

Health professional education in autism and intellectual disability: systematic review

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Background

Health and mental health professionals often lack knowledge and confidence to provide quality healthcare to people with intellectual disability and those on the autism spectrum. Educational interventions are proposed as solutions, but their effectiveness and optimal characteristics remain unclear.

Aims

To evaluate the effectiveness of educational interventions in improving health professionals' knowledge, skills, attitudes, confidence and/or self-efficacy in providing care to people with intellectual disability and those on the autism spectrum.

Method

A mixed-methods systematic review was conducted searching six major databases, adhering to PRISMA guidelines (PROSPERO CRD42022309194). Studies were included if they assessed outcomes of educational interventions aimed at improving health professionals' capacity to provide care to people with intellectual disability and/or those on the autism spectrum.

Results

We identified 34 studies: five focused on intellectual disability, two on intellectual and developmental disabilities, and 27 on autism. All reported positive findings, although heterogeneity of measures limited synthesis. Most studies (30 out of 34)

employed single group pre-test/post-test designs, with only nine using validated outcome measures. Only eight studies reported co-design or co-delivery involving people with lived experience.

Conclusions

Educational interventions demonstrate positive effects on health professionals' capacity to provide care. Significant gaps include limited evidence for adult-focused interventions, uncertainty about optimal delivery modes and duration, and minimal inclusion of people with lived experience in intervention design and delivery. Future interventions should involve people with lived experience in design and delivery, and incorporate validated outcome measures to enhance evidence quality.

Keywords

Intellectual disability; autism; health; mental health; health professional education.

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Health and mental health professionals lack knowledge and confidence to provide healthcare to individuals with intellectual and developmental disabilities¹ and autistic individuals.² Negative attitudes have also been reported, contributing to stigma.³ This contributes to poorer health outcomes, a finding that has been highlighted as contributing to neglect and inadequate treatment in inquiries in Australia⁴ and England,⁵ prompting recommendations for education at undergraduate, postgraduate levels and in the workplace for practising professionals.⁶ England has introduced legislation to mandate this training for all health and social care staff.⁷ Education in this area needs to increase knowledge about the nature of intellectual disability and autism, as well as to understand some of the diagnostic and management issues that are important in providing healthcare, including diagnostic overshadowing.⁸

However, the evidence for such education to change knowledge, attitudes and confidence is unclear. Some recent systematic reviews have investigated some aspects of this question, including a systematic review of post-graduate medical education in training programmes,⁹ and a systematic review of outcomes of autism-related training for physicians.¹⁰ Whether there is a minimum dose (either in duration or frequency) of education required to maintain improved knowledge and attitudes is also unclear, but of relevance to employers, as this education will need to be conducted in paid work hours. In recent years, there have also been calls for improved standards of evaluation of education, including use of standardised outcome measures and improved quality of study design.¹¹ The inclusion of individuals with intellectual disability and autistic individuals is valued and recommended in research in this area, and

embedding these principles in research design and delivery is an emerging focus in the literature.¹²

The objective of this review was to evaluate the evidence base for the use of educational interventions to build the capacity of health professionals to work more effectively with individuals with intellectual or developmental disabilities, including autistic individuals. This included answering the following questions:

- Is education effective in improving knowledge, attitudes, confidence and/ or self-efficacy of healthcare professionals to provide healthcare to individuals with intellectual or developmental disabilities?
- What is the frequency and nature of the involvement of individuals with intellectual or developmental disabilities, including autistic individuals?
- Are there particular modes, or duration of education that are more effective?
- What outcome measures are used to evaluate effectiveness of education in this area?

Method

Our systematic review is reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement,¹³ and the corresponding checklist can be viewed in Supplementary Table 1 available at <https://doi.org/10.1192/bjo.2025.10842>. The protocol was prospectively registered with PROSPERO (CRD42022309194) on 24 March 2022.¹⁴

Table 1 Search terms			
Participants	Intervention	Population	Outcomes
'staff' OR 'health* work*' OR 'clinician*' OR 'health professional*' OR 'health practitioner*' OR 'nurs*' OR 'psych*' OR 'social worker*' OR 'occupational therapist*' OR 'paramedic' OR 'gp' OR 'general practitioner*' OR 'family medicine practitioner*' OR 'paediatric*' OR 'physician*' OR 'doctor*' OR 'resident*' OR 'intern*'	strateg* OR intervention* OR model* OR education OR train* OR 'medical education'	'intellectual disabilit*' OR 'Complex communication need*' OR 'Developmental disabilit*' OR 'Intellectual handicap*' OR 'Intellectual impairment*' OR 'Learning disabilit*' OR 'Mental handicap*' OR 'Mental retardation' OR 'autis*' OR 'asperger*'	capacity OR knowledge OR awareness OR attitude* OR 'skill*'

Eligibility criteria

To be included, studies had to report quantitative and/or qualitative outcomes of educational interventions aimed at building the capacity of health professionals to work effectively with individuals with intellectual or developmental disabilities (including autistic individuals) of any age. Outcomes included clinician knowledge, attitudes, confidence (a broad term in earlier research) and/or self-efficacy (context-specific confidence). The focus was on qualified health professionals (e.g. medical, nursing, allied health), not undergraduate students; studies with mixed cohorts required >50% healthcare professionals to be eligible. This distinction reflects differing educational needs and motivations between practising clinicians and students. Eligible interventions used any method or mode of training, but needed a clear goal of enhancing clinical care capacity not solely diagnostic- or treatment-specific training.

Studies were included if they met all the following:

- (a) participants were health professionals working in main-stream (non-specialist intellectual disability, intellectual and developmental disabilities, or autism health) settings, including community and hospital settings;
- (b) interventions aimed to build clinician capacity to work effectively with individuals with intellectual or developmental disabilities (including autistic individuals) and included an educational component;
- (c) quantitative and/or qualitative within or between-individual comparisons were reported;
- (d) outcomes included at least one of the following: clinician knowledge, attitudes, confidence or self-efficacy.

Studies were excluded if they met one or more of the following:

- (a) >50% participants were students, trainees (including professionals in training) or non-health professionals (e.g. disability support workers);
- (b) interventions focused solely on diagnosis or screening, (e.g. diagnosis of foetal alcohol spectrum disorder, conducting cervical screening);
- (c) no relevant quantitative or qualitative findings were reported (e.g. studies reporting only diagnostic outcomes without assessing health professional knowledge, attitudes, confidence or self-efficacy).

Search strategy

Studies were identified by searching PubMed, PsycINFO, ProQuest, Web of Science, CINAHL, EMBASE and the grey literature. The Cochrane Library and PROSPERO database were also searched to ensure no other systematic reviews were planned or had been published in this area. A University of Queensland librarian reviewed the search strategy. The search was not restricted to date,

thus a variety of search terms that included historical terms for intellectual disability and autism were included. Broad terms for clinicians were used to cover the wide variety of health professionals, and possibility that interventions were only conducted on one professional group. Search terms are summarised in Table 1.

Each search term was limited to title/abstract, each search string was connected using the Boolean operator 'AND', and the * indicates that the search is broadened to include any words starting with these letters preceding the *.

Study selection

Authors C.F. and K.B. undertook dual independent blinded reviews of the titles and abstracts of articles remaining after removal of duplicates, using the Covidence platform on Windows and macOS (Veritas Health Innovation, Melbourne, Australia; see <https://www.covidence.org>). C.F. and K.B. then undertook dual independent blinded review of the full text of included articles. Further information was sought from authors of two included publications to clarify published information relevant to inclusion. Each article described a unique study, and there were no studies that were reported in more than one article. Disagreements between reviewers were resolved at each stage through discussion, and consensus was able to be reached without involvement of a third reviewer.

Data collection, extraction, synthesis and analysis

Data was extracted on the Covidence platform, using a form designed for this study by C.F. Data extraction was dually independently undertaken by C.F. and S.G. Data extraction commenced on 31 August 2024 and was completed on 17 December 2024. Conflicts were resolved through discussion and consensus achieved at each stage of the above process.

Data items that were extracted for each study were: reference details; country (where intervention was delivered); consumer involvement (co-design (yes/no) and co-delivery (yes/no)); delivery mode (face to face, online, video, written); format (didactic, interactive, mixed (noting if Extension for Community Healthcare Outcomes (ECHO)); duration of intervention; setting (primary care, community health, community mental health, paediatric hospital, mental health in-patient care); study design (qualitative, single group pre-test/post-test, prospective waitlist control, non-randomised two-group, partial stepped wedge randomised controlled trial); outcome measure area (knowledge, attitudes, confidence, self-efficacy, skills, behaviour) and name of measure; quantitative methods; and results. For studies that included qualitative methods, the aim, approach and main themes were summarised. Missing data were denoted by 'NS' (not stated). Each data point was extracted by two independent reviewers, C.F. and S.G. Any differences in data were discussed, and consensus was reached.

Participant numbers were collected, along with their professional group (medical, nursing, allied health professionals – specific professional listed if identifiable). The number of participants who completed the intervention and post-intervention evaluation were recorded, compared with those who commenced and provided baseline data. The objective of the intervention was recorded, in addition to the area of focus (intellectual disability, intellectual and developmental disabilities or autism), whether it focused on paediatric or adult healthcare, and any specific education focus (the diagnosis of autism or intellectual disability, general clinical care).

Evaluation methods were a focus of this review. Data was collected to describe the study design, outcome measures and data points and results, in those studies where published or validated measures were used. In those studies where qualitative methods of evaluation were reported, the framework, analytic process and focus of investigation and themes were recorded for each study.

Study risk-of-bias assessment

The variation in methods of assessment and evaluation of health professional education made it difficult to meaningfully compare the quality and risk of bias of included studies. Therefore, the Mixed-Methods Appraisal Tool (MMAT)¹⁵ was used to assess qualitative methods, and the Medical Education Research Study Quality Instrument (MERSQI) was used to assess quality of quantitative studies.¹⁶ The MMAT is a critical appraisal checklist of the methods used.¹⁵ The MERSQI, on the other hand, is quantitatively focused and has a scoring system, but it does not specify specific thresholds of methodological quality. It has been validated as a reliable tool for this purpose.¹¹ The MERSQI consists of ten items, with total possible scores ranging from 5 to 18. One study suggested using a score of 14 to denote high-quality studies,¹⁷ and another agreed and further proposed suggested ranges of 5–9 for low-quality studies and 9–14 for medium-quality studies.¹⁰ Authors C.F. and S.G. undertook dual blinded independent assessments, applying the MERSQI and the MMAT (where appropriate), using these thresholds. Disagreement in quality ratings were resolved through discussion between the two reviewers, until consensus was reached. Risk of bias in data extraction was minimised by using two independent blinded investigators (C.F. and S.G.) to assess each study via the Covidence platform. Disagreements in risk of bias assessments were resolved through discussion.

Selective reporting bias was assessed by comparing planned and reported outcome measures for each study via checking published trial protocols and, where not published, the methods specified in the publications.

Effect measures

P-values were selected to indicate statistical significance across studies, as they were commonly reported in this study and allow some comparison between studies.

Synthesis methods

Synthesis of mixed methods studies was initially conducted by analysing quantitative and qualitative findings separately.¹⁸ Data was extracted and recorded using the Covidence platform, and then collated into a table to record characteristics of individual study design (Tables 2 and 3). Qualitative findings were then collated in a separate table that included data on methods, themes and findings (Table 4). The frequency of each data field in Tables 2 and 3 were collated in Table 9 to synthesise findings.

Results

Study selection

A total of 6803 studies were identified on searching relevant databases. After duplicates were removed, 4602 studies remained for screening of title and abstract; 4498 of these did not meet inclusion criteria and were removed. After assessment for eligibility, another 69 studies were excluded. The main reasons for exclusion were that the participant group did not consist of predominantly health professionals ($n=28$) or that there was no reporting of outcome measures or methods ($n=19$). This left 34 studies that met the eligibility criteria for the review (Fig. 1).

Study characteristics

The design characteristics of the 34 studies are summarised in Tables 2 and 3, where they are arranged according to the specific focus of the education (intellectual disability, intellectual and developmental disabilities, or autism). All studies included quantitative measures, no studies were purely qualitative, and five of the 34 studies used mixed methods. Table 4 summarises the qualitative design of those studies where qualitative analysis was reported.

The earliest study was published in 1992, although the vast majority were published between 2014 and 2023. In four studies, the focus of the educational intervention was intellectual disability clinical care in adults.^{19–23} There were two intellectual and developmental disabilities educational interventions focused on clinical care in children.^{24,25} The remaining 27 studies were autism educational interventions: 19 focused on autism in children and eight focused on autism in adults. Of the 19 studies that focused on autism in children, nine focused on screening and diagnosis of autism^{26–34} and ten focused on clinical care.^{35–44} The eight educational interventions that covered autism in adults all focused on clinical care.^{45–52}

Risk of bias in studies

The MERSQI was used to assess quality of quantitative data, with scores presented in; Table 5. Only two studies were rated high quality, 22 studies were rated moderate and ten were rated low. Notably, just 11 of the 34 studies used validated, published scales; the remainder relied on unvalidated, bespoke measures. The MMAT was applied to mixed-methods studies, with the lowest scoring domain determining overall quality. Two studies achieved 80% (four stars) and three scored 60% (three stars). A common limitation was the lack of rationale for using mixed methods. Higher-scoring studies reported a clear qualitative framework and methods, whereas lower-scoring ones did not.

Results of individual studies

The results of individual studies are represented in Tables 4 (qualitative), 6 (knowledge and attitudes), 7 (confidence and self-efficacy) and 8 (behaviour). Three studies reported item-level statistical analysis but not of total scores.^{21,29,43} Three different studies reported scores, but did not perform statistical analyses.^{33,47,48} All 29 studies that reported statistical analyses reported statistically significant findings in at least one outcome area. Findings were similarly positive across each subject area of intellectual disability, intellectual and developmental disabilities, and autism. Qualitative data from the five mixed-methods studies also demonstrated positive findings and tended to focus on the effects of the training on clinical care (Table 4). Only the mixed-methods study by Sengupta et al⁴⁴ described participant feedback

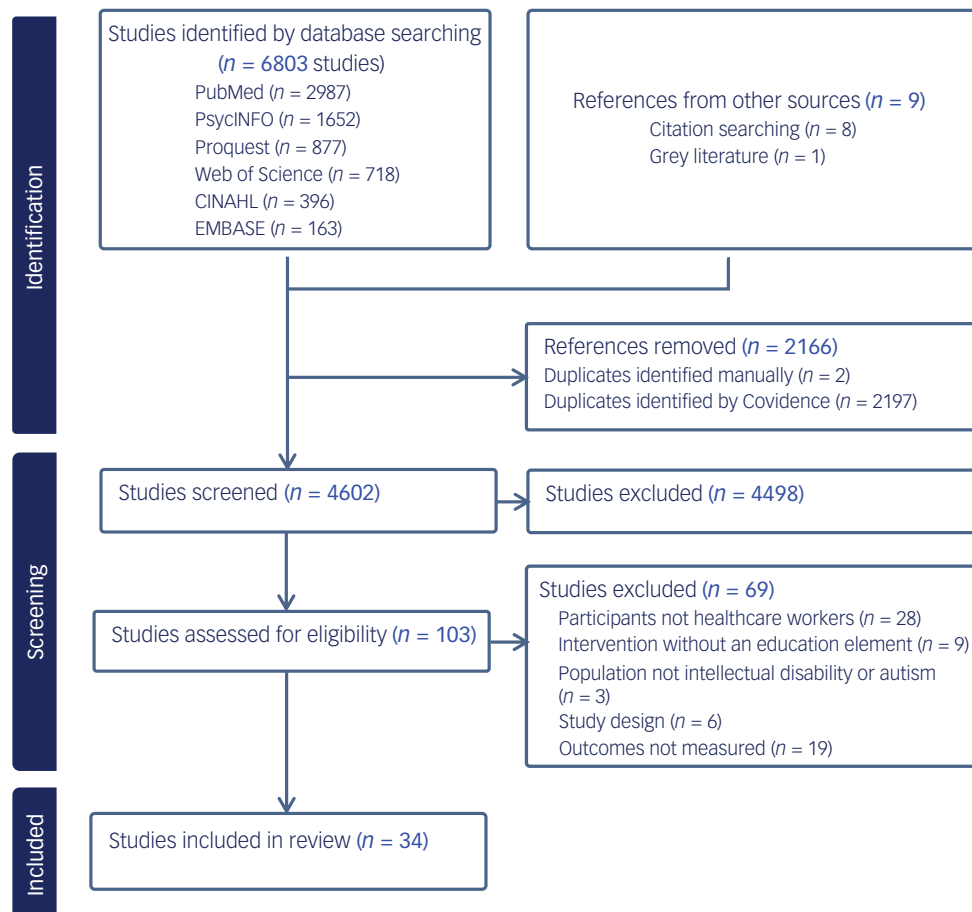


Fig. 1 PRISMA flowchart for study identification, screening and inclusion.¹³

relating to the inclusion of people with lived experience in the delivery of the education, noting that participants found it very valuable (Table 4).

Results of syntheses

Table 9 shows that only eight out of 34 studies reported co-design or co-delivery, with just one incorporating both. Of the six co-delivered studies, three involved individuals with intellectual disability or autistic individuals, and three involved parents of autistic children. Interventions were delivered across 15 countries – 26 in high-income countries (including 15 in the USA, five in Australia, two in the UK) and eight in low- and middle-income countries. Delivery modes varied: 13 were fully online, 12 were face to face, seven used both and two combined written with either video or face-to-face formats. Twelve studies delivered education of 11–20 h, whereas nine were 1–5 h with positive findings. Most interventions were workplace-based, primarily in community health settings.

Most studies (30 out of 34) used a single-group pre-test/post-test design, with 15 collecting data only immediately pre- and post-intervention. Five studies included a qualitative component, although only three of these reported a guiding framework – all using thematic analysis. Because of varied outcome measures, effectiveness by delivery mode (online versus face to face) could not be reliably compared. However, all studies using statistical analyses reported at least one statistically significant positive finding in knowledge, attitudes, confidence and/or self-efficacy. Of the six studies assessing behaviour, five used objective measures, such as

the number of cases referred for assessment or use of autism screening measures. Data were typically collected immediately pre- and post- intervention; just over half included a 3-month follow-up, with some extending further to assess for sustained impact. Knowledge was the most assessed outcome, followed by confidence, self-efficacy and attitudes. Behaviour was the least frequent outcome measured, but had some of the longest follow-up intervals, including 6 months, 12 months and 4 years (Tables 8 and 9). Across all studies, 15 studies only assessed for effects immediately following the education, 11 studies for up to 6 months and 2 studies for over 12 months (Table 9).

Table 10 describes the validated scales used in these studies in further detail. The majority (25 out of 34) of studies used bespoke measures that were designed for purpose and not published or validated. Of the nine studies that used outcome measures that were published and validated, ten different scales were used, and none stood out as more commonly used. Some scales were developed specifically for use in this area, whereas others were not. The ASD Knowledge and Self-Efficacy Questionnaire⁵³ and Autism Spectrum Disorder Knowledge Questionnaire – Physician's Edition (AKQ-P),⁵⁴ were designed to measure knowledge of autism. By contrast, only one scale measuring attitudes was specifically designed for use in relation to intellectual disability or autism, the Attitudes Towards Intellectual Disability (ATTID) scale,⁵⁵ whereas the other two published scales were designed for assessing attitudes to evidence-based practice (Evidence-Based Practice Attitude Scale, EBPAS)⁵⁶ or mental illness (Community Attitudes Towards the Mentally Ill, CAMI).⁵⁷ Confidence was measured using the targeted Therapy Confidence Scale – Intellectual

Table 2 Intellectual and developmental disabilities study design characteristics

Study identifier	Study			Duration	Setting	Study design	Outcome measures			
	Country	Co-design	Co-delivery				Delivery mode	Format	Domain	Measure
Intellectual disability – clinical care of adults										
Dagnan 2018 ¹⁹	UK	No	No	Face to face	Interactive	10 or 20 h	Community mental healthcare	SGPP, Qualitative (post)	Attitudes, Confidence, Self-efficacy	ATTID, TCS-ID, GSE
Eagleson 2022 ²⁰	Australia	Yes	No	Online	Didactic	Not stated	Mental healthcare	SGPP	Knowledge, Attitudes, Confidence, Skills	Bespoke
Harper 1992 ²¹	USA	No	No	Video, Written	Didactic	45 min	Health service providers	SGPP	Knowledge	Bespoke
Melville 2006 ²²	UK	No	Yes	Written + Face to face	Mixed	45 min (Written), 3 h (Face to face)	Primary care	Non-randomised, two group	Knowledge, Self-efficacy	Bespoke
Bessell 2023 ²³	Australia	No	No	Online	Mixed (ECHO)	15 h	Primary care, Community mental healthcare	Prospective waitlist control	Knowledge, Confidence	Bespoke
Intellectual and developmental disabilities – clinical care of children										
McConkey 2014 ²⁴	Macedonia	Yes	No	Face to face	Interactive	20 h	Community healthcare	SGPP	Knowledge, Attitudes, Confidence	Bespoke
Sadoo 2022 ²⁵	Uganda	No	No	Face to face	Interactive	2 days	Community healthcare	SGPP Qualitative	Knowledge, Confidence	Bespoke
SGPP, single-group pre-test/post-test; ATTID, Attitudes to the Treatment of People with Intellectual Disabilities in Mainstream Services; TCS-ID, Therapy Confidence Scale-Intellectual Disabilities; GSE, General Self-Efficacy Scale; ECHO, Extension for Community Healthcare Outcomes. Study identifier: only the first author is noted, with year of publication. Bespoke refers to unpublished measures, constructed for purpose by authors.										

SGPP, single-group pre-test/post-test; ATTID, Attitudes to the Treatment of People with Intellectual Disabilities in Mainstream Services; TCS-ID, Therapy Confidence Scale-Intellectual Disabilities; GSE, General Self-Efficacy Scale; ECHO, Extension for Community Healthcare Outcomes. Study identifier: only the first author is noted, with year of publication. Bespoke refers to unpublished measures, constructed for purpose by authors.

Disabilities (TCS-ID)⁵⁸ and the non-disability specific Confidence in Coping with Patient Aggression Instrument.⁵⁹ Self-efficacy scales were specific for intellectual disability (General Self-Efficacy Scale, GSE)⁶⁰ or autism (Primary Care Autism Self-Efficacy survey, PCASE).⁶¹ The Challenging Behaviour Attributions Scale (CHABA) was used to assess beliefs around aggression.⁶²

Table 11 demonstrates knowledge and confidence had the most statistically significant improvements, although fewer studies measured outcomes other than knowledge. Qualitative findings revealed various knowledge and skills gains across interventions. One study discussed that although participants thought they already knew about autism, the intervention helped them ‘see that there was much more to learn’.⁴⁴ An intervention that focused on therapists working with people intellectual disability reported increased awareness of the needs of people with intellectual disability and how they could improve their practice.¹⁹ Examples of changes that were identified included adaptation of materials, nature of communication and the interventions used in therapy.^{19,25} Changes in attitudes were also highlighted, and related to the involvement of a parent of an autistic child as part of the expert hub providing education, which gave greater awareness and insights into the experience of the autistic child and their family.⁴⁴ One paper evaluated the use of co-mentoring as a technique that was chosen to improve the uptake of learnings in the workplace following a didactic training course. Benefits included the opportunity to discuss learnings and how they might be implemented, challenges were the logistic challenges in a busy workplace.³⁵

Reporting biases

Few studies performed statistical analyses on collected data or analysed only single questionnaire items. Although no results were missing, reporting bias likely exists because all studies with statistical analysis reported at least one positive finding, and it would be expected that there would be some studies in this area that showed no change in measured parameters.

Discussion

This systematic review supports education’s effectiveness in improving healthcare professionals’ knowledge, attitudes, confidence and self-efficacy when working with individuals with intellectual or developmental disabilities. All 29 purely quantitative studies showed significant improvements in at least one measured aspect (Table 10), with five mixed-methods studies providing additional qualitative support for effectiveness and implementation (Table 4). This review’s focus on healthcare professionals means its findings have applicability in the workplace, where issues such as the cost and motivation for employees to participate in education differ from those relevant to undergraduate training. However, significant limitations weaken the quantitative findings, including selection bias, sample sizes, non-published and non-validated outcome measures, and the absence of negative findings across all studies. Only nine out of 34 studies used validated measures (with four using the same instrument) (Table 10), only five studies used objective outcome measures (Table 8) and some qualitative studies lacked robust coding and analysis methods. Together, these limitations weaken the conclusions that can be drawn from this systematic review.

There is an established international lack of health professional knowledge and confidence in this area.^{2,3,63,64} The positive findings in both high- and low- and middle-income countries promote the importance of prioritising education for health professionals and students. The review further demonstrates that

Table 3 Autism study design characteristics

Study identifier	Country	Study						Study design	Outcome measures		
		Co-design	Co-delivery	Delivery mode	Format	Duration	Setting		Domain	Measure	
Autism – screening in children											
Balogh 2015 ²⁶	Canada	No	No	Face to face, Online	Mixed	2 days + Online	Primary care	SGPP	Knowledge, Behaviours	Bespoke	
Bordini 2015 ²⁷	Brazil	No	No	Face to face	Didactic	15 h	Community healthcare, Primary Care	SGPP	Knowledge, Behaviours	Bespoke, Referrals	
Carbone 2016 ²⁸	USA	No	Yes ^a	Face to face	Interactive	Not reported	Community healthcare	SGPP	Behaviours, Self-efficacy	Number of screenings, Bespoke	
Johnson 2012 ²⁹	USA	No	No	Online	Mixed	1 h	Paediatric hospital	SGPP	Not stated	Bespoke	
Lucarelli 2018 ³⁰	USA	No	No	Face to face, Online	Didactic	Not reported	Hospital (emergency)	SGPP	Knowledge, Attitudes, Confidence	Bespoke	
Mahoney 2023 ³¹	USA	No	No	Face to face, Online	Interactive	6 h	In-patient healthcare	SGPP	Knowledge, Confidence, Other	Bespoke	
Mazurek 2018 ³²	USA	No	Yes	Face to face, Online	Mixed (ECHO)	9 h	Community healthcare, Primary care	SGPP, Qualitative	Self-efficacy, Behaviours	PCASE, Number of screenings	
Swanson 2014 ³³	USA	No	No	Face to face	Interactive	2 days	Community healthcare	SGPP	Behaviours	Bespoke	
van't Hof 2021 ³⁴	Netherlands	No	No	Online	Didactic	4.5 h	Community healthcare	SGPP	Knowledge, Attitudes, Confidence, Satisfaction	AKQ-P, CAMI, Bespoke	
Autism – clinical care of children											
Ashburner 2015 ³⁵	Australia	No	No	Face to face	Other	>3 days	Community healthcare	SGPP, Qualitative	Knowledge, Confidence	Bespoke	
Bellesheim 2020 ³⁶	USA	No	Yes ^a	Online	Mixed (ECHO)	9 h	Community healthcare	SGPP	Behaviours	Bespoke	
Donnelly 2023 ³⁷	USA	No	No	Online	Interactive	90 min	Community healthcare, In-patient care	SGPP	Knowledge, Attitudes, Confidence	Bespoke, EBPAS, CCPAI, CHABA	
Eray 2017 ³⁸	Turkey	No	No	Face to face	Didactic	2 h	Primary care	SGPP	Knowledge	Bespoke	
Silva 2018 ³⁹	Brazil	No	No	Face to face, Online	Didactic	4 h	Hospital mental healthcare	SGPP	Knowledge, Satisfaction, Attitudes	KAP, Bespoke	
Gore 2024 ⁴⁰	Australia	No	No	Face to face, Online	Mixed	Not reported	Community healthcare	SGPP	Knowledge, Self-efficacy	Bespoke	
Jonsdottir 2020 ⁴¹	Iceland	No	No	Face to face	Didactic	4 h	Community healthcare	Retrospective pre-post, no control group	Knowledge, Confidence	Bespoke	
Ong 2021 ⁴²	Australia	Yes	No	Face to face	Didactic	2 h	In-patient healthcare	SGPP	Knowledge, Confidence	Bespoke	
Pasco 2014 ⁴³	Romania	No	No	Face to face, Online	Mixed	Varying	Community healthcare	SGPP	Knowledge	Bespoke	
Sengupta 2022 ⁴⁴	India	No	Yes	Online	Mixed (ECHO)	26 h	Community healthcare, Hospital healthcare	SGPP, Qualitative	Knowledge, Satisfaction, Self-efficacy	Bespoke, PCASE	
Autism – clinical care of adults											
Ben-Sasson 2018 ⁴⁵	Israel	No	No	Face to face	Interactive	2 days	Community healthcare	SGPP	Knowledge, Self-efficacy, Satisfaction	ASD-KS, Bespoke	
Dreiling 2022 ⁴⁶	USA	No	No	Online	Mixed (ECHO)	15 h	Communitymental healthcare	SGPP	Knowledge, Satisfaction, Self-efficacy	Bespoke, PCASE	
Giachetto 2019 ⁴⁷	Uruguay	No	No	Online	Didactic	20 h	Community healthcare	SGPP	Knowledge	Bespoke	
Giarelli 2012 ⁴⁸	USA	No	No	Face to face	Interactive	2 days	In-patient healthcare	SGPP	Knowledge	Bespoke	
Malow 2023 ⁴⁹	USA	Yes	Yes	Online	Mixed (ECHO)	12 h	Community healthcare, Primary care	SGPP	Knowledge, Self-efficacy	Bespoke	
Mazurek 2020 ⁵⁰	USA	No	Yes ^a	Online	Mixed (ECHO)	24 h	Community healthcare, Primary care	Partial stepped wedge RCT	Knowledge, Self-efficacy	Bespoke	
Mazurek 2020 ⁵¹	USA	No	Yes	Online	Mixed (ECHO)	12 h	Community healthcare	SGPP	Knowledge, Self-efficacy	Bespoke, PCASE	
McGonigle 2014 ⁵²	USA	Yes	No	Online	Didactic	1.5–3 h	Hospital care (emergency)	SGPP	Knowledge, Confidence	Bespoke	

SGPP, single-group pre-test/post-test; ECHO, Extension for Community Healthcare Outcomes; PCASE, Adapted, shortened version of the Primary Care Autism Self-Efficacy survey; AKQ-P, Autism Spectrum Disorder Knowledge Questionnaire – Physician Edition; CAMI, Dutch translation of the Community Attitudes to Mental Illness questionnaire; EBPAS, Evidence-Based Practice Attitude Scale; CCPAI, Confidence in Coping with Patient Aggression Instrument; CHABA, Challenging Behaviour Attributions Scale Short Form; KAP, Knowledge, Attitudes, Practice; ASD-KS, Autism Knowledge and Self-Efficacy Questionnaire. a. Delivered by a parent of an autistic child, no involvement by autistic person themselves. Study identifier: only the first author is noted, with year of publication. Bespoke refers to unpublished measures, constructed for purpose by authors.

Table 4 Qualitative design and outcome of mixed-method studies						
Study identifier	Qualitative aims	Approach	Method	Analysis process	Areas for investigation	Themes
Intellectual disability – clinical care of adults						
Dagnan 2018 ¹⁹	To add to the understanding of the effect of training and to gain insight from therapists’ reflections on the impact of training on their clinical practice	Thematic analysis	Individual Interviews, two questions	No coding method described. Themes described and collated, then validated by a second rater	Whether skills acquired in training were used and how they were used	(a) Increased awareness and sensitivity (b) Adaptation and simplification of materials (c) Adaptation and simplification of communications (d) Adapting interventions
Intellectual and developmental disabilities – clinical care of children						
Sadoo 2022 ²⁵	To explore perceptions of the training programme and impact on confidence levels, attitudes and practice	Thematic framework approach	Focus group discussions using semi-structured interview guide	Coding framework, descriptive analysis described	Central beliefs of the psychologists regarding the contribution of nurses/social workers to the diagnostic process in both research conditions	(a) Training was beneficial (b) Resultant improved communication skills positively influenced relationships with caregivers (c) Intervention changed attitudes and behaviour because of clearer understanding of causes of disability and improved knowledge of diagnosis and management
Autism – screening in children						
Mazurek 2018 ³²	To evaluate the feasibility of the model and to examine the effects of this training approach on primary care provider self-efficacy and practice change	None stated	Qualitative written survey questions	None stated	Perceptions of changes in practice, changes in relationships and interactions with patients and autism and their families, and potential impact on their communities	(a) Enhanced screening and evaluation (b) Increased use and knowledge of autism resources (c) Improved access to care for families (d) Greater autism knowledge (e) Increased local expertise (f) Improved relationships with families
Autism – clinical care of children						
Ashburner 2015 ³⁵	To evaluate workplace training	None stated	Qualitative written survey questions	Two coders used an inductive process to search for preliminary and higher order themes in responses. Responses were grouped and analysed statistically	Successes, challenges, pairing preferences, and recommended improvements	(a) Successes in co-mentoring (b) Challenges in co-mentoring (c) Pairing preferences for co-mentoring (d) Recommendations for improving co-mentorship programme
Sengupta 2022 ⁴⁴	To evaluate the relevance and effectiveness of an evidence-based tele-mentoring model Extension for Community Healthcare Outcomes (ECHO) Autism in increasing paediatricians’ access to best-practice care for children with autism spectrum disorder in low- and middle-income country contexts	Thematic analysis hybrid of approaches (deductive <i>a priori</i> coding and data-driven inductive approach)	Qualitative written survey questions	Coding manual was developed. Codes were used to identify themes. One coder and one reviewer	Relevance to learner, benefits of participation, changes to behaviour as result of training	(a) Case-based discussion format was much more helpful than theory (b) Layering of concepts across sessions helped learning (c) Parent of autistic child as member of expert hub was very valuable
Study identifier: only the first author is noted, with year of publication.						

Table 5 Quality assessment				
Study identifier	MERSQI (/15)	Quality assessment		
		MMAT (%)		
		Qualitative	Quantitative	Mixed
Intellectual disability – clinical care of adults				
Dagnan 2018 ¹⁹	10	100	100	80
Eagleson 2022 ²⁰	9			
Harper 1992 ²¹	10			
Melville 2006 ²²	10.5			
Intellectual and developmental disabilities – clinical care of children				
Bessell 2023 ²³	10			
McConkey 2014 ²⁴	8.5			
Sadoo 2022 ²⁵	14.5	100	80	80
Autism – screening in children				
Balogh 2015 ²⁶	12.5			
Bordini 2015 ²⁷	11.5			
Carbone 2016 ²⁸	11.5			
Johnson 2012 ²⁹	5.5			
Lucarelli 2018 ³⁰	10			
Mahoney 2023 ³¹	9.5			
Mazurek 2018 ³²	9.5	60	80	60
Swanson 2014 ³³	10.5			
van't Hof 2021 ³⁴	14.5			
Autism – clinical care of children				
Ashburner 2015 ³⁵	10	80	60	60
Bellesheim 2020 ³⁶	9.5			
Donnelly 2020 ³⁷	13			
Eray 2017 ³⁸	7			
Silva 2018 ³⁹	10			
Gore 2024 ⁴⁰	9			
Jonsdottir 2020 ⁴¹	10			
Ong 2021 ⁴²	6.5			
Pascoe 2014 ⁴³	4.5			
Sengupta 2022 ⁴⁴	10.5	100	80	80
Autism – clinical care of adults				
Ben-Sasson 2018 ⁴⁵	10			
Dreiling 2022 ⁴⁶	10			
Giachetto 2019 ⁴⁷	8.5			
Giarelli 2012 ⁴⁸	6.5			
Malow 2023 ⁴⁹	11			
Mazurek 2020 ⁵⁰	10			
Mazurek 2020 ⁵¹	12			
McGonigle 2014 ⁵²	7.5			

MERSQI, Medical Education Research Study Quality Instrument; MMAT, Mixed-Methods Appraisal Tool. Study identifier: only the first author is noted, with year of publication.

education has been successfully delivered to improve screening and diagnosis in children, as well as clinical care for all age groups, across intellectual and developmental disabilities, including autism. However, most papers (22 out of 34) focused on improving diagnosis and clinical care in children, with the vast majority (19 out of 22) specifically addressing autism. This distribution may reflect the relatively recent increased awareness and educational needs regarding autism in children, with these studies potentially employing more rigorous methods because they are more recent. Notably, there appears to be a relative lack of evaluated educational interventions focused on improving clinical care for adults with intellectual or developmental disabilities, including those on the autism spectrum.

Improving knowledge, attitudes, confidence and self-efficacy

Recent calls for improved health professional education evaluation¹⁶ prompted development of the Standards for Quality Improvement Reporting Excellence in Education (SQUIRE-EDU)⁶⁵ and measures

to assess quality of medical education research.^{11,16} The MERSQI measure, used to assess quality in this review, ranks outcomes in increasing order of quality, with lowest ranking scores for subjective self-report measures of satisfaction, attitudes, perceptions and general facts, followed by knowledge and skills, followed by behaviours; and highest ranking scores for the use of patient/healthcare outcomes. Most studies in this systematic review scored the lowest scores. There was some measurement of behaviours in six studies (Table 8), such as health professionals performing periodic health assessments, or blinded patient assessments of skills to assess diagnostic accuracy in one study (Tables 2 and 3).²⁰ The challenge in the area of intellectual and developmental disabilities is that, apart from screening and diagnosis in children, there are few behavioural or patient outcome parameters that can be measured in adults. One potential objective measure could be the number of patients identified with intellectual disability in records pre- and post-intervention.

This review’s synthesis of qualitative and quantitative results suggests that education is especially effective in improving knowledge in this area. However, it is of concern that attitudes of health professionals, a major source for concern in this area, was relatively under-investigated quantitatively, reported in only seven papers. This is despite the availability of several published and validated scales to measure attitudes in intellectual disability,^{66–68} and some in autism.^{69,70} It is also noteworthy that the synthesis of quantitative knowledge outcomes was problematic, as most scales were unpublished and situation specific. It was not clear what type of knowledge was improved in most of the quantitative results, and how generalisable that might be to healthcare for people with intellectual disability and those on the autism spectrum. Qualitative findings did suggest improvements in knowledge and provided some examples of the ways that this knowledge improved practice. Confidence, and the closely related concept of self-efficacy, were measured, with confidence showing particularly impressive improvements in eight of the ten studies that measured it.

Co-design and delivery

The value of involving consumers in research has gained increasing recognition, with supporting policies and resources emerging in countries such as the UK, Canada and Australia.^{71–73} Inclusion of individuals with lived experience in the design and delivery of intellectual and developmental disabilities health education and research is now widely acknowledged as a priority.⁷⁴ However, this review found such involvement to be rare – only one study reported both co-design and co-delivery. Although seven different studies involved people with lived experience in the delivery of the education, only one reported feedback from participants on how this affected their educational experience. There can be challenges involving individuals with intellectual disability or those on the autism spectrum, but it is not a new practice. As early as 2008, Tracy and Iacono included tutors with intellectual disability in teaching medical students on communication with people with intellectual disability.⁷⁵ This approach requires careful planning and support, and should be embedded early in project development, and considered in the evaluation of the education.

Effective dosing and mode of delivery

This review also sought to examine whether there was a minimum dose of education necessary to improve outcomes. Education of paid employees is a financial burden to the employer, so this finding

Table 6 Knowledge and attitudes results

Study identifier	Participants		Scale	Knowledge									
	Completed	Profession		Pre		Post		3 months		6 months		12 months	
				Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Intellectual disability – clinical care of adults													
Dagnan 2018 ¹⁹	42/68	Allied health											
PWP													
HIP													
Eagleson 2022 ²⁰	60/351	Medical, Nursing, Allied health											
Harper 1992 ²¹	31/Not reported	Medical	Bespoke	85	Not reported	86	Not reported						
		Medical student		87	Not reported	88	Not reported						
		Nursing		80	Not reported	83	Not reported						
Melville 2006 ²²	63/79	Nursing	Bespoke										
Written				32.9	Not reported			39.6**	Not reported				
Written + Face to face				32.4	Not reported			35.6**	Not reported				
Control				31.5	Not reported			33.4	Not reported				
Bessell 2023 ²³	62/101	Medical, Nursing, Allied health	Bespoke										
Intervention				2.8	0.4	3.6	0.5						
Control				2.9	0.7	2.9	0.6						
Intellectual and developmental disabilities – clinical care of children													
McConkey 2014 ²⁴	19/19	Nursing	Bespoke	57.0	Not reported	84***	Not reported						
Sadoo 2022 ²⁵	64/93	Medical, Nursing	Bespoke	4.0	Not reported					7.0	Not reported		
Autism – screening in children													
Balogh 2015 ²⁶	26/Not reported	Medical, Nursing	Bespoke										
Intervention				2.6	0.7					3.1	0.6		
Control				2.6	1.1					2.3	1.1		
Bordini 2015 ²⁷	22/29	Medical (Paediatrics, General practice)	Bespoke	6.7	Not reported	9.2**	Not reported						
Carbone 2016 ²⁸	43/43	Medical (General practice)											
Johnson 2012 ²⁹	599/604	Nursing	Bespoke	5.5	Not reported							8.7 ^a	Not reported ^a
Lucarelli 2018 ³⁰	54/129	Nursing, Allied health	Bespoke	3.3	1.0	4.3***	1.0						
Mahoney 2023 ³¹	107/300	Nursing	Bespoke	4.2	0.8							4.3	0.7
Mazurek 2018 ³²	18/26	Medical (General practice), Nursing											
Swanson 2014 ³³	118/Not reported	Medical (Paediatrics)											
van't Hof 2021 ³⁴	78/93	Medical	AKQ-P										
			General	7.2	1.3	7.8**	1.0	7.3	1.2				
			Specific	5.9	1.6	7.1**	1.4	6.5	1.7				
Autism – clinical care of children													
Ashburner 2015 ³⁵	32/Not reported	Allied health (Occupational therapy)	Bespoke	16.9	4.8	21.9***	2.6						
Bellesheim 2020 ³⁶	28/Not reported	Medical											
Donnelly 2020 ³⁷	233/308	Medical (Paediatrics), Nursing, Allied health	Bespoke	9.5	1.4	10.2***	1.1						
Eray 2017 ³⁸	75/79	Medical (General practice)	Bespoke	34.7	Not reported	88.0***	Not reported						
Silva 2018 ³⁹	14/14	Nursing, Allied health	KAP	53.5	12.0	65.5**	8.3						
Gore 2024 ⁴⁰	38/344	Nursing	Bespoke	35.9	3.3	36.9	2.8						
Jonsdottir 2020 ⁴¹	56/56	Medical, Nursing	Bespoke	2.1	0.5	3.1***	0.3						

(Continued)

Table 6 (Continued)

	Participants		Knowledge										
Study identifier	Completed	Profession	Scale	Pre		Post		3 months		6 months		12 months	
				Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Ong 2021 ⁴²	8/12	Allied health	Bespoke	3.3	0.6	3.8*	0.6						
Pasco 2014 ⁴³	329/588	Medical, Nursing, Allied health	Bespoke	17.5	Not reported	20.5	Not reported						
Sengupta 2022 ⁴⁴	62/88	Medical (Paediatrics)	Bespoke	63.2	Not reported	78.9***	Not reported						
Autism – clinical care of adults													
Ben-Sasson 2018 ⁴⁵	26/Not reported	Allied health (Physiotherapy)	ASD KSEQ	4.1	0.8	4.7	0.5						
Dreiling 2022 ⁴⁶	51/86	Allied health	Bespoke	11.1	2.8					14.3***	2.6		
Giachetto 2019 ⁴⁷	38/Not reported	Medical	Bespoke	Item	Not reported	Item	Not reported						
Giarelli 2012 ⁴⁸	34/37	Nursing	Bespoke	Raw	Not reported	Raw	Not reported						
Malow 2023 ⁴⁹	37/44	Medical, Nursing	Bespoke										
			Cohort 1	20.1	2.7					21.0*	2.4		
			Cohort 2	18.9	2.0					20.6*	2.1		
Mazurek 2020 ⁵⁰	132/148	Medical (General practice, Paediatrics), Nursing	Bespoke	56	Not reported			62.0***	Not reported				
Mazurek 2020 ⁵¹	12/16	Medical (General practice, Paediatrics), Nursing	Bespoke	67.3	11.5			71.9	12.6				
McGonigle 2014 ⁵²	110/110	Nursing	Bespoke	3.7	Not reported	3.9**	Not reported						
Attitudes													
Study identifier	Scale	Pre		Post		3 Months		12 Months					
		Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.				
Intellectual disability – clinical care of adults													
Dagnan 2018 ¹⁹													
PWP	ATTID	8.3	2.0	9.4	1.7	9.2*	2.2						
HIP		8.1	2.0	9.1	1.8	8.9*	1.6						
Eagleson 2022 ²⁰	Bespoke	8.51	Not reported			8.8*	Not reported			8.45		Not reported	
Harper 1992 ²¹													
Melville 2006 ²²													
Written													
Written + Face to face													
Control													
Bessell 2023 ²³													
Intervention													
Control													
Intellectual and developmental disabilities – clinical care of children													
McConkey 2014 ²⁴													
Sadoo 2022 ²⁵													
Autism – screening in children													
Balogh 2015 ²⁶													
Intervention													
Controls													
Bordini 2015 ²⁷													
Carbone 2016 ²⁸													
Johnson 2012 ²⁹													
Lucarelli 2018 ³⁰	Bespoke	4.7	0.7					4.7	0.7				

(Continued)

(Continued)

Mahoney 2023 ³¹					
Mazurek 2018 ³²					
Swanson 2014 ³³					
van't Hof 2021 ³⁴	CAMI	Item	Not reported	Item	Not reported

Autism – clinical care of children

Ashburner 2015 ³⁵					
Bellesheim 2020 ³⁶					
Donnelly 2020 ³⁷	EBPAS	64.4	11.8	73.2***	12.0
Eray 2017 ³⁸					
Silva 2018 ³⁹	KAP	42.1	8.6	66.5	9.1
Gore 2024 ⁴⁰					
Jonsdottir 2020 ⁴¹					
Ong 2021 ⁴²					
Pasco 2014 ⁴³					
Sengupta 2022 ⁴⁴					

Autism – Clinical care of adults

Ben-Sasson 2018 ⁴⁵
Dreiling 2022 ⁴⁶
Giachetto 2019 ⁴⁷
Giarelli 2012 ⁴⁸
Malow 2023 ⁴⁹
Mazurek 2020 ⁵⁰
Mazurek 2020 ⁵¹
McGonigle 2014 ⁵²

PWP, psychological well-being practitioner; HIP, high-intensity practitioner; ATTID, Attitudes to the Treatment of People with Intellectual Disabilities in Mainstream Services; CAMI, Dutch translation of the Community Attitudes to Mental Illness questionnaire; EBPAS, Evidence-Based Practice Attitude Scale; KAP, Knowledge, Attitudes, Practice; ASD KSEQ, Autism Spectrum Disorder Knowledge and Self-Efficacy Questionnaire.
a. Follow-up was at 18 months. Study identifier: only the first author is noted, with year of publication. Bespoke refers to unpublished measures, constructed for purpose by authors. Data points: 0 = immediately pre- and post- the intervention. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Table 7 Confidence and self-efficacy quantitative results

	Participants		Confidence								
				Pre		Post		3 months		6 months	
Study identifier	Completed	Profession	Scale	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Intellectual disability – clinical care of adults											
Dagnan 2018 ¹⁹	42/68	Allied health	TCS-ID								
PWP				29.8	8.6	41.4	7.0	40.1***	8.0		
HIP				21.3	8.7	32.1	6.4	29.9***	10.2		
Eagleson 2022 ²⁰	60/351	Medical, Nursing, Allied health									
Harper 1992 ²¹	31/Not reported	Medical, Medical students, Nursing									
Melville 2006 ²²	63/79	Nursing									
Written											
Written + Face to face											
Control											
Bessell 2023 ²³	62/101	Medical, Nursing, Allied health									
Intervention			Bespoke	2.7	0.5	3.5*	0.5				
Control				2.6	0.7	2.8	0.8				
Intellectual and developmental disabilities – clinical care of children											
McConkey 2014 ²⁴	19/19	Nursing	Bespoke	21	Not reported	16	Not reported				
Sadoo 2022 ²⁵	64/93	Medical, Nursing	Bespoke	2.7	Not reported					4.7***	Not reported
Autism – screening in children											
Balogh 2015 ²⁶	26/Not reported	Medical, Nursing	Bespoke								
Intervention				21.3**	6.1					26.2***	6.0
Control				21.5	4.9					22.4	6.6
Bordini 2015 ²⁷	22/29	Medical (Paediatrics, General practice)									
Carbone 2016 ²⁸	43/43	Medical (General practice)									
Johnson 2012 ²⁹	599/604	Nursing									
Lucarelli 2018 ³⁰	54/129	Nursing, Allied health									
Mahoney 2023 ³¹	107/300	Nursing	Bespoke	3.7	0.8	4.0***	0.7				
Mazurek 2018 ³²	18/26	Medical (General practice), Nursing									
Swanson 2014 ³³	118/Not reported	Medical (Paediatrics)	Bespoke	Item		Item					
van't Hof 2021 ³⁴	78/93	Medical	Bespoke	29.0	5.6	37.7**	2.8	37.0**	4.1		
Autism – clinical care of children											
Ashburner 2015 ³⁵	32/Not reported	Allied health (Occupational therapy)	Bespoke	61.9	17.8	77.1***	9.4				
Bellesheim 2020 ³⁶	28/Not reported	Medical									
Donnelly 2020 ³⁷	233/308	Medical (Paediatrics), Nursing, Allied health	CCPAI	17.0	4.2	19.2***	1.1				
Eray 2017 ³⁸	75/79	Medical (General practice)									
Silva 2018 ³⁹	14/14	Nursing, Allied health									
Gore 2024 ⁴⁰	38/344	Nursing									
Jonsdottir 2020 ⁴¹	56/56	Medical, Nursing	Bespoke	2.1	0.5	3.1***	0.3				
Ong 2021 ⁴²	8/12	Allied health	Bespoke	3.3	1.1	4.0	0.6				
Pasco 2014 ⁴³	329/588	Medical, Nursing, Allied health									
Sengupta 2022 ⁴⁴	62/88	Medical (Paediatrics)									

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Autism – clinical care of adults											
Ben-Sasson 2018 ⁴⁵	26/Not reported	Allied health (Physiotherapy)									
Dreiling 2022 ⁴⁶	51/86	Allied health									
Giachetto 2019 ⁴⁷	38/Not reported	Medical									
Giarelli 2012 ⁴⁸	34/37	Nursing									
Malow 2023 ⁴⁸	37/44	Medical, Nursing									
Mazurek 2020 ⁵⁰	132/148	Medical (Paediatrics, General practice), Nursing									
Mazurek 2020 ⁵¹	12/16	Medical (Paediatrics, General practice), Nursing									
McGonigle 2014 ⁵²	110/110	Nursing		Bespoke	3.0	Not reported	3.8	Not reported			
Self-efficacy											
		Pre		Post		3 months		6 months		12 months	
Study identifier	Scale	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Intellectual disability – clinical care of adults											
Dagnan 2018 ¹⁹	GSE										
PWP		8.3	2.0	9.4	1.7	9.2*	2.2				
HIP		8.1	2.0	9.1	1.8	8.9*	1.6				
Eagleson 2022 ²⁰	Bespoke	8.5	Not reported			8.8*	Not reported			8.45	Not reported
Harper 1992 ²¹											
Melville 2006 ²²	Bespoke										
Written		8.9	2.1			9.2	2.1				
Written + Face to face		9.2	2.1			8.9	2.5				
Control		8.8	2.4			8.3	2.0				
Bessell 2023 ²³											
Intervention											
Control											
Intellectual and developmental disabilities – clinical care of children											
McConkey 2014 ²⁴											
Sadoo 2022 ²⁵											
Autism – screening in children											
Balogh 2015 ²⁶											
Intervention											
Control											
Bordini 2015 ²⁷											
Carbone 2016 ²⁸	Bespoke	Item	Not reported	Item	Not reported						
Johnson 2012 ²⁹											
Lucarelli 2018 ³⁰											
Mahoney 2023 ³¹	Bespoke	3.5	0.8	3.7***	0.7						
Mazurek 2018 ³²	PCASE	201.4	44.3							269.3***	31.8
Swanson 2014 ³³											
van't Hof 2021 ³⁴											
Autism – clinical care of children											
Ashburner 2015 ³⁵											
Bellesheim 2020 ³⁶											
Donnelly 2020 ³⁷											
Eray 2017 ³⁸											
Silva 2018 ³⁹											
Gore 2024 ⁴⁰	Bespoke	4.0	0.6	4.4**	0.7						
Jonsdottir 2020 ⁴¹											
Ong 2021 ⁴²											

(Continued)

(Continued)

Table 7 (Continued)									
Self-efficacy									
Study identifier	Scale	Pre		Post		3 months		6 months	
		Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Pasco 2014 ⁴³	PCASE	2.7	Not reported	3.5***	Not reported				
Sengupta 2022 ⁴⁴									
Autism – clinical care of adults									
Ben-Sasson 2018 ⁴⁵	Bespoke	2.0	0.6	2.4*	0.6			85.3***	2.6
Drelling 2022 ⁴⁶	PCASE	65.0	13.4						
Giachetto 2019 ⁴⁷									
Giarelli 2012 ⁴⁸									
Malow 2023 ⁴⁹	Bespoke	18.9	2.7						
Cohort 1		18.9	2.0					20.3*	2.4
Cohort 2		42.0	Not reported			61.0***	Not reported	20.6*	2.1
Mazurek 2020 ⁵⁰	Bespoke	181.9	54.0			210.5*	38.9		
Mazurek 2020 ⁵¹	PCASE								
McGonigle 2014 ⁵²									
TCS-ID, Therapy Confidence Scale–Intellectual Disabilities; GSE, General Self-Efficacy Scale; PCASE, Adapted, shortened version of the Primary Care Autism Self-Efficacy survey; KAP, Knowledge, Attitudes, Practice; AKQ-P, Autism Spectrum Disorder Knowledge Questionnaire – Physician edition; CAMI, Dutch translation of the Community Attitudes to Mental Illness questionnaire; CCPAI, Confidence in Coping with Patient Aggression Instrument. Study identifier: only the first author is noted, with year of publication. Bespoke refers to unpublished measures, constructed for purpose by authors. Data points: 0 = immediately pre- and post- the intervention. * <i>P</i> < 0.05, ** <i>P</i> < 0.01, *** <i>P</i> < 0.001.									

could help encourage efficient use of educational interventions in this area. In this review, approximately a third of interventions were 5 h or less in duration, and about a third were over 11 h. Unfortunately, the variety of measures used limits the strength of conclusions that can be drawn.

Guidance on the most effective modality can be considered by the finding of generally positive results across all modes of delivery, including the 13 out of 34 studies that used online delivery only. This shows promise for the effectiveness of online education, which has greater flexibility in remote areas, and in ease of access and administration. However, further research is required to allow more robust consideration of these variables.

Limitations

One of the main limitations of this review is its focus on restricting inclusion of papers that described either qualitative or quantitative outcome measures. This was necessary to ask the key question in relation to effectiveness of education. However, it means that the findings relate only to this group of evaluated educational interventions, and these may not be representative of all educational interventions in this area. The requirement for published outcomes also means that any papers with narratively discussed outcomes would also have been excluded. The heterogeneous focus of included studies (e.g. diagnosis versus clinical care) may also have made comparisons between education with different types of approaches less reliable or valid.

Implications and future directions

This systematic review found that educational interventions consistently improved healthcare professionals’ knowledge, attitudes, self-efficacy, confidence and skills. However, many studies lacked validated or comparable outcome measures, limiting the strength of findings. Co-design and co-delivery were uncommon and should be prioritised in future research and incorporated into evaluation. There is a clear need for a validated knowledge scale tailored to health professionals to support comparisons between studies. Qualitative components provided valuable insights into intervention impact, but overall, more robust outcome measures are needed to strengthen future study designs.

In conclusion, this mixed-methods systematic review found that educational interventions had positive effects on health professionals’ knowledge, skills, confidence and or self-efficacy. Health professional participants often expressed surprise at how much there was to learn, and reported that training improved the quality of the care they provided to people with intellectual disability and those on the autism spectrum. Involving people with intellectual disability and those on the autism spectrum in the design and delivery of interventions was noticeably scarce, and should be prioritised in future efforts. Further research is needed to determine the most effective delivery modes and duration of education.

Lived experience summary (by R.d.G. and C.F.)

Education is important for health professionals to help them give better care to people with intellectual disability and autistic people. Some need to learn more about how to communicate with people with intellectual disability and autistic people, and how to listen better. Otherwise, people with disabilities don’t get the care they need.

It would be good for this education to be mandatory everywhere, like it is in England, because then all health staff would learn more about people with disabilities and how to care for them better.

Table 8 Behaviour results

Study identifier	Follow-up duration	Measure		Score			
				Pre-education		Post-education	
				Mean	s.d.	Mean	s.d.
Balogh 2015 ²⁶	6 months	Self-reported use of guidelines	Control	7.7	4.2	7.8	3.4
			Intervention	7.8	3.2	12.8***	3.5
		Self-reported periodic health examinations	Control	31.8	10.5	32.5	10.9
			Intervention	34.9	7.2	37.2	10.9
		Self-reported assessment of behaviour change	Control	24.6	5.7	23.6	5.8
			Intervention	24.2	6.0	27.5	7.1
Bordini 2015 ²⁷	4 months	Number of cases referred for autism diagnostic assessment/total cases		1/274	Not reported	13/229	Not reported
Carbone 2016 ²⁸	4 years	ASD screening rates		15%	Not reported	91%***	Not reported
Mazurek 2018 ³²	Immediately post-education completion	Administration of autism screening tool		80%	Not reported	100%*	Not reported
		Percentage of well-child visits in past 12 months that included an autism screen		65%	Not reported	91%*	Not reported
Swanson 2014 ³³	Range: 0.75-3.5 years	Utilise more than one formal ASD screening measure		91%	Not reported	95%	Not reported
Bellesheim 2023 ³⁶	Mean 1.54 years	Conduct independent ASD assessment		23%	Not reported	68%	Not reported
	12 months	Performance of general developmental screen		53.3%	Not reported	96.7%	Not reported
		Performance of M-CHAT ASD screening		68.3%	Not reported	97.1%	Not reported

M-CHAT, Modified Checklist for Autism in Toddlers; ASD, autism spectrum disorder. Study identifier: only the first author is noted, with year of publication. Data points: 0 = immediately pre- and post- the intervention. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

Table 9 Combined design characteristics of included studies

Category	Variable	Number
Education focus	Intellectual disability clinical care in adults	4
	Intellectual and developmental disabilities clinical care in children	3
	Autism diagnosis in children	9
	Autism clinical care in children	10
	Autism clinical care in adults	8
Intervention Setting		
	High-income country	
	USA	15
	UK	2
	Australia	6
	Canada	1
	Israel	1
	Brazil	2
	Iceland	1
	The Netherlands	1
	Low- and middle-income country	
	India	1
	Macedonia	1
	Uganda	1
	Uruguay	1
	Turkey	1
	Romania	1
Methods		
	Consumer involvement	
	Co-design only	2
	Co-delivery only	5
	Co-design and co-delivery	1
	Mode of delivery	
	Online only	13
	Face to face only	12
	Face to face and online	7
	Written and video	1
	Written and face to face	1
Format	Interactive	9
	Didactic	12
	ECHO	7
	Mixed	5
	Other (co-mentoring)	1
Duration	<1 h	1
	1–5 h	9
	6–10 h	4
	11–20 h	12
	>20 h	3
	Not stated	5

(Continued)



Table 9 (Continued)

Category	Variable	Number
Setting	Primary care	8
	Community health	19
	Paediatric hospital	1
	General hospital	6
	Mental health in-patient	2
	Community mental health	3
	Emergency department	2
	Broad healthcare setting	2
	Design	
	Single-group pre-test/post-test	30
Design	Retrospective single-group post-test	1
	Waitlist control	1
	Partial stepped wedge randomised controlled trial	1
	Non-randomised two group	1
	Mixed quantitative + qualitative	5
	Qualitative only	0
	Domains measured	
	Knowledge	28
	Attitude	7
	Confidence	13
Measures	Self-efficacy	11
	Skills	2
	Behaviours	6
	Satisfaction	4
	Studies using published validated measures	9
	Studies using bespoke measures only	25
	Data time points	
	Pre- and immediate-post only	15
	Pre- and immediate-post and up to 3 months	8
	Pre- and immediate-post and >3 to 6 months	3
Data time points	Pre- and immediate-post and >6 to 12 months	4
	Pre- and immediate-post and >12 months	2

It's important that people with disabilities are involved in the design, so that they can say what people with disabilities want health professionals to hear, so they are teaching the right things. Involving people with disability in giving the education is a good way to show

Table 10 Outcome measures				
Scale name	Scale focus	Scale author and year	Scale design	Study using this scale
Intellectual disability				
Attitudes Towards Intellectual Disability (ATTID)	Attitudes	Morin 2013 ⁵⁵	5 items extracted from larger 67 item scale	Dagnan 2018 ¹⁹
Therapy Confidence Scale – IntellectualDisabilities (TCS-ID)	Confidence	Dagnan 2015 ⁵⁸	14 items, 5 point Likert	Dagnan 2018 ¹⁹
General Self-Efficacy Scale (GSE)	Self-efficacy	Dagnan 2015 ⁵⁸	5 items	Dagnan 2018 ¹⁹
Autism spectrum disorder				
ASD Knowledge and Self-Efficacy Questionnaire	Knowledge, self-efficacy	Atun-Einy 2018 ⁵³	79 items	Ben-Sasson 2018 ⁴⁵
Evidence-Based Practice Attitude Scale (EBPAS)	Attitude	Aarons 2010 ⁵⁶	15 items, 5 point Likert	Donnelly 2020 ³⁷
Confidence in Coping with Patient Aggression Instrument	Confidence	Thackrey 1987 ⁵⁹	10 items, Likert scale	Donnelly 2020 ³⁷
Challenging Behaviour Attributions Scale (CHABA)	Aggression	Hastings 2007 ⁶²	39 items, 5 point Likert scale	Donnelly 2020 ³⁷
Primary Care Autism Self-Efficacy survey (PCASE)	Self-efficacy	Mazurek 2016 ⁶¹	57 items, 6 point Likert	Mazurek 2019 ³² Mazurek 2020 ⁵¹ Dreiling 2022 ³⁴⁶ Sengupta 2022 ³⁴⁴
Autism Spectrum Disorder Knowledge Questionnaire – Physician’s Edition (AKQ-P)	Knowledge	van’t Hof 2020 ⁵⁴	32 multiple choice questions	van’t Hof 2021 ³⁴
Community Attitudes Towards the Mentally Ill (CAMI)	Attitudes	Taylor 1981 ⁵⁷	40 items, 5 point Likert	van’t Hof 2021 ³⁴
a. abbreviated form. Scale author and year, Study using this scale: only first author of publication is noted, with year of publication.				

Table 11 Synthesis of quantitative findings		
Variable	Statistical significance	Number
Improved knowledge	$P < 0.001$	10
	$P < 0.01$	5
	$P < 0.05$	6
	Not significant	4
	No analysis reported	3
	Total	28
Improved attitudes	$P < 0.001$	2
	$P < 0.01$	1
	$P < 0.05$	2
	Not significant	2
	Total	7
Improved confidence	$P < 0.001$	7
	$P < 0.01$	1
	$P < 0.05$	1
	No analysis reported	2
	Not significant	2
	Total	13
Improved self-efficacy	$P < 0.001$	5
	$P < 0.01$	1
	$P < 0.05$	3
	Not reported	1
	Not significant	1
	Total	11

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Supplementary material

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Data availability

The data-sets produced during the current study will be available on reasonable request from the corresponding author, C.F.

Author contributions

All authors developed and formulated the review questions and scope. C.F. developed the search strategy in consultation with C.M. and E.H. C.F. conducted the searches. C.F., S.G. and K.B. undertook the screening and data extraction. C.F. drafted the manuscript, with input from the author group. All authors reviewed and contributed to the editing of the manuscript and have approved the final manuscript. C.F. collaborated with R.G., who has lived experience of intellectual disability, to produce the Lived Experience summary.

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health professionals what it’s like to have a disability, so that they can understand better and be more familiar with disability.

Measuring if the education works is important because people with a disability need to be able to see health professionals who can offer equal service to people with a disability to the general population. It’s important that health professionals learn from the education and that it can be shown that they have learnt, to offer the best healthcare to people with a disability.

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Declaration of interest

None.

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