS increased the number of training sessions from 14 to 16 (Rabin et al., 2018). Due to feedback from clinicians and families that the lessons contain too much information, the lessons have

been revised(Rabin et al., 2018).

All studies used interventions that were based on programmes from western countries. Four studies trialled a translated and modified version of the UCLA programme (PEERS), including trials in Hebrew (Rabin et al., 2018), Chinese (Shum et al., 2019), and Korean (Hong et al., 2019; Yoo et al., 2014). No other social skills programmes were used in more than one study.

***Technology-based interventions*** Four studies evaluated the effects of technology-based interventions on social skills of adolescents with ASD. These studies included Prosocial online game [(game-CBT); (Chung et al., 2016)], application Cliplets-Based Video [(CBV); (Lee et al., 2016)], and immersive technologies including Augmented Reality [(AR); (Chen et al., 2015)] and Virtual Reality-based simulation [(VR); (Lahiri et al., 2015)]. A total of 41 adolescents participated in these studies, with sample sizes ranging from 3 (Chen et al., 2015) to 20 (Chung et al., 2016) and participants from 11 to 18 years. Twenty participants were described as having borderline intelligence (Chung et al., 2016), 15 participants had low average intelligence (Chen et al., 2015; Lahiri et al., 2015), and 6 participants had average intelligence (Lee et al., 2016). The interventions were delivered in hospital settings (Chung et al., 2016; Lahiri et al., 2015) and school settings (Chen et al., 2015; Lee et al., 2016). Interventions ranged in duration from 2 sessions to 18 sessions.

All studies of technology-based interventions used technology-based teaching and other learning strategies, the Cliplets-Based Video included discussion (Lee et al., 2016), for the AR and VR intervention the study included asking questions and feedback (Chen et al., 2015; Chung et al., 2016; Lahiri et al., 2015). Additionally, the intervention of online game CBT and VR intervention allowed participants to practise communication with an avatar (Chung et al., 2016; Lahiri et al., 2015). All technology-based interventions were based on theoretical models originally developed in Western countries (e.g., USA) included the cognitive behaviour therapy (Chung et al., 2016) and theory of mind (Chen et al., 2015; Lahiri et al., 2015; Lee et al., 2016).

***Staff-direct instruction intervention*** Five studies included healthcare professionals as therapists (Cheung et al., 2018; Crooke et al., 2016; Hua et al., 2008; Lee et al., 2016). A total of 55 adolescents with ASD participated in these studies, with sample sizes ranging from 1 (Hua et al., 2008) to 39 (Crooke et al., 2016). Participants ranged in age from 9 to 15 across the studies. Thirty-nine participants were described as having borderline intelligence (Crooke et al., 2016), 1 participant was low average (Hua et al., 2008), four participants had below borderline intelligence (Hui et al., 2016), and 11 participants did not provide the cognitive ability (Cheung et al., 2018; Lee et al., 2009). Participants attended school (Crooke et al., 2016; Hua et al., 2008; Lee et al., 2009), clinic (Cheung et al., 2018) and integrated between clinic and school (Hui et al., 2016).

All studies were delivered by staff (e.g., psychiatrists, psychologists, special educators, social workers) and combined teaching, role-playing, and rehearsal techniques. Two studies had a component generalising skills with peers (Hua et al., 2008; Hui et al., 2016). Interventions ranged in duration from 8 sessions to 29 sessions. All staff-direct instruction interventions were based on theories from western countries (e.g., USA), such as social cognitive (Crooke et al., 2016; Lee et al., 2016), theory of mind (Cheung et al., 2018; Hua et al., 2008), and Applied Behaviour Analysis (ABA) (Hui et al., 2016). Studies by Crooke et al. (2016) and Lee et al. (2009) were adapted from the Think Social Programme to the Hong Kong version. Cheung et al. (2018)'s adapted the Friendship Lab programme and translated the programme into Chinese.

## 4. Study results

### *4.1. The effectiveness of social skills interventions for adolescents with ASD in Asian countries*

The social skills outcomes were completed by adolescents with ASD and their caregivers. Twelve studies used feedback from multiple respondents (e.g., adolescents with ASD, caregivers, teachers, staff, technologies), while 4 studies used only staff information (Chen et al., 2015; Hua et al., 2008; Hui et al., 2016; Lahiri et al., 2015).

A number of methods were employed to evaluate social skills studies including rating scales, tests and observations. Four studies used observation methods (Hua et al., 2008; Hui et al., 2016; Olcay-Gül & Tekin-Iftar, 2016; Rabin et al., 2018), two studies used social skills questionnaires combined with physical testing, including functional magnetic resonance imaging (fMRI)scanning to detect brain activity in response to emotional words (Chung et al., 2016) and eye tracker goggles were used to evaluate the component of conversation based on engagement (e.g., gaze pattern, pupils dilation, blink rate) (Lahiri et al., 2015).

Ten studies reported follow-up assessments ranging from 2 weeks to 4 months post intervention (Chan et al., 2018, 2015; Cheung et al., 2018; Hua et al., 2008; Hui et al., 2016; Lee et al., 2016; Olcay-Gül & Tekin-Iftar, 2016; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014), while others included pre-and-immediate post-intervention measurements (Cheung et al., 2018; Crooke et al., 2016; Hong et al., 2019; Lahiri et al., 2015; Lee et al., 2016; Lee et al., 2009).

The social skills outcomes, measurement tools, results of studies, and effect size are provided in Supplementary Material 4. One social skill outcome was measured in four studies of individual interventions (Chen et al., 2015; Hui et al., 2016; Lahiri et al., 2015; Lee et al., 2016; Olcay-Gül & Tekin-Iftar, 2016), three studies of group-based intervention (Chan et al., 2018; Crooke et al., 2016; Lee et al., 2009) and the study combination of individual and group base intervention (Hua et al., 2008). The integrated outcomes of six group-base interventions were measured [(i.e., combination of social skills); (Cheung et al., 2018; Chung et al., 2016; Hong et al., 2019; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014)]. The social skills outcomes measured across the 15 studies can be categorised under 3 themes; social communication (Laugeson & Ellingsen, 2014), social cognition (Baron-Cohen et al., 1985; Laugeson & Ellingsen, 2014; Leekam, 2016) and social competence (Spence, 2003).

**Social communication** Eight studies evaluated the effectiveness of programmes on social communication (Chung et al., 2016; Crooke et al., 2016; Hong et al., 2019; Lahiri et al., 2015; Lee et al., 2009; Olcay-Gül & Tekin-Iftar, 2016; Rabin et al., 2018; Yoo et al., 2014) in various terms. Social communication was related to: 1) conversation skill (Hong et al., 2019; Lahiri et al., 2015; Rabin et al., 2018; Yoo et al., 2014), 2) the combination of initiation, listening with eyes/brain, abstract and inferential language, understand and

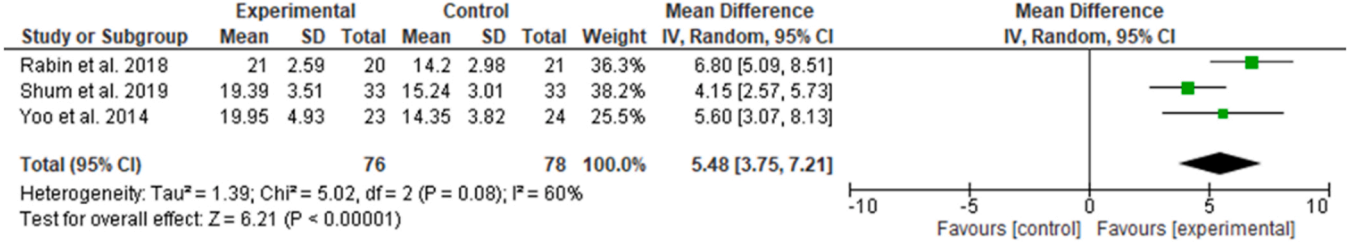


**Fig. 2.** Forest plot of intervention group VS waiting list group on social skills knowledge.

gestalt (Crooke et al., 2016; Lee et al., 2009), 3) basic of communication [(greeting, expressing feeling, asking); (Olcay-Gül & Tekin-Iftar, 2016)] and 4) chatting and understanding the emotional words (Chung et al., 2016). The social communication measurement tool used varied across studies and included the use of Conversation Skill Contextual assessment of social skills [(CASS); (Rabin et al., 2018)], Social Communication Questionnaire [(SCQ); (Chung et al., 2016; Hong et al., 2019; Yoo et al., 2014)], ILAUGH scale (Crooke et al., 2016), Social Thinking Rating scales [(STRS); (Lee et al., 2009)], and the use of eye tracker googles (Lahiri et al., 2015).

Four parent-assisted programmes resulted in significant improvements in social communication among the adolescents in the study. Three studies using the PEERS programme reported significant improvements on CASS (F [9,28] =5.26, p.001) and SCQ scores (Hong et al., 2019; Yoo et al., 2014). One social story study (Olcay-Gül & Tekin-Iftar, 2016) significantly increased 90% of the target social communication behaviour. Furthermore, two studies of technology-integrated interventions found that AR (Lahiri et al., 2015) improved social communication performance ($p = .0102$) and that prosocial online games (Chung et al., 2016) improved social communication quality in both groups ($z = 2.84$, p.01). Two studies of staff-direct instruction interventions (Crooke et al., 2016; Lee et al., 2016) of the Social Thinking Adaptation Programme used different structure, session, and tool measurements.

**Social cognition** Five studies tested the efficacy of programmes on social cognition (Chen et al., 2015; Cheung et al., 2018; Chung et al., 2016; Hua et al., 2008; Lee et al., 2016). Social cognition is related to Theory of Mind [(ToM); (e.g., understanding the mental state of others);(Cheung et al., 2018; Hua et al., 2008)], emotional recognition (Chen et al., 2015; Chung et al., 2016), perception and judgement of facial expressions in social situations (Lee et al., 2016). The measurement tool used for social cognition varied across studies including, The Theory of Mind Inventory – Second Edition (ToMI-2), The Strange Stories Test (Cheung et al., 2018), Test of Theory of Mind [(TToM); (Hua et al., 2008)], used fMRI to find out how emotional words affect brain activity (Chung et al., 2016), used scenarios to test emotional recognition (Chen et al., 2015), used questionnaires to test understandings of emotion in social situations with interviews parents and therapists (Lee et al., 2016).

Two studies of staff directed instruction interventions (Cheung et al., 2018; Hua et al., 2008) found that there was a significant increase in theory of mind; however, in the study of Cheung et al. (2018), this was not maintained at follow-up. Three studies of technology-integrated interventions (Chen et al., 2015; Chung et al., 2016; Lee et al., 2016) revealed improved TOM on responses to facial and emotional recognition, perception and judgement of facial and emotional expressions in social situations, and changes in blood flow in the brain in response to emotional words.

**Social competence** Seven studies tested the efficacy of programmes on social competence (Chan et al., 2018; Cheung et al., 2018; Hong et al., 2019; Hui et al., 2016; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014) which included social skills knowledge, social engagement, social responsiveness, social behaviour and social skills.

***Social skills knowledge*** Four parent-focussed studies evaluated the social skills knowledge (Hong et al., 2019; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014) in terms of having a reciprocal two-way conversation, using verbal and non-verbal communication skills, expanding peer networks by identifying relevant activities, starting and ending conversation with peers, appropriate methods for handling teasing. All studies of PEERS tested efficacy knowledge of social skills by using Test of Adolescent Social Skills Knowledge (TASSK), which was translated into Hebrew (Rabin et al., 2018), Chinese (Shum et al., 2019), and Korean version (Yoo et al., 2014). The pooled result from three RCTs, measuring social skills knowledge using the TASSK was 5.48 (95%CI, 3.75–8.13, $p < .0001$), showing a significant potential improvement in social skills knowledge from the PEERS programme. The heterogeneity was moderate ($I^2$ =60%; Fig. 2).

***Social engagement*** Three parent-focussed studies evaluated social engagement (Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014) using the Quality of Play Questionnaire for Adolescents (QPQ-A); Quality of Play Questionnaire for Parents [(QPQ-P); (Shum et al., 2019; Yoo et al., 2014)], and Quality of Socialization Questionnaire [(QSQ); (Rabin et al., 2018)]. The findings revealed that in two studies, the PEERS programme significantly (Rabin et al., 2018; Yoo et al., 2014) improved social engagement. However, PEERS in the Chinese version showed a nonsignificant improvement on QPQ (Shum et al., 2019).

***Social responsiveness*** Three parent-focussed studies (Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014) tested the efficacy of a programme on social responsiveness in terms of the severity of social impairments associated with ASD in social situations by using different versions of the Social Responsiveness Scale [(SRS); (Yoo et al., 2014)] and SRS-2 (Rabin et al., 2018; Shum et al., 2019). These programmes resulted in significant improvements in overall social responsiveness.

***Social behaviour*** Two studies (Hua et al., 2008; Hui et al., 2016) tested the efficacy of staff instruction interventions on specific social behaviours. The measurement of these studies was observed behaviour for each target skill. The teaching interactions procedure (Hui et al., 2016) showed that all participants were improved on each target skill after receiving the intervention. ToM and social skills intervention (Hua et al., 2008) also show that the participants changed their social behaviour to be more appropriate and was improved in social interaction (73%).

***Social skills*** Three studies evaluated social skills (Chan et al., 2018; Cheung et al., 2018; Rabin et al., 2018) according to different terms, including: the 7 domains of social competence, including social motivation, social knowledge, verbal conversational skills, nonverbal sending skills, emotion, and cognition (Chan et al., 2018), and the combination of communication, cooperation, assertiveness, responsibility, empathy, engagement, and self-control (Cheung et al., 2018; Rabin et al., 2018). The Chinese Version Social Skills Improvement System (SSIS-RS-C) (Cheung et al., 2018), SSIS (Rabin et al., 2018), and Multidimensional Social Competence Scale-Chinese Version (MSCS-C) (Chan et al., 2018) were used to assess social skill. Two studies of parent assisted programmes (Chan et al., 2018; Rabin et al., 2018) significantly improved social skills scores. According to parent reports, all CBT-CSCA programme (Chan et al., 2018) participants improved significantly on the MSCS-C ($p = .001$). However, no statistically significant differences in adolescent self-reported behaviour were found ($p = .123$). In the Hebrew version of PEERS (Rabin et al., 2018), all participants improved on the SSIS as rated by parents ($p < .001$) and teachers ($p = .08$). Furthermore, one study of a staff-direct instruction

**Table 3**
Cultural adaptation social skills intervention for adolescent with ASD.

| Authors | Country | Theoretical model | Intervention development /name of original intervention | Language | Persons | Metaphor | Content | Concept | Goal | Methods | Context |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Rabin et al. (2018) | Israel | - | PEERS | + | + | - | + | + | - | + | + |
| Chan et al. (2018) | Hong Kong | Social competence, cognitive behaviour therapy | Cultural adaptation process (CAP) and social competence model | - | + | - | + | + | + | + | + |
| Shum et al. (2019) | Hong Kong | - | PEERS | + | + | + | + | + | + | + | + |
| Yoo et al. (2014) | South Korea | | PEERS | + | + | - | + | + | + | + | + |
| Cheung et al. (2018) | Hong Kong | Social cognitive and Theory of mind | Friendship lab programme | + | + | - | + | - | - | - | - |
| (Hong et al., 2019) | South Korea | - | PEERS | + | - | - | - | - | - | - | - |
| Crooke et al. (2016) | Hong Kong | - | Think social (Winner,2000) | + | + | + | + | + | - | + | - |

*Note:* + Data report, - No data report

intervention (Cheung et al., 2018) improved on SSIS-RS-C (Chinese version). The results showed that the SSIS-RA-C scores increased at the post-test, but this effect was not maintained at follow-up.

### 4.2. Cultural adaptation of social skills interventions

The EVM model (Bernal et al., 1995; Bernal et al., 2009) was used to investigate the extent to which the social skills interventions included in this review had undergone cultural adaptation (Table 3). Attempts at cultural adaptation were evident in seven of the included studies (Chan et al., 2018; Cheung et al., 2018; Crooke et al., 2016; Hong et al., 2019; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). Drawing on the framework of Bernal's EVM model (Bernal et al., 1995; Bernal et al., 2009), cultural adaptation of the interventions is discussed here in relation to eight dimensions:

**Language:** Five studies reported the process of linguistic adaptation translation (translation from English to their own language) and the content was reviewed by healthcare professionals (Cheung et al., 2018; Crooke et al., 2016; Hong et al., 2019; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). Additionally, these studies reported the use of culturally appropriate language (i.e., idioms, words, and slang) while adopting intervention. For example, the Chinese version of the PEERS changed the term "knock-knock jokes" to "panda Jokes" to represent silly jokes. Also, in the Korean version, the term "knock-knock jokes" was changed to "greeting joke". These were changed to reflect what was commonly used in their culture.

**Persons:** Six studies addressed the ethnic and interpersonal compatibility of study participants and investigators (Chan et al., 2018; Cheung et al., 2018; Crooke et al., 2016; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). By pilot testing the intervention, (Chan et al., 2018; Crooke et al., 2016; Shum et al., 2019), interviewing caregivers, patients and trainers for received feedback (Cheung et al., 2018; Rabin et al., 2018), and surveying adolescents to identify cultural context in their community, the therapists clarified the characteristics of the cultural group (Shum et al., 2019; Yoo et al., 2014). The original intervention of PEERS emphasised the role of parents as co-therapists. PEERS' Chinese version (Shum et al., 2019) discovered that social coaching is not typically practised in Chinese culture. Therefore, the protocol and handout for this adaptation intervention incorporated parental coaching strategies. Also, the training session was extended in Hebrew version (Rabin et al., 2018). This changed encourage the parents and the clinician can teach their adolescents in two-way communication and starting conversation with their peers. This dimension contributes to the development of cooperation among treatment participants.

**Metaphor:** Two studies replaced verbal symbols (Rabin et al., 2018) and visual symbols (Crooke et al., 2016) from the original intervention in an adapted intervention. Shum et al. (2019) reworded the original session's good sportsmanship to "Hevreman" in Hebrew which refers to person who is likeable but not naive. Crooke et al. (2016) developed a set of social photos that showed Chinese local social scenarios and activities in support to their [Social Think in Hong Kong] study participants' work. This dimension helps participants in their engagement with the programme.

**Content:** Six studies integrated content of local culture, values, customs and traditions in their interventions (Chan et al., 2018; Cheung et al., 2018; Crooke et al., 2016; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). In these studies, the researchers considered the cultural knowledge when delivering and assessing the programme including local social activities and adolescents' social networks (Chan et al., 2018; Cheung et al., 2018; Crooke et al., 2016; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014), as well as parenting styles (Shum et al., 2019). For instance, the adaptation of the PEERS Hebrew version (Rabin et al., 2018) altered the intervention's social activities by omitting uncommon Israeli activities (e.g., going to the lake, playing hockey, badminton, or baseball) and modified the "get together" session to local customs of showing the visitor only the kitchen and the bathroom. The findings indicated that participants were capable of completing this activity. Compare the results to the same "get together" session in the PEERS Chinese version that retained the original activities conducted in North America (Laugeson & Ellingsen, 2014). The frequency of engaging in this activity has not significantly increased. This activity may be incompatible with local Chinese culture.

**Concepts:** Five studies demonstrated attempts to adapt clear and consistent constructs to targeted culture (Chan et al., 2018; Crooke et al., 2016; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). PEERS in Hebrew, Korean and Hong Kong version identified term of culture in their society (Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). Shum et al. (2019), for example, identified terms of cultural values and parenting practises between Hong Kong and other Chinese society. Chan et al. (2018) designed domains of social competence into four training modules which focus on Chinese social context and researchers were translated and validated the MSCS into Chinese. The other study of Crooke et al. (2016) adapted the Think Social intervention (USA) and investigated the outcome for teaching social behaviours to Chinese individuals. This programme also investigated the needs of participants for the programme 's implementation.

**Goals:** Three studies constructed intervention goals within the context and knowledge of values, customs and traditions of interventions (Chan et al., 2018; Shum et al., 2019; Yoo et al., 2014). For example, the PEERS in Hong Kong (Shum et al., 2019) version aimed to identify in terms of cultural valves and parenting practises because this study hypothesised that parent-child interaction and parenting styles might effect when this programme implemented in Asian countries. Also, the PEERS in Korean version (Yoo et al., 2014) identified in term of the culturally sensitive on Korean teen (e.g., extracurricular activities, method for making friend, diversity issue in Korean culture, popular hobbies and social network) and changed. Also, CBT-CSCA in Hong Kong (Chan et al., 2018) intended to identify culturally sensitive social contexts (e.g., dining out with family members) and designed a social competence module for the training programme.

**Methods:** Five studies attempted to incorporate cultural knowledge into the intervention methodology, modified intervention method and measurement to fit the cultural context (Chan et al., 2018; Crooke et al., 2016; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). Shum et al. (2019) found that Chinese parents are typically as competent in providing social coaching to their teens as are parents in Western societies. The delivery of the PEERS was modified across the studies testing this intervention. For example, role

playing, behavioural rehearsal exercises in parent groups were added. The coaching handout for parents and social rules for teens were developed and included in the behavioural rehearsal exercise in the Korean adaptation of PEERS. The number of sessions in Hebrew was increased to meet the needs of trainers and participants (Rabin et al., 2018).

**Context:** Four studies considered the contextual issues; social, economic, historical, and political contents, that may affect the intervention within each culture (Chan et al., 2018; Rabin et al., 2018; Shum et al., 2019; Yoo et al., 2014). These studies consider the methods, task and procedure when migrating the intervention to the participant's culture. When adapting the intervention to the participant's culture, these studies take into account the method, task, and procedure. Chan et al. (2018) created activities and games based on Chinese popular culture. They renamed the session "Appropriate use of humour" information about racial, ethnic, or religious groups as "jokes regarding disability, religion, gender, facial/physical appearance, and race" to reflect the importance of diversity and added the most popular examples of social networking sites.

All studies tested the effectiveness of the adapted and translated interventions. The findings indicate that customised interventions in Asian countries are more effective at improving social skills outcomes for adolescents with ASD.

## 5. Discussion

This study used systematic review methodology to investigate the effectiveness and cultural adaptation of social skill interventions for adolescents with ASD in Asian countries. Overall, studies showed that social skills programmes for adolescents with ASD seemed to improve social skills and that many of these programmes had undergone cultural adaptation to make them more appropriate and effective for the populations they intended to engage.

Participants in all types of interventions (i.e., parent-assisted, technology – based, and staff-directed instruction interventions) have a heterogeneous diagnosis and varied cognitive ability (IQs >65). However, the participants in technology-integrated intervention (i.e., VR, AR) and those that teach complex social skills such as social cognition, social competence (i.e., CBT, Theory of Mind) have IQs between 80 and 90. Researchers reported that participants had IQs greater than those who played online games in studies that used VR and AR technology. This finding is consistent with Malihi et al. (2020) 's previous finding that ASD with high IQs (85−110) have a greater ability to utilise VR than ASD with a low IQs. (Mosher et al., 2021). However, these studies did not compare participants' IQs when VR and AR were used to train social skills. Future researchers should take into account participants' performance when utilising technology to improve social skills.

Stakeholders' perspectives are important in the process of culturally adapting social skills interventions for use by adolescents with ASD in Asia. Involving stakeholders in the adaptation of programmes should gather information from individual's on their perspective of interventions and the relevance of the cultural context (e.g., adolescents with ASD, caregivers) and groups (healthcare professionals) who have past and current experience with social skills intervention (Conde et al., 2005). However, PEERS' Korean (Yoo et al., 2014) found that the completion rate of homework activities was low because, due to the social context, adolescents in these studies had extra activity. Thus, in future studies researchers should ask about the barriers to implementing the adaptation intervention (e.g., delivery processes), which can provide more facilitation in engaging participants in programmes. Similarly, Castro et al. (2010) suggested that the process to adapt interventions should explore the positive and negative intervention components described in the published evidence about the parent intervention.

Previous research discovered that it is difficult for adolescents with ASD to generalise skills across contexts (Gates et al., 2017; Ke et al., 2017; McMahon et al., 2013). In the studies included in this review, family members were frequently involved in ASD social skills programmes. Family members were used as co-therapists in all studies of parent-assisted interventions and can coach and mentor adolescents with ASD in their natural environment. Parents can encourage their children to practise social skills in everyday situations, which is important because individuals with ASD may have trouble generalising skills across settings [(i.e., relating new stimuli to previous experience); (de Marchena et al., 2015; Rimland, 1964)]. In addition, two studies of staff-assisted interventions (Hua et al., 2008; Hui et al., 2016) used peers to practise generalisation skills with adolescents with ASD. Therefore, the use of family members and peers to facilitate the generalisation of social skills seems to be a key component of social skills programmes for adolescents with ASD in Asia.

The outcomes of social skills are conceptualised and measured differently across the studies included in this review. Each study defines what constitutes a positive social skills outcome differently. Consider social communication, for example, which has been quantified in seven studies using at least four distinct assessments and definitions (e.g., CASS, SCQ, SCQ-K, ILAUGH). Additionally, some outcome measures (e.g., (Crooke et al., 2016; Rabin et al., 2018) were developed specifically for the study and focus on one or two aspects of social skills only. Because of the very high number of measures used, comparing treatment outcomes across studies has proven difficult. Over 60% of studies measured the outcome from multiple respondents (i.e., ASD, care givers, peers, medical staff who are the trainers). Furthermore, one study (Rabin et al., 2018) developed an observation measurement from the trainer's perspective. These methods may help to mitigate the bias inherent in evaluating the effectiveness of intervention, as intervention tools are frequently self-reporting. This is the issue that was discovered in a previous study (McMahon et al., 2013), which found expectancy biases can hide or exaggerate treatment effects when outcomes are measured using only one method (e.g., a questionnaire or observation) and a small number of informants (like parents or teachers).

### *5.1. The effect of cultural adaptation on social skills interventions for adolescents With ASD In Asia 's countries*

The cultural adaptation process is important when researchers adapt an intervention from Western countries. There was strong evidence that cultural adaptation had been appropriately used in the included studies (Rathod et al., 2018; Soto et al., 2018). Adapting

a social skills intervention for adolescents with ASD in Asian cultures requires an understanding of the cultural language, social context of the local culture, and the cultural characteristics of group participants in order to modify the intervention's content and structure. These modifications can result in an increase in the effectiveness of teaching strategies and methods, as well as cooperation and engagement with the training. The adaptation process ensures the programme's acceptability, relevance, comprehensibility, and completeness. Acceptability of the cultural tool and method modification based on language, context and content. Furthermore, Kumpfer et al. (2017) discovered that cultural adaptation of family evidence-based interventions can increase family engagement by approximately forty percent. Although the evidence in this review illustrates a positive approach to the development of culturally relevant social skills programmes for adolescents with ASD, there are numerous countries where no research has been done, especially those in South Asia, such as Thailand, where data on the effectiveness and cultural adaptation of social skills treatments for adolescents with ASD is scarce. Future research focussing on the effectiveness of social skills programmes in these countries and how they can be adapted for a wider population would be important.

Of the studies included in this review, some suggest that social skills interventions can improve the social communication, social cognition, social competence, and social skills knowledge of adolescents with ASD. The scale of these improvements are similar to the effects seen in studies in Western countries, which suggests that the cultural adaptation processes have successfully tailored the programmes to the Asian cultural contexts. However, the total number of participants included in studies to date is very small, and the heterogeneity of outcome measures used in the studies described here means further RCTs are needed.

## 6. Implications and limitations

The findings reported here are valuable for informing the development and cultural adaptation of social skills interventions for adolescents with ASD in Asian countries. The review included studies published in the English language only. This might have limited the findings since studies that have been reported in non-English languages were excluded. It is possible that information about social skills training programmes may be available in other, non-published literature across relevant Asian countries, however, that was outwith the scope of this review. Given that the study does not compare interventions that underwent cultural adaptation to those that did not, future studies could seek to compare cultural adaptation interventions. Since there are only three RCTs included in the meta-analysis, researchers should aim to improve the rigour of future studies examining the effectiveness of social skills interventions for young people with ASD.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data Availability

No data was used for the research described in the article.

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## Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.rasd.2023.102163.

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