Systematic Review

Examining the Efficacy of Communication Partner Training for Improving Communication Interactions and Outcomes for Individuals With Traumatic Brain Injury: A Systematic Review

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KEYWORDS
Communication; Rehabilitation; Systematic review;

Abstract  Objective: To describe the evidence regarding communication partner training (CPT) interventions for individuals with traumatic brain injury (TBI) and their conversation partners.

Data Sources: Eleven key databases—PubMed, CINAHL, Cochrane Registry of Controlled Trials, Embase, Linguistic and Language Behavior Abstracts, ProQuest, Scopus, Web of Science, PsycBITE, SpeechBITE, and ERIC—were searched from inception through 2019.

List of abbreviations: CP, communication partner; CPT, communication partner training; ECP, everyday communication partner; OCEBM, Oxford Centre for Evidence-Based Medicine; RCT, randomized controlled trial; ROBINS-I, Risk Of Bias In Non-randomized Studies - of Interventions; RoBINT, Risk of Bias in N-of-1 Trials; SCED, single-case experimental design; TBI, traumatic brain injury.

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Traumatic brain injury (TBI) is recognized as a global health priority in view of the social and economic costs to society, and the complex and expensive medical and rehabilitation care it necessitates. Moreover, as one of the peak ages of injury ranges from 15 to 24 years, this leaves many young people with the burden of a lifelong injury that is globally recognized as chronic disease. After TBI, >75% of individuals will experience some form of communication impairment. This can be devastating as communication underlies all human social life and is the means by which social and vocational goals are achieved, group decisions are made, and by which people receive and provide support. It is therefore critical that health care and community service providers working with persons with TBI have an understanding of the latest evidence that informs their practice with respect to communication issues. There is a need for reviews that comprehensively and critically appraise the literature on important issues such as communication partner training (CPT).

Communication can be viewed as a partnership, a bidirectional process involving 2 or more persons following an unspoken and inherent set of culturally biased rules including implied rules of politeness based on social contexts. Individuals with TBI experience communication impairments particularly in the realm of social communication, whereby they have difficulty adhering to the unspoken rules of conversation. These impairments are evidenced on standardized tests and in everyday conversations and may include challenges such as difficulty understanding and responding, difficulty recognizing and repairing communication breakdowns, and apparent lack of awareness and insensitivity to the communication needs of others. Furthermore, these impairments often have a devastating effect on interpersonal relationships, participation, and community reintegration and lead to inequities in social and health care supports.

Not only do these impairments affect the person with TBI, but they also contribute to stress and burden for families and caregivers. Family members have described their loved one’s communication as ranging from slow and hesitant, restricted to a limited repertoire of stereotypic expressions, to being tangential or inappropriate and overtalkative. These communication behaviors are perceived by others as challenging, and sometimes, as exhausting and embarrassing. Historically, interventions to remediate communication impairments have focused on the individual, and there is a body of evidence of interventions for cognitive-communication disorders.

Consistent with a more social and environmental perspective, involving communication partners (CPs) have also become a recognized approach to intervention and originated as a means of intervention and support for people with aphasia. This method, referred to as CPT, aims to facilitate improvements in the quality of interactions and information transfer and has been found to be a potentially efficacious method of helping families, caregivers, and community members optimize communication success. CPT after TBI has evolved because of a paradigm shift in approaches to rehabilitation that have altered the emphasis from remediation of individual cognitive and communication skills in isolation, to one which emphasizes participation, community integration, and quality of life. CPT is in keeping with the context-sensitive approach defined by Ylvisaker that includes context-supported participation with the goal of enabling participation in everyday activities. Inherent within this approach is the aim of reducing participation inequities through building of partnerships between the person with TBI and their CPs.

Given that communication is a bidirectional process, CPT alter the goal from communication competence, where the burden is placed on the individual with TBI, to one of communication success with shared responsibility between CPs. With this shared responsibility, the individual with TBI can gain acceptance from family and peers.
establish and maintain friendships, and meet the demands of school, work, and community.\textsuperscript{4,34}

It is also recognized that communication is highly gendered,\textsuperscript{35} and recently, there is an increased understanding of the effect of sex and gender on recovery from TBI.\textsuperscript{15,36,37} This is also reflected in an emerging body of research regarding communication outcomes after TBI. For example, Byom et al.\textsuperscript{28} examined intimate and non-intimate conversations of individuals with and without TBI and identified differences by sex.\textsuperscript{38} Specifically, as conversations become more intimate, men with TBI have difficulty adjusting and using vocabulary referring to emotion.\textsuperscript{38} Patient-care-giver communication has also been postulated to be affected by sex or gender, because women with TBI are more aware of their pragmatic social communication impairments than men with TBI.\textsuperscript{39} Thus, examining the influence of sex and gender on communication interventions and outcomes is increasingly relevant.

Given the prevalence of communication impairments and subsequent health and participation inequities after TBI, reducing these inequities requires community participation and increased community accessibility. Thus, it is imperative that clinical practitioners, decision and policy makers, and researchers have a broader understanding of the state of current evidence regarding CPT interventions to improve health and participation inequities and increase accessibility and quality of life for individuals with TBI.

**Purpose**

A descriptive review of CPT and TBI was conducted by Wiltshire and Ehrlich in 2014,\textsuperscript{28} who described 4 published studies. The authors reported that sample sizes in general were small and that the evidence was not sufficient to make recommendations on the clinical efficacy of CPT for individuals with TBI and their CPs.\textsuperscript{28} The authors did not conduct a quality appraisal of the included studies.

The purpose of this review was to expand the descriptive results of Wiltshire and Ehrlich,\textsuperscript{28} and systematically examine the efficacy of CPT as an intervention for individuals with TBI and their CPs. Specifically, we aimed to identify, evaluate, and synthesize the evidence, and, to identify analysis by sex and gender within each study to elucidate any gender-specific differences, needs, and practice recommendations. We aimed to answer the following questions:

1. What is the efficacy of CPT as an intervention for individuals with TBI and their CPs?
2. What types of CPs benefit from this type of training?
3. Is there any evidence to suggest that sex and gender play a role in the efficacy of CPT?

**Methods**

We defined a research protocol and registered it in PROSPERO, an international prospective register of systematic reviews, under registration number CRD42019130167.\textsuperscript{40}

**Inclusion criteria**

We sought studies relating to communication or conversation partners and TBI. CPT was defined as an intervention that provides training to a person or persons other than the individual with the communication impairment, with the intent of improving language, communication, participation, and/or well-being of the individual with the communication impairment. The review was limited to papers published in English. Given that the evidence regarding CPT and TBI is in the early stages, our search criteria was kept fairly broad in relation to year of publication, study type (original research only), or design (eg, controlled trials or qualitative reports). Thus, to identify all potentially relevant information that could guide knowledge transfer, training and clinical practice, and inform future research and policy, all peer-reviewed publications were considered for inclusion in the review except for the criteria below.

**Exclusion criteria**

Studies were excluded that were not peer reviewed, did not relate specifically to TBI, were a commentary rather than original research, or were a scoping or systematic review.

**Search strategy**

On March 27, 2019, 11 key databases were searched from inception to the present—PubMed, CINAHL, the Cochrane Registry of Controlled Trials, Embase, Linguistic and Language Behavior Abstracts, ProQuest, Scopus, Web of Science, PsycBITE, SpeechBITE, and ERIC—to identify citations addressing the use of conversation partners or communication partners for patients with a TBI. TBI was searched using the MeSH TBI/and postconcussion syndrome/and keywords encephalopathy, edema, and concussion. Also included were terms for common measurements of brain injury: Glasgow outcome scale and Rancho Los Amigos Scale. Conversation partner was defined by the keywords communication partner, conversation partner, conversation advocate, communication advocate*, or communication train*, as well the MeSH caregivers appearing alongside words pertaining to communication disorders. After a gray literature search was performed in PsycBITE and SpeechBITE, we expanded the search to include in-service or noncaregiver training. One other paper not indexed in the 11 databases was identified by a colleague. After the citations were screened, a citation search was run on all articles that met the study’s inclusion criteria. The titles and abstracts of all work quoting these 11 of the 12 articles were identified in the Web of Science. The article identified by the colleague was not identified in any database other than Google Scholar.

The search yielded 1088 potentially relevant titles that were imported into EndNote 9.0 for further consideration. These were submitted to 2 reviewers for title and abstract review.
Study selection

After removing duplicates, 1003 titles and abstracts were screened by 2 authors for eligibility. A further 981 were excluded, leaving 17 potentially relevant studies as full text. To ensure interrater reliability, 2 authors read the text of 3 of the same papers and then conferred regarding eligibility. Because there was 100% agreement, the 2 authors independently applied the selection criteria to decide on inclusion or exclusion of the remaining studies. Five additional studies were excluded based on focus or type of publication, yielding 12 studies for data extraction, critical appraisal, and analysis. Each of the 9 quantitative studies were appraised for their methodological quality and rigor. Where applicable, we critically appraised the Level of Evidence of each of the studies, as per the guidelines of the Centre for Evidence-Based Medicine Oxford Levels of Evidence. We assessed bias for randomized controlled trials (RCTs) using the Cochrane Collaboration tool, and for non-RCTs using the Risk Of Bias In Non-randomized Studies - of Interventions (ROBINS-I). We assessed internal validity of the single case studies with the Risk of Bias in N-of-1 Trials (RoBINT) Scale. A quality assessment was not conducted on the qualitative studies. For each tool, 2 authors independently scored the methodological features as being present or absent, discrepancies were discussed, and consensus reached. A summary of Risk of Bias is shown in tables 2 and 3, and fig 2.

Data extraction and critical appraisal

Data for the 12 included studies were extracted and entered into a Microsoft Excel file by the first author, followed by a review for accuracy and completeness by the second author. Data included bibliographic information, country of study origin, design, population characteristics, description of the CPT, description of the outcome measure(s), documentation of any analysis by sex and gender, findings, and presence or absence of follow-up evaluation. A qualitative meta-analysis of themes and findings across the studies was conducted, structured around the types of CPs trained (eg, paid caregivers, police officers, family members), the CPT intervention as well as the perceptions of participants regarding the functional efficacy of the interventions. We discussed the findings in the context of TBI rehabilitation with application to knowledge transfer,
| Title, Author, and Country of Origin | Study Design | Level of Evidence | Participants/Population of Interest: Target Communication Partner | CPT Intervention | Outcome Measure(s) | Sample Size and Demographics | Analysis by Sex and/or Gender | Main Findings | Length of Follow-up |
|-------------------------------------|-------------|-------------------|---------------------------------------------------------------|----------------|-------------------|-----------------------------|-----------------------------|--------------|-------------------|
| Training of communication partners of persons with TBI: a randomised controlled trial by Togher et al., Australia | RCT with cross-over of groups with-between group equivalence at baseline | II | CPs: police officers; individuals with severe TBI and pragmatic communication disorder | Six 2-hour sessions with 6 modules 1. What is TBI 2. Communication in context 3. Telephone inquiries 4. Telephone inquiries 5. Practice with people with TBI 6. Revision and role plays | No. of moves according to the analytic framework Generic Structure Potential pre- and posttraining and control | N = 20 police officers  Men = 20 Training group: Mean age = 33 y Mean education = 18.6 y Control group: Mean age = 27 y Mean education = 17.1 y N = 20 individuals with TBI Men = 20 Mean age = 36.3 y 36 staff: Physician N = 1 Nursing = 7 Physiotherapist and physiotherapist assistant N = 8 SLP N = 7 Sex: not specified Mean age and education: not specified | No: NA as all participants were men | Trained officers had more efficient-focused interactions in telephone calls posttraining Mean no. of moves decreased Shorter interactions | None |
| Effectiveness of communication/interaction strategies with patients who have neurological injuries in a rehabilitation setting, by Shelton and Shyrock., United States | Cross-sectional observational survey | V | CPs: licensed health care providers; hospitalized patients in rehabilitation with TBI | NA: an examination effectiveness, frequency, and types of communication strategies used by staff | NA | | | Use of communication strategies aided the interactions Use of more strategies increased success of interactions | None |
| Sales assistants serving customers with traumatic brain injury, by Goldblum and Alant., South Africa | 3 phase RCT | II | CPs: customer service managers, customer care assts., deli/bakery sales assts | 1X 4-hour training session with original onsite videotaped scenarios within small group discussion format | Pre- and postquestionnaires designed specifically for study Pre- and posttraining | | No | Experimental group was more confident and more knowledgeable than controls after training | None |

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|-------------------------------------|--------------|-------------------|---------------------------------------------------------------|------------------|-------------------|-----------------------------|-----------------------------|----------------|-------------------|
| Evaluating communication training for paid carers of people with traumatic brain injury, Behn et al, *44* Australia and United Kingdom* | Single-blind RCT | II | CPs: paid caregivers in long-term care or in-patient rehabilitation facility | 17-hour programme (across 8wk) with conversational interactions (ie, structured and casual) between paid careers and people with TBI | Primary outcome measures: adapted MSC and adapted MPC, and global impression scales of conversation Secondary outcome measures: LCQ, Modified Burden Scale | confidence rating scale | Control group: N=33 Sex: women=32 Mean age=41.9 y and education: not specified Experimental group: (Trained) N=5 Sex: not specified Mean age=24.2 years Mean education=12.6 y | No | Trained paid careers more able to acknowledge and reveal competence Of those with TBI, conversations perceived as more appropriate, interesting, and rewarding compared to control group |
| An exploration of participant experience of a communication training program for people with traumatic brain injury and their communication partners, Togher et al, *41* Australia* | Qualitative | NA | CPs: ECPs: mothers, fathers, husbands, wives, caregivers Outpatients with moderate-severe TBI at least 9 mo postinjury | TBI Express: 10-wk conversational skills therapy program; TBI Express: weekly group and individual sessions for both treatment groups Joint condition focused on both partner person | Analysis of semistructured videotaped interviews with questions regarding the treatment, participants’ experience of the training program, information regarding strengths of the program and improvement in partner carer’s experience | N=44 TBI N=44 ECP ECP TBI JOINT condition: N=14 Sex: men=11, women=3 Mean age=30.3 y Mean education=12 y | Informal notations: 1. CPs who were mothers (women) experienced more anxiety about their own communication and may need more support 2. The | None |

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| Title, Author, and Country of Origin | Study Design | Level of Evidence | Participants/ Population of Interest: Target Communication Partner | CPT Intervention | Outcome Measure(s) | Sample Size and Demographics | Analysis by Sex and/or Gender | Main Findings | Length of Follow-up |
|-------------------------------------|--------------|-------------------|---------------------------------------------------------------|-----------------|-------------------|-----------------------------|-----------------------------|---------------|-------------------|
| Training communication partners of people with severe traumatic RCT CPT (joint) with individual treatment | 3 arm non-RCT CPT (joint) with individual treatment | III | CPs: ECPs Outpatients with moderate-severe TBI at least 9 m postinjury | TBI express: 10-wk conversational skills therapy program; TBI Express: weekly | Blind ratings of the person with TBI’s level of participation during | N = 44 TBI N = 44 ECP ECP TBI JOINT condition: N = 14 | Sex: men = 11, women = 33 | CPT improved conversational performance relative to training the person with | 6 mo | (continued on next page)
| Title, Author, and Country of Origin | Study Design | Level of Evidence | Participants/ Population of Interest: Target Communication Partner | CPT Intervention | Outcome Measure(s) | Sample Size and Demographics | Analysis by Sex and/or Gender | Main Findings | Length of Follow-up |
|------------------------------------|-------------|------------------|---------------------------------------------------------------|----------------|------------------|---------------------------|-----------------------------|--------------|------------------|
| brain injury improves everyday conversations: a multicenter single blind clinical trial, Togher et al. * | (TBI solo) and a waitlist control group with 6-mo follow-up | (TBI alone) and a waitlist control group | conversation on the measure of participation in communication adapted Kagan scales | | | | | | |
| | | | women = 3 | | Mean age = 30.3 y | | | | |
| | | | Mean education = 12 y | | ECP TBI SOLO condition: N = 15 | | | | |
| | | | Sex: men = 14, women = 1 | | Mean age = 39.7 y | | | | |
| | | | Mean education = 12 y | | ECP TBI CONTROL condition: N = 15 | | | | |
| | | | Sex: men = 13, women = 2 | | Mean age = 38.1 y | | | | |
| | | | Mean education = 12.7 y | | ECP JOINT: N = 14 | | | | |
| | | | Sex: men = 4, women = 10 | | Mean age = 50.3 y | | | | |
| | | | Mean education = 13.1 y | | ECP TBI SOLO: N = 15 | | | | |
| | | | Sex: men = 2, women = 13 | | Mean age = 49 y | | | | |
| | | | Mean education = 12.9 y | | ECP CONTROL: N = 15 | | | | |
| | | | Sex: men = 3, women = 12 | | Mean age = 49.7 y | | | | |
| | | | Mean education = 12.4 y | | | | | | |
| Title, Author, and Country of Origin | Study Design | Level of Evidence | Participants/Population of Interest: Target Communication Partner | CPT Intervention | Outcome Measure(s) | Sample Size and Demographics | Analysis by Sex and/or Gender | Main Findings | Length of Follow-up |
|-------------------------------------|--------------|-------------------|-------------------------------------------------|------------------|---------------------|-----------------------------|-----------------------------|---------------|-------------------|
| Describing conversations between individuals with traumatic brain injury (TBI) and communication partners following communication partner training: using exchange structure analysis, Sim et al.\(^\text{45}\) Australia\(^*\) | Multisite non-RCT | III | CPs: ECPs Community-dwelling individuals with severe TBI at least 1 year postinjury | TBI Express: 10-wk conversational skills therapy program; weekly group and individual sessions for both treatment groups | Adapted MPC TBI JOINT condition: N=14 Sex: men=11, women=3 Mean age = 30.3 y Mean education=12 y TBI CONTROL condition: N=15 Sex: men=13, women=2 Mean age = 38.1 y Mean education=12.7 y ECP JOINT condition: N= 14 Sex: men=4, women=10 Mean education=13.1 y ECP CONTROL condition: N=15 Sex: men=3, women=12 Mean age = 49.7 y Mean education=12.4 y | No | Exchange structure analysis and productivity analysis revealed significant change in the use of testing moves by trained ECPs and significant change in productivity by trained participants with TBI |
| Experiences from a communication training programme of paid carers in a residential rehabilitation centre for people with | Qualitative | NA | CPs: paid caregivers in long-term care facility | 17-hour programme (across 8 wk) with conversational interactions (ie, structured and casual) between paid careers and people with TBI | Semistructured interviews | N=5 Sex: women=5 Mean age = 38.6 y Mean education=12.6 y | No | Paid careers described improved knowledge and use of strategies, improved communication, positive emotional experiences, |

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| Study Design | Level of Evidence | Participants/Population of Interest: Target Communication Partner | CPT Intervention | Outcome Measure(s) | Sample Size and Demographics | Analysis by Sex and/or Gender | Main Findings | Length of Follow-up |
|--------------|-------------------|---------------------------------------------------------------|-----------------|-------------------|-----------------------------|-----------------------------|--------------|-------------------|
| Non-RCT      | III               | CPs: ECPs (family members) Community-dwelling individuals with severe TBI at least 1 year postinjury | TBI express: 10-wk LCQ conversational skills therapy program; weekly group and individual sessions for both treatment groups Joint condition focused on both partner person with TBI while TBI solo condition | N=44 TBI | N=44 ECP ECP TBI JOINT condition: N=14 Sex: men=11, women=3 Mean age=30.3 y Mean education=12 y | No Training 6 mo | Communication partners of people with chronic-severe TBI using TBI express led to perceived improvements in everyday communication ability by both the person with TBI and their family |
| Descriptive qualitative | NA               | CPs: ECPs (family members) Community-dwelling individuals with severe TBI at least 1 year postinjury | Analysis of transcribed conversations using adapted Kagan scales | N=8 4 with TBI Sex: men=1, women=3 Mean age=25.5 y Mean education=12.3 y 4 ECPs Sex: men=1, women=3 Mean age=52.3 y Mean education=17.3 y | No | | barriers and facilitators to consider for future communication training programmes Kagan plus dyads | None had obvious changes in their questioning practices which facilitated selection of topics and development of related talk, ie, improved communication Kagan neutral had less obvious differences, thus less apparent improved communication |
| Questioning in conversations before and after communication partner training for individuals with traumatic brain injury, Mann et al,47 Australiaa* | | | | | | | | | (continued on next page)
| Title, Author, and Country of Origin | Study Design | Level of Evidence | Participants/Population of Interest: Target Communication Partner | CPT Intervention | Outcome Measure(s) | Sample Size and Demographics | Analysis by Sex and/or Gender | Main Findings | Length of Follow-up |
|-------------------------------------|--------------|-------------------|-------------------------------------------------|------------------|------------------|--------------------------|----------------------------|-----------------|------------------|
| Joint video self-modeling as a conversational intervention for individual with moderate-severe TBI and 27 mo | Mixed methods: qualitative and quantitative | IV | CP: spouse of individual with moderate-severe TBI and 27 mo | 16 sessions of joint video self-modeling, jointly reviewing | women = 1 Mean age = 39.7 Mean education = 12.8 y ECP TBI CONTROL condition: N = 15 Sex: men = 13, women = 2 Mean age = 38.1 y Mean education = 12.7 y ECP JOINT: N = 14 Sex: men = 4, women = 10 Mean age = 50.3 y Mean education = 13.1 y ECP TBI SOLO: N = 15 Sex: men = 2, women = 13 Mean age = 49 y Mean education = 12.9 y ECP control: N = 15 Sex: men = 3, women = 12 Mean age = 49.7 y Mean education = 12.4 y ECP TBI: N = 1 Sex: men = 1 Age = 53 y Education: not | | | | Pre- and postmeasures of social communication | 6 mo |
### Table 1 (continued)

| Title, Author, and Country of Origin | Study Design | Level of Evidence | Participants/Population of Interest: Target Communication Partner | CPT Intervention | Outcome Measure(s) | Sample Size and Demographics | Analysis by Sex and/or Gender | Main Findings | Length of Follow-up |
|-------------------------------------|--------------|-------------------|-----------------------------------------------------------------|------------------|-------------------|-----------------------------|----------------------------|----------------|-------------------|
| **A single case experimental design study on improving social communication skills after traumatic brain injury using communication partner telehealth training, Rietdijk et al.** | Single-case experimental design | IV | Individuals with TBI and their ECP | TBIconneCT (a telehealth version of TBI express): 10-wk program with one 1.5-h session per week directed by a clinician | Exchange structure analysis | TBI: N = 1 | No | Positive change found on blinded ratings of conversation and self-reported measures for both participants | Participant 1 = 3 mo postintervention, Participant 2 = 9 mo postintervention (was unavailable earlier due to traveling) |
| | | | | Sessions occurred online via Skype | LCQ, CCRSA, QOLIBRI, PART-O Global ratings of conversation quality | | | | | |
| | | | | Program content includes didactic instruction, structured role plays, practice of conversation and recordings for identification of communication difficulties, and strategies to address said difficulties | | | | | | |
| | | | | | | | | | | |
| **an individual with traumatic brain injury and his everyday partner: a pilot investigation, Hoepner and Olsen,** United States | quantitative | Single-case design | postinjury | recordings of conversations from their home and community under the guidance of a coach | | Specified | ECP: N = 1 | Sex: women = 1 | identified improvements in self-awareness and self-regulation. The partner increased positive conversational supports and reduced setups and antagonistic statements | | |
| | | | | | | | Sex: men = 1 | Age = 50 y | Education: not | | |
| | | | | | | | | | Specified | | |

Abbreviations: CCRSA, Communication Confidence Rating Scale for Aphasia; LCQ, La Trobe Communication Questionnaire; MPC, measure of participation in conversation; MSC, measure of support in conversation; PART-O, Participation Assessment with Recombined Tools (Objective); QOLIBRI, Quality of Life After Brain Injury; SLP, speech-language pathologist.

* Denotes papers from the same study.
training, and clinical practice. Results are displayed in evidence tables (see table 1). Excerpts from the findings are included in the body of the text to illustrate key aspects of the qualitative meta-synthesis.

Determining overall quality of the evidence
According to the Oxford Centre for Evidence-Based Medicine (OCEBM), the Oxford Levels of Evidence (2011) were not designed to provide a definitive judgement regarding the quality of the evidence or a specific recommendation.51 To determine the overall quality of the evidence, we considered the following four questions specified by the OCEBM to make the determination:

1. Do you have good reason to believe that your patient is sufficiently similar to the patients in the studies you have examined?

2. Does the treatment have a clinically relevant benefit that outweighs the harms?

3. Is another treatment better?

4. Are the patient’s values and circumstances compatible with the treatment?

Results
Type of evidence
Twelve studies met the inclusion criteria (see fig 1) and consisted of 3 RCTs,31,45,46 a non-RCT yielding 3 sub-studies,21,45,46 1 single-case experimental design,49 1 mixed method single-case qualitative and experimental study,48 1 observational study,43 and 3 qualitative semistructured studies.27,41,47 See table 1.

Participants
The total number of participants varied by study and ranged from 2 to 88, with the total from all studies being 525 and 291 when excluding substudies from the same research program. There were 223 individuals with TBI, and 302 communication partners across all studies, with 106 individuals with TBI and 185 communication partners when excluding substudies. Although most studies included individuals with TBI and CPs, Goldblum and Alant31 and Behn et al 44 included only CPs.31,44 Types of CPs included police officers, health care professionals, sales assistants, care-givers within inpatient rehabilitation, family members, and everyday communication partners (ECPs). Across all studies, 218 men and 225 women were included, and 93 men and 116 women were included when excluding substudies. Across all studies, there were only 3 female participants with TBI; however, most of CPs (n=143) were women. The average age was 38.2 years and average education was 13.8 years. Participant inclusion and exclusion criteria were fairly consistent across studies. For those with TBI participants, inclusion criteria (where specified) were (1) chronic moderate-severe or severe TBI, (2) significant social communication or pragmatic impairments, (3) have a CP with whom they interact regularly, (4) at least average premorbid intelligence confirmed from the most recent

| Table 2 | Risk of bias summary using the ROBINS-I assessment: review authors’ judgments about each risk of bias outcome for the included studies |
| Bias Domains | Sim et al[45,*] | Togher et al[46,*] | Togher et al[41,*] |
| Preintervention | | | |
| 1. Confounding | L | L | L |
| 2. Selection of participants | L | M | M |
| 3. Classification of interventions | L | L | L |
| Postintervention | | | |
| 4. Deviation from intervention | L | L | L |
| 5. Missing data | L | L | L |
| 6. Outcome measurement | L | L | L |
| 7. Selection of reported result | L | L | L |
| Overall | Low | Low | Low |

Abbreviations: C, critical; L, low; M, moderate; NI, no information; S, serious.
* Papers from same study.

| Table 3 | Risk of bias summary using the RoBiNT: review authors’ judgments about each risk of bias outcome for the included studies |
| Bias Domains | Hoepner and Olsen[48] | Rietdijk et al[49] |
| IV subscale | | |
| 1. Design with control | 0 (unclear) | 1 |
| 2. Randomization | 0 | 0 |
| 3. Sampling of behavior | 2 | 2 |
| 4. Blinding of people involved in the intervention | 0 | 0 (unclear) |
| 5. Blinding of assessor(s) | 2 | 2 |
| 6. Interrater agreement | 1 (built into the MPC with anchor ratings) | 0 (unclear) |
| 7. Treatment adherence | | |
| Overall IV score/14 | 8 | 8 |

NOTE. 0, failed to meet criteria; 1, met previously accepted standards; 2, meets currently recommended criteria.
Abbreviations: IV, internal validity; MPC, measure of participation in conversation.
neuropsychological assessment, and (5) intelligible speech and English proficiency. Rietdijk et al. used the above inclusion criteria with the exception of average premorbid intelligence and also specified a home computer with internet. Behn et al. also had an exclusion criteria of (1) cooccurring drug and/or alcohol use, (2) no evidence of psychosis, (3) no university level credentials, (4) English proficiency, and (5) full-time work as a caregiver. For those studies including TBI participants, exclusion criteria were mostly consistent across studies including the presence of (1) severe dysarthria or aphasia preventing intelligibility in conversation with an unfamiliar listener; (2) drug or alcohol addiction, or active psychosis; and (3) multiple TBIs. Rietdijk et al. also had an exclusion criteria of (1) cooccurring degenerative neurologic disorder or (2) severe amnesia preventing participants from provided informed consent, and, for CPs, no history of TBI. Please refer to supplemental appendix S1 (available online only at http://www.archives-pmr.org/) for details of the outcome measures and interventions.

Thematic content analysis of qualitative studies

A meta-synthesis and analysis of qualitative findings identified 3 main categories of content themes: (1) benefits of CPT and TBI including improved understanding and awareness of the effect of TBI on communication, improved understanding and awareness of communication roles, and specific strategies to support the communication competence of the person with TBI; (2) risks of CPT including increased awareness of negative communication behaviors or barriers on behalf of the communication partners and increased anxiety during the early sessions of the program; and (3) suggestions for improving the CPT programs including increased role play and less didactic teaching.

Study findings

To answer the questions posed in this review, we have synthesized the findings according to (1) type of communication partner trained and (2) considerations of sex and gender.

Communication partners: community members (nonfamily or caregivers)

Two studies, both RCTs and thus Level 2 evidence, assessed the effect of CPT on community members who were not directly related to people with TBI. Both studies incorporated a broad array of context-sensitive skills and awareness relating to effective communication and produced a positive result. Togher et al. conducted an RCT with cross-over of groups to determine whether a training program would improve the interaction style of police officers during telephone-based service inquiries with participants with TBI. Male police officers were recruited from the Police Services and randomly assigned to an intervention group or control group. Twenty males with TBI were also recruited to participate in the telephone interactions. The intervention involved a 6-week group training program. Pre- and posttreatment effects were evaluated using transcribed telephone service encounters. Positive changes for the experimental group included spending more time to establish the nature of the inquiry, taking increased time to respond, more efficient, focused interactions and reduced overall interaction time, and fewer unrelated utterances by participants with TBI. Goldblum and Alant also conducted an RCT to determine whether a group training program could improve the interaction styles of sales assistants with customers with TBI. Sixty-four staff (62 women) including customer service managers, customer care assistants, and frontline customer sales assistants were recruited from a retail supermarket chain and randomly assigned to the experimental and control groups. The intervention involved one 4-hour small group training session (see supplemental appendix S1). Pre- and posttreatment effects were evaluated using 2 questionnaires developed specifically for the trial and administered on 2 different occasions to the experimental and control groups pre- and posttraining. Positive changes were observed for the experimental group who became more confident and more knowledgeable. For both studies, training of CPs led to greater understanding, provision of
appropriate supports, and greater feedback and structure of everyday interactions. Overall, although the format, content, and duration of these interventions varied, results from these two Level 2 studies suggest that increasing awareness and skill of community-based CPs were beneficial in improving conversational interactions.

Communication partners: paid caregivers
Two studies with differing methodologies assessed the effect of CPT on paid caregivers working directly with people with TBI. Behn et al.\textsuperscript{44} conducted a single-blinded RCT Level 2 study\textsuperscript{51} to determine whether a CPT program could improve interactions with individuals with TBI.\textsuperscript{52} Ten paid caregivers (sex not specified) were recruited from a residential rehabilitation center and randomly allocated to a training or control group. Five individuals with TBI (3 men) were recruited from consecutive admissions to the rehabilitation center, as conversation partners. The intervention was adapted from the previously published TBI Express.\textsuperscript{53} The program was adapted to be context sensitive by introducing situations common to the rehabilitation center. Pre- and posttreatment effects were evaluated by two primary outcome measures (see supplemental appendix S1). Despite the small sample size, positive changes for the experimental group were observed by blind assessors, including being better able to acknowledge and use supported communication strategies to reveal the competence of people with TBI. These improvements were confined to structured conversation yet were maintained at 6-month follow-up.

Behn et al.\textsuperscript{47} later conducted a qualitative investigation of the experiences of these same caregivers and aimed to determine the effect of the previously described CPT program using qualitative, semistructured interviews to gather information regarding participants’ experiences of talking with TBI patients, the training program, and any suggested changes. This later study revealed that the paid caregivers were women. Each 5- to 20-minute videotaped interview was conducted prior to and after the training program. The interview time varied depending on the amount of information the participant wished to provide. The data were coded and analyzed for themes and revealed 4 major categories including experiences of (1) improved knowledge and use of strategies, (2) improved communication, (3) positive emotional experiences, and (4) barriers and facilitators of the training program. One particular participant’s quote appeared to exemplify the value of CPT in terms of increased awareness, skill, and altering perspectives about the communication of persons with TBI and recognizing the need for respect and dignity for their patients (with TBI).

“It’s definitely improved my skills, it’s definitely made me see things differently and I look at the clients differently … one of the clients who is the hardest to try and work your skills around, that test your skills I think, but it also tests your emotions … it [CPT] teaches us to respect these people [with TBI], they are human beings … that’s how I want to be spoke to in a normal tone of voice not a domineering tone, like I am up here you are there.”\textsuperscript{47(p1157-8)}

Additionally, the authors solicited feedback on the CPT program, which is particularly relevant from the perspective of stakeholder engagement. The involvement of people and organizations directly affected by research in the research process itself is increasingly recognized as an important and ecologically valid means of affecting positive change.\textsuperscript{56} Participants identified that functional, practical activity-based approaches were more effective than the didactic lecture-based components and provided the following suggestions:

We would like … “Probably more time to, like, practice with tape recorders and stuff [because] we didn’t get a lot of time…[and] some time in our work time that we can practice.”

"Perhaps we could do it with you as the client… I still wish I could see myself back [on video]…[I] find that useful, with body language, posture, what am I saying to you…"\textsuperscript{47(p1558)}

Although the evidence for CP training of paid caregivers remains limited with this small-N Level 2 study and qualitative study, the combination of findings suggests that training of paid caregivers can result in improved knowledge, better conversations, greater satisfaction, and confidence with their interactions with TBI patients. Additionally, participants developed a greater understanding of the effect of cognition on communication and increased awareness of strategies to encourage people with TBI to express their own thoughts and opinions.

Communication partners: health care professionals
One study examined correlations between the use of communication strategies by licensed health care providers and the success of interactions with adults with neurologic injuries and communication or cognitive impairments within an in-patient rehabilitation setting.\textsuperscript{43} This observational study included a mixed patient population; however, almost two-thirds had a diagnosis of TBI, and the remaining one-third had a diagnosis of ABI, (primarily stroke and some with anoxic brain injury). Thus, the findings may have application to other health care providers working with TBI patients. Thirty-six health care providers (sex not specified) including a physician (n = 1), nurses (n = 7), physical therapists and physical therapy assistants (n = 13), occupational therapists and certified occupational therapy assistants (n = 8), and speech-language pathologists (n = 7) were recruited from a rehabilitation center to participate in this study, along with 36 in-patients with neurologic injury and varying levels of cognitive-linguistic severity from mild-moderate to severe-profoundly impaired. This Level 5 cross-sectional study involved the rating of 102 five-minute videotaped interactions (between in-patients and licensed health care providers) by 5 judges (trained speech language pathologists) who were unfamiliar with the patients and staff being videotaped. Participants were blinded as to when conversations were being recorded. Immediately after the interaction, a judge rated conversational success according to a predetermined 5-point scale of the level of attentiveness, compliance with and participation in the task or topic discussed. The staff member or research participant completed a 7-choice questionnaire about their perceived awareness of and use of specific strategies.

After establishing interrater reliability, the judges identified that the most successful interactions, regardless
of patient severity, were those involving the strategies of short, direct sentences and directions presented one at a time and facing the patient and making eye contact. For mild-moderately impaired patients, strategies of allowing the patient extra time to respond and supplementing communication with gestures and/or pointing resulted in the most successful interactions, and for severely-profoundly impaired patients, the strategies of repetition of information and clarification of communication attempts resulted in the most successful interactions. Positive correlations were also found between the number and use of strategies and success of the interactions. Although this study did not provide any CP training, and thus does not provide any evidence to support the efficacy of CPT, it provides some limited evidence that awareness and use of specific communication strategies has a positive effect on the success of interactions between patients with neurologic injuries including TBI and health care providers within inpatient rehabilitation.

Communication partners: ECPs
Seven of the included studies used varying methodologies to assess the effect of CPT on family members, referred to as ECPs of individuals with TBI. Each study incorporated an array of context-sensitive skills and heightened awareness relating to effective communication; findings from the quantitative studies yielded positive results including increased awareness of strategies and confidence in more effective communication.

Togher et al46 conducted a multicenter, non-RCT to assess the efficacy of the program TBI Express55 for individuals with TBI and their ECPs as compared to training the individuals with TBI alone. TBI Express is a communication training program for people with TBI and their families, friends, and caregivers. It includes ten modules of 2.5-hour group sessions and 45-minute individual sessions. It is available for purchase and includes a manual and DVD resources to support the delivery of the program for individuals with TBI and their family or caregivers or for individuals with TBI alone. Please refer to supplemental appendix S1 for further details.

Forty-four participants with TBI (men=38) were recruited from three different brain injury units along with their ECP (women=34). This 3-arm Level 3 clinical trial allocated participants to 1 of 3 groups: (1) JOINT condition; both the individual with TBI and their ECP received communication training; (2) SOLO condition; only the individual with TBI received training; and (3) CONTROL condition; a delayed training group. Casual conversations between individuals and their ECPs were rated by blinded assessors. Positive changes were identified and differed significantly between groups. Specifically, both treatment groups significantly improved in social affiliation, information transfer, and communicative support. However, the JOINT group had greater gains than the SOLO group for information transfer and aspects of communicative support and maintained their improved communication skills at 6 months posttraining.

This research program also yielded 3 other studies, 1 quantitative and 2 qualitative. Sim et al45 aimed to specify the effects of the TBI Express and thus further examined the casual conversation samples collected from the JOINT and CONTROL groups.45 Casual conversations were formally analyzed. Positive changes were reported whereby the ECPs in the JOINT group made improvements to their communicative style, significantly reducing their use of test questions (ie, questions where they already knew the answer) compared to controls. The authors suggested this likely contributed to the overall improved quality of the conversations.

Mann et al27 used a qualitative methodology to describe the questioning patterns during casual conversations between 4 individuals with TBI and their ECP (from the study by Togher et al46 described above) from the JOINT condition, before and after the CPT. Although the overall findings from Togher et al46 were positive, there was variation in terms of the degree and presence of change within the JOINT group, as measured by the adapted Kagan scales (see supplemental appendix S1). For most dyads (conversations between 2 individuals), the conversation samples were rated more highly for information transfer and social affiliation after intervention and were thus termed plus dyads. A smaller number of dyads had little change in their pre- and postintervention ratings and were termed neutral dyads. Approximately, 10 minutes of casual conversations per dyad were transcribed. Questions within each sample were identified and qualitatively analyzed focusing on aspects of sequence organization. As described above, positive changes were observed after the training whereby plus dyads had obvious changes in their questioning practices after training which facilitated the selection of topics and the development of related talk, that is, improved communication. The neutral dyads revealed less obvious differences in questioning practices after training, indicating that improved communication in the postintervention samples was less apparent.

Togher et al41 also conducted a qualitative study investigating the overall experiences of the participants who attended the communication training program described above.

Semistructured videotaped interviews were completed by participants at the end of the training. Using a qualitative generic analysis procedure, data were categorized into topics and subtopics. Participants described improvements in communication skills, the effect of improved communication skills on relations, and provided insights into valuable components of the programs and components that were challenging or needed changes. A number of participant comments illustrate the value of the training:

"I think the best thing was the way you did the role playing, it was a perfect way of explaining... of making each one look at ourselves and see." "You’ve shown us how to do that without just telling us how to do it, you’ve actually shown us."41(p1566)

The authors also reported comments from CPs who were mothers of individuals with TBI that were invaluable in understanding the participatory experience, as well as identifying supports needed going forward. The mothers reported that attending the groups was quite challenging especially the first few sessions. One mother stated:
"It’s been probably a bit, was a bit daunting for myself. I thought it was, when I first came in, honestly, I could have left... it was just too confronting and the way that I felt in myself I just, because you don’t know what, you’re doing the best you can and now you’re coming and people are going to tell you what you’ve done may not have been right... I just don’t know whether I was ready for criticism but that’s not how it was at all but that’s how I thought... I actually had a panic attack for the first two things (sessions)” Rietdijk et al 49 (p1570)

This feedback was of particular importance for application to clinical practice because the researchers identified that it would be of benefit to normalize the feelings of the CP as part of the program introduction and involve a clinical psychologist to assist participants to cope with any anxiety. Although these qualitative studies do not add to the body of evidence regarding changes in performance pre- and posttraining of CPs, they do add to our understanding of the potential benefits and useful components of the training programs. Furthermore, they demonstrate the value of stakeholder engagement and qualitative research methodologies as part of evaluating the outcomes of the clinical trial.

Finally, two Level 4 single-case experimental design (SCED) studies also assessed the effect of CPT on conversation and social communication for individuals with TBI and their ECPs. Hoepner and Olsen48 conducted a pilot study to assess the effect of joint video self-modeling as a CPT intervention for social interactions by individuals with TBI and their partners.48 Similar to the work of Togher et al,41 the study design also included a qualitative component to understand the experiences of the participants. A 53-year-old man with moderate-severe TBI and his 50-year-old CP (female spouse) were recruited to participate in the study. Positive changes were identified, specifically improvements in self-awareness and self-regulation for the participant with TBI, and the ability of the CP to acknowledge and reveal the competence of the participant with TBI also increased. The findings suggest that CPT through the medium of video self-modeling appears to hold potential for increasing self-awareness and improving communication interactions for individuals with TBI and their partners.

Riedijk et al49 built on the work of Togher et al46 and conducted a feasibility study to assess the effect of CPT with TBI Express to improve social communication skills after TBI using a modified version called TBIconneCT with telehealth as the delivery medium to improve access to training.49 Positive changes were identified. Two participants with TBI and their CPs were recruited and completed TBIconneCT training: modifications included module content formatted onto slides for screen sharing. Participants used a private video-conference website to enable completion of recordings of home practice conversations and to share recordings. Outcome measures included conversational analysis and blinded ratings of conversation samples and self-report measures (see supplemental appendix S1). Participants were recruited from a previous study by the authors and included a 33-year-old man with severe TBI and his CP, a 30-year-old female friend, and a 24-year-old woman with severe TBI and her CP, her 42-year-old mother. Treatment goals were individualized to reflect communication behaviors of interest as well as their shared and individual goals. The study indicated positive change on blinded ratings of conversation and self-reported measures for both participants; however, exchange structure analysis conducted on session-by-session data did not demonstrate treatment effects due to variability during baseline. The findings corroborated the efficacy of TBI Express and indicated potential for using telehealth to provide social communication skills training to people with TBI and their families.

With the exception of the single-case studies, a group format was used to deliver the training.21,31,42,44,46 The hours of intervention ranged from 4 to 35 hours, spanning across 8.9 weeks on average.

Taken together, the findings of the qualitative Level 3 studies, the Level 4 SCED studies, and the associated qualitative findings provide moderate evidence of the benefits of CPT on improving conversational interactions among individuals with TBI and their ECPs. Moreover, the inclusion of qualitative data provides important social validation of the interventions because it reflects the end-user perspective and thus extends the conclusions that can be determined from quantitative data alone.41

Considerations of sex and gender
Given the relatively new and emerging understanding of the effect of sex and gender on overall recovery from TBI as well as communication outcomes, we did not identify any analysis or evaluation of findings according to sex or gender.

Critical appraisal

Levels of evidence
The studies varied in terms of their methodological quality. According to the Oxford Levels of Evidence,31,42,44,46 3 studies were deemed as Level 2 RCTs.31,42,44 An additional 3 studies were deemed as Level 3 non-RCTs,31,42,46 and 2 studies, both single-case experimental designs were deemed as Level 4.46,49 One observational study with no intervention was deemed as Level 5 (Clinical reasoning). We did not critically appraise the qualitative studies.

Risk of bias
Figure 2 shows the risk of bias in each of the 3 RCTs using the Cochrane Risk of Bias tool.53 Ratings ranged from low to moderate or unclear across domains. The overall risk of bias was low in 2 studies and moderate in 1. Risk of bias was most often due to selection bias and lack of blinding. The lack of randomization in 2 of 3 studies reflects the inherent challenges of conducting rehabilitation research, such as availability of participants. In Goldblum et al,31 there was moderate performance bias because the researcher was not blinded to the data, while participants were blinded when baseline measures were taken. In Behn et al,44 it was unclear if raters were blind to the condition.

The ROBINS-I tool53 was used to assess bias in 3 non-randomized studies of interventions (see table 2). Overall,
all 3 studies were determined to have a low risk of bias. All studies provided detailed descriptions of most ROBINS-I domains. Only 1 domain, selection of participants, had a moderate risk of bias due to lack of randomization. However, it was clear that randomization was not possible within the context due to lack of availability of CPs as treatment was conducted during working hours.

The RoBiNT was used to assess the internal validity of the 2 SCED studies (see table 3). Overall, the studies were determined to have a moderate-high risk of bias due to lack of randomization and lack of blinding of those administering the intervention.

Discussion

This review aimed to examine the evidence for CPT for individuals with TBI and their communication partners. Specifically, we aimed to analyze and critically appraise the evidence based on the research questions. The discussion below summarizes the findings on this basis.

What is the efficacy of CPT as a means of intervention for individuals with TBI and their communication partners?

We identified 11 studies with differing methodologies that examined outcomes from, or perceptions of the experiences of CPT interventions for individuals with TBI and a variety of communication partners. All of the studies used a context-sensitive approach. A twelfth nonintervention study observed the effect of strategies on success of communication interactions. Although description of the interventions was limited, 8 of 12 studies used the publicly available program TBI Express and 1 study used a version of this program adapted for telehealth delivery, TBI-connecT. Thus, the replicability of the interventions is considered to be fairly high. There was also consistency across most of the outcome measures, which provides additional support for the replicability of the studies and synthesis of the findings. For all of the studies, the intervention was delivered for CPs of individuals with TBI in the postacute, more chronic stage of injury, who were primarily community dwelling. The risk of bias was moderate for most of the quantitative studies. All 11 studies found a positive effect of the intervention on at least 1 of the target communication behaviors of interest as indicated by positive changes on the outcome measures. Only 3 studies included follow-up analyses at 6 months and all 3 reported some maintenance of skill. The number of RCTs was small, and while this study design provides the highest quality of evidence as compared to other study designs, the challenges inherent within this population such as lack of availability of a CP or lack of participants with equivalence at baseline, are recognized as being valid reasons for implementing other designs (such as non-RCTs), which can also provide high-quality evidence. Both SCED studies were pilot or feasibility studies and provide the basis for further exploration. In total, 302 communication partners and 223 individuals with TBI (including substudies) and 185 communication partners and 106 individuals with TBI (excluding sub-studies) received the interventions. Most of the evidence comes from 1 research group in Australia.

We applied the following four questions from the OCEBM to help determine the overall efficacy of the evidence for CPT training:

1. Do you have good reason to believe that your patient is sufficiently similar to the patients in the studies you have examined? Other than the majority of research being conducted in Australia, the patient profiles are very similar to those that would be seen clinically in North America and the United Kingdom, as well as Australia and New Zealand.

2. Does the treatment have a clinically relevant benefit that outweighs the harms? We conclude based on the evidence that the clinically relevant benefits far outweigh any potential harm, which was limited to a report of potential initial distress by mothers of people with TBI, and for which specific recommendations have been made by the researchers to mitigate this.

3. Is another treatment better? The treatment has been compared to solo conditions where only the person with TBI receives the training and the partner training results are significantly better.

4. Are the patient's values and circumstances compatible with the treatment? Yes, we conclude that this treatment is highly contextualized and functional.

Although we conclude that in general, the methodological quality of the studies is modest, these studies provide some quantitative and qualitative evidence that CPT was beneficial in improving the communication interactions and quality of communication competence for individuals with TBI and their CPs, particularly when using a context-sensitive approach.

What types of communication partners benefit from this type of training?

Of the 12 included studies, 7 focused on CPs who were family members including spouses, partners, and parents. The remaining 5 studies included CPs who were nonfamily members. Three RCTs with sample sizes ranging from 5 to 31 focused on training police officers, shop keepers or retail personnel, and care givers. One observational study examined the strategies used by licensed health care providers. Overall, these studies provide a modest level of evidence to suggest that CPT can be effective for a variety of communication partners.

Is there any evidence to suggest that sex and gender play a role in the efficacy of CPT?

As anticipated, we did not find any formal evidence to suggest that sex and gender play a role in the efficacy of CPT because there was no formal analysis of findings according to sex or gender. However, it is of interest to note that the most of participants with TBI were men across all studies, and with the exception of the study by Togher et al where the communication partners were all men, most of the communication partners were
women. Of additional interest, Togher et al\textsuperscript{[41]} reported that the mothers (women) in their qualitative study experienced an emotional response to the training as well as expressions of self-doubt and perceived negative judgment during the initial training sessions, and some of the mothers also reported experiencing anxiety.\textsuperscript{[41]} In contrast, these feelings and experiences were not reported by any of the male communication partners. Furthermore, the authors pointed out that the interviewers in this qualitative study were all women and thus may have affected the dynamics of the interview situation which perhaps led female participants to express a greater depth of emotion about their experiences than the male participants.\textsuperscript{[42]}

**Study limitations**

There were several limitations to the included studies and our review. Although the evidence to support CPT is emerging, in general, sample sizes were relatively small and as such were inadequately powered. This may have led to a type II error whereby there exists a failure to detect true differences between groups. Furthermore, most of the studies are from 1 research laboratory in Australia and thus there may be cultural bias in the findings. We also recognize that the risk of bias varied across studies and was sometimes unclear. We acknowledge that those studies with unclear risks were likely published either before, or early on in the implementation of, publication standards for reporting of non-RCTs\textsuperscript{[51]} and for SCED (N of 1 trials).\textsuperscript{[52]} The inclusion and exclusion criteria were also somewhat restrictive in that individuals with active mental health challenges and/or addictions or multiple TBIs were not included in the studies. This is despite the fact that these individuals are among the most vulnerable with TBI, as evidenced by the high prevalence of comorbid mental health issues\textsuperscript{58} unstable housing,\textsuperscript{59} and criminal justice involvement.\textsuperscript{[60]} Finally, although our search strategy was broad, it is possible we may have missed some relevant studies that were not in English or not published in the peer-reviewed literature.

We also recognize that despite there being no evidence of an effect of sex or gender on the findings of the included studies, we cannot definitively conclude there was no effect because this was not analyzed. Accordingly, we suggest that future studies should add analysis by sex and gender. We acknowledge that in general the research on CPT is still in the early stages and there is additional work to be done. We further recommend that additional research be of higher methodological rigor, with more clearly described interventions and consistent postintervention follow-up. Future research is needed to examine the benefits of CPT for pediatric populations including parents, siblings, and educators, as well as for frontline staff working with vulnerable individuals with TBI and comorbid mental health and addictions, vulnerable housing, and criminal justice involvement. A larger scale study examining the efficacy of TBConneCT, the telehealth adaptation of TBI Express is reportedly planned\textsuperscript{[49]} and has potential to provide access to training for those in remote communities.

**Conclusions**

What this paper adds: To our knowledge, this is the first comprehensive systematic review to examine CPT as an intervention to improve the communication outcomes of individuals with TBI. We have also attempted to identify the types of communication partners who have benefitted from this training. Finally, we have highlighted the need for consideration of sex and gender in the development, evaluation and efficacy of interventions for individuals with TBI, particularly in the realm of communication.

The studies included in this review identified the potential of CPT to enhance both activity and participation domains in the International Classification of Functioning, Disability and Health\textsuperscript{[59]} for individuals with TBI, by increasing positive supported communication, interaction, and social connections. Given that interventions for TBI have been found to be most effective when using a collaborative and contextualized approach that also includes consideration of the barriers existing within the social environment,\textsuperscript{30,31,42} CPT is an intervention with minimal risk that has the potential to improve health and participation inequities and increase accessibility and quality of life for individuals with TBI.

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