Description and effectiveness of communication partner training in TBI: A systematic review

Nicholas Behn, PhD
Division of Language and Communication Science
School of Health Sciences
City, University of London
Northampton Square
London, EC1V 0HB
UK

Jill Francis, PhD
Division of Health Services Research and Management
School of Health Sciences
City, University of London
Northampton Square
London, EC1V 0HB
UK

Leanne Togher, PhD
Speech Pathology
Faculty of Medicine and Health
The University of Sydney
Sydney, Australia

Ellie Hatch, BSc (Hons)
Division of Language and Communication Science
School of Health Sciences
City, University of London
Northampton Square
London, EC1V 0HB
UK

Becky Moss, PhD
Division of Language and Communication Science
School of Health Sciences
City, University of London
Northampton Square
London, EC1V 0HB

UK

Katerina Hilari, PhD
Division of Language and Communication Science
School of Health Sciences
City, University of London
Northampton Square
London, EC1V 0HB
UK

Corresponding Author
Nicholas Behn, PhD, Division of Language and Communication Science, School of Health Sciences, City, University of London, Northampton Square, London, EC1V 0HB, UK.
Email: Nicholas.Behn.1@city.ac.uk

ABSTRACT

Objectives: Evaluate the current evidence on communication partner training and its effectiveness on outcomes for people with TBI and/or their communication partners.

Methods: *Information sources:* Systematic searches of nine databases (AMED, CINAHL, EMBASE, Medline/EBSCOHOST, PsycINFO, PsycBITE, PsycARTICLES, PubMed, Scopus) from database inception to February 2019. *Eligibility criteria:* Empirical studies on interventions for adult communication partners where the primary focus of the program (>50%) was on improving communication skills of people with TBI and/or communication partners. *Data:* participants, characteristics of the training, outcome measures and findings. *Risk of bias:* standard checklists were used for methodological quality (PEDRO, ROBiN-T) and intervention description (TIDieR). *Synthesis:* narrative synthesis and effect sizes (Cohen's d) for group-level studies.

Outcomes: Ten articles (describing eight studies) met eligibility criteria: three randomized controlled trials, two non-randomised controlled trials and three single-case experimental designs. Studies included a total of 258 people with TBI and 328 communication partners, however all but one study had fewer than 65 participants. Methodological quality varied and intervention description poor. Three studies in the final synthesis (n=41 communication partners, n=36 people with TBI) reported positive intervention effects. Effect sizes in group studies were (*d*=0.80-1.13) for TBI and (*d*=1.16-2.09) for communication partners.

Conclusions: The articles provided encouraging though limited evidence for training communication partners. Greater methodological rigour, more clearly described interventions, and consistent use of outcome measures and follow-up post-treatment are needed. Further research in this field is warranted.

INTRODUCTION

Traumatic brain injury (TBI) is a global health problem which results in substantial health-care and societal costs costing the UK economy an estimated £15 billion each year with 1.3 million people living with the consequences of a TBI-related disability.[1] According to the World Health Organisation, TBI will surpass many diseases as a major cause of death and disability by 2020.[2] Cognitive-communication impairments are prevalent after TBI with incidence rates commonly above 75% (e.g. lack initiation, verbose, tangential, disruptive social behaviours).[3] Such impairments have a devastating long-term impact on return to work, and school, family, community and social participation, and quality of life of people with TBI.[4-8]

Treatment approaches to improve communication skills have predominantly focused on the skills of people with TBI in the clinical context, with little information about how improvements translate to real-life.[9] Communication partners such as family, friends, and healthcare professionals, who interact regularly with the person with TBI, provide support who can help generalize skills from the treatment setting to real-life contexts. Partners have regularly identified an unmet need for training and support for themselves[10,11] from the point of injury[12] to many years post-injury.[13] Such training and support has been a long-term issue but only recently has the actual reporting of research on this issue been addressed. Directing the focus of treatment to the communication partner (with or without the person with TBI) could potentially have a positive impact on the communication skills of people with TBI.[14] Many studies have shown that the communication skills of partners can either enhance or inhibit the skills of people with TBI.[15-17] Communication partners that provide structure, cueing and positive experiences[18] and more communication strategies[17] lead to more successful interactions.

Training partners in improving their communication skills is recommended during rehabilitation.[3,9,19] In 2014, an international expert panel of clinicians and researchers recommended the inclusion of communication partners in rehabilitation following a review of existing evidence and clinical practice guidelines.[19] In stroke and aphasia, systematic reviews have shown the positive effect of communication partner training.[20,21] Similar positive outcomes have been shown in a review for people with TBI however, the results were based on two studies identified between 2004 and 2014.[22] Furthermore, little detail on the characteristics of training programmes (e.g. materials, fidelity practices) and how they may be best implemented in clinical practice is provided.

Therefore, the aim of this article is to provide a systematic review of the available evidence and explore the characteristics of training (e.g. setting, trainers, length, delivery format, content); and explore the effectiveness of training for people with TBI and/or their communication partners.

METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines formed the basis for the conduct and reporting of this review.[23] The protocol for this systematic review is registered on PROSPERO (CRD42018106599).

Search strategy

The following electronic bibliographic databases were searched in August 2018 (and rerun 7th February 2019) by the first author (NB): Embase, Cinahl, PsycINFO, PsycArticles, Medline, AMED, PsycBITE, Scopus and PubMed. In addition, reference lists from eligible articles were checked. Variants of four key terms were entered into each database

1. Population terms: Traumatic brain injur*; head injur*; brain damage*; head trauma; brain injur*.
2. Intervention terms: Interven*; therap*; treatment; program*; rehabilitation; training; coaching; education; inservice.
3. Type of intervention terms: Pragmatics; conversation; communicati*; cognitive-linguistic; cognitive-communicati*; interact*; language; relationship; discourse; social cogniti*; social perception; theory of mind; soci*; interpersonal; socio-linguistic.
4. Communication partner terms: Partner; family; spouse; support team; volunteer; staff; significant other; dyad; support worker; carer; assistant.

Search strategies were amended in accordance with the limiters of each platform, as not all databases permit the inclusion of search techniques. Two authors (NB and EH) used the

online software Covidence[24] to screen titles and abstracts for suitability. If eligibility was inconclusive from abstracts alone, the full text of the paper was reviewed. Full-text reviews were completed by the same two authors. Studies were deemed eligible for inclusion if both authors agreed on eligibility. Disagreement was resolved by the opinion of a third author (KH).

Selection criteria

For the purposes of this review, communication partner training was defined as an intervention that is directed at people other than the person with the communication impairment and is delivered with the aim of improving the impairment, communication, participation and/or wellbeing of the person with communication impairment and/or the communication partner. Studies were therefore considered eligible if the training was delivered to communication partners (familiar or unfamiliar) of people with TBI (who may or may not be present for the training). Research studies were eligible if they were published in a peer-reviewed journal and the full-text was available. All articles were also required to be intervention studies directed at communication partners where the primary focus of the program (>50%) was on improving their communication skills. Mixed design studies were included if the main focus was intervention.

Other studies (e.g. observational, qualitative) were used for context and description, but not included in the synthesis of the findings. Mixed population studies were only included if outcomes were reported separately for people with TBI. Search limiters were articles in English with adult and human only populations. Studies were excluded if they were secondary sources of data (systematic reviews, book chapters).

Data extraction and quality assessment

Data extraction was undertaken for all included studies by the first author (or BM for articles published by the first author). For each eligible study the following information was extracted: publication details; study design; participant details of communication partners and people with TBI where appropriate; intervention (e.g. format, delivery, content, setting); outcome measures; follow-up and overall effectiveness of the intervention. As communication and conversational ability is dyadic, the primary outcome was the communication skills of the person with TBI and/or the communication partner (studies that included either or both of these were included). Where additional information was required (e.g. means, range of scores), the authors of the papers were contacted.

To evaluate the extent to which each study adequately described the intervention, the 12-item Template for Intervention Description and Replication (TIDieR)[25] was used. Clear intervention descriptions are needed for reproducing effective interventions and identifying potential active components. The Physiotherapy Evidence Database (PEDro) scale was used to rate the methodological quality of randomised and non-randomised controlled trials.[26] A total score out of 10 is derived where 9-10 is a study of excellent quality, 6-8 good quality, 4-5 fair quality and below 4 poor quality.[27] The Risk of Bias in N-of-1 Trials (ROBiN-T) scale was used to assess single-case experimental designs.[28] This scale measures the internal and external validity of a study across 15-items giving a total score out of 30. An algorithm can be applied to the internal validity items to classify methodological rigor on a six-tiered grading from very low to very high.[29] Two reviewers (NB and BM) rated the description of interventions and methodological quality of studies with disagreements resolved by consensus. Reviewers did not rate articles they authored and a third reviewer was used in these instances (EH).

Data synthesis

For all studies participant details, a description of the intervention, outcomes measured, and quantitative data (with effect sizes calculated for significant findings) was provided. For synthesis, only studies with outcomes that had been psychometrically tested and those scoring 4 and above on the PEDro scale and graded as fair-to-very high on the ROBiN-T scale were included. Eligible group-level studies that used similar outcomes to rate the skills of people with TBI and their communication partners were pooled into a meta-analysis, using standardised mean difference (SMD) and a fixed effect model.

RESULTS

Study selection

Study selection is illustrated in Figure 1. The searches identified 9679 articles, of which 6504 remained after duplicates were removed. Their titles and abstracts were reviewed, and a further 6436 were removed. Full-text review of the remaining 68 articles was conducted, and 58 were excluded. Reasons for exclusion were agreed between two reviewers. Disagreement on inclusion of one article was resolved by a third reviewer (KH). A final set of 10 articles, describing eight studies, was included in the review.

[insert Figure 1 around here]

Study characteristics.

Studies used five group designs reported across seven articles[30-36] and three single-case experimental designs (SCEDs).[37-39] The studies were conducted in Australia,[33-38] Poland,[32] South Africa,[31] United Kingdom[30] and the United States.[39]

Methodological quality

Overall, there was 81.5% agreement in ratings of methodological quality, with 87% agreement for group-level designs and 76% for SCEDs. For group-level studies (Table 1), quality of studies was rated as good[30,33,34] fair[31] or poor.[32] For the SCEDs (Table 2), ratings ranged from 11–22 (out of 30), with each study providing more information on external validity (scores ranging 9-15 out of 16) compared to internal validity of the study (scores ranging 2-7 out of 14).

[insert Table 1 and 2 around here]

Research participants

Tables 3 and 4 provide detailed descriptions of people with TBI and their communication partners organised according to study type.

People with TBI. Of the eight studies in this review, seven included people with TBI. Of these, one study had 200 participants,[32] two studies had 20-29 participants[33,34] and four studies had five or fewer participants.[30,37-39] The remaining study did not include any people with TBI.[31] There was considerable heterogeneity in sample characteristics. For studies reporting age (n=7), the age range of participants was 18-68 years, and in those reporting gender (n=7), there were 168 men (65.1%) and 90 women (34.9%). In most studies (n=6),

participants had sustained a severe TBI. In studies that reported time post-injury (n=5), the range of years post-injury was 0.6 to 20 years. Two studies reported years of education: 7-18 years,[34,38] and one mean years of education: between 12.92 and 13.98.[32]

[insert Table 3 around here]

Communication partners. Across the eight studies, one study had 200 participants,[32] four studies had 10-64 participants[30,31,33,34] and three studies had fewer than five participants.[37-39] Of these, 226 were familiar communication partners (208 spouses/partners of people with TBI, 14 parents, 2 friends and 2 siblings) and 102 were unfamiliar (64 shop assistants, 20 police recruits, 18 paid carers). No information was provided in the papers on frequency and duration of contact between unfamiliar communication partners and people with TBI. For studies reporting age range (n=7) communication partners were between 19-79 years. Gender was provided in 7 studies, where 99 women (77%) and 29 men (23%) were included. Years in education was reported in 5 studies, with a range of 10-23 years.

[insert Table 4 around here]

Intervention reporting

Overall there was 86% agreement between raters on intervention description. With respect to individual items, five studies (62.5%) reported on between seven and nine items, and the remaining three studies (37.5%) reported on less than half of the TiDieR items (Table 5). With the exception of Manko et al,[32] later studies (post-2012) tended to be better reported.

[insert Table 5 around here]

Of the eight studies examined, four trained both the person with TBI and their communication partner[32,34,38,39] and four only the communication partner[30,31,33,37] (Table 6). In terms of length of treatment and dosage, for studies that reported number of weeks of training (n=7), the range was 1-24 weeks with an average of 10.7 weeks. In addition, six of these studies reported number of sessions and hours of training. The number of sessions ranged from 1-20 (average 9.5). The number of hours ranged from 4-35 hours (average 16).

The content of the interventions varied across studies. Three studies used a published programme.[30,34-36,38] Most studies provided intervention in situations of most relevance to the communication partners: workplace conversations, serving customers, telephone inquiries and everyday conversation. Five studies provided education about brain injury and the effects on communication.[31-36,38] All but one study[31] provided direct training of communication strategies. Of these, one study provided little detail about what this entailed;[32] for the remaining six, strategy use was practiced through role-plays and/or actual interactions between people with TBI and communication partners with verbal feedback about performance. To facilitate self-monitoring and generalisation of skills, four studies

had communication partners video or audiotape conversations with people with TBI to review within intervention sessions.[30,34-36,38,39]

[insert Table 6 around here]

Comparators

The five group-level studies included control conditions. Two randomised controlled trials (RCT) contained a no-treatment control group.[30,31] The control condition in a third RCT had participants (police officers) receive standard baton and weapons training.[33] One non-randomised study (reported across three articles) compared the trained group to a waitlist control condition, and people with TBI who were trained without their communication partners.[34-36] A second non-randomised study trained all participants, but the groups differed as to whether participants presented with post-traumatic stress disorder.[32]

Outcomes

All studies used at least one primary outcome of communication skills for the person with TBI and/or the communication partner, with several studies choosing more than one (Table 6). Six studies used psychometrically robust blindly-rated scales to measure the skills of the person with TBI,[30,34,38,39] the skills of the communication partner, [30,34,38,39] or provide an overall impression of the conversation.[30,38] Other studies used reliable and valid questionnaires completed by either the person with TBI or communication partner to assess perceived communicative ability[30,35,38,39] or communication confidence.[38] Several studies used less psychometrically robust measures: linguistic analyses (exchange structure analysis,[36,38] generic structure potential[33] and/or productivity analyses[36]), self-developed

measures to assess knowledge and confidence of a communication partners communication skills,[31] and frequency counts of a pre-identified target communicative behaviour as was the case for single-case designs.[37-39] Secondary outcomes were used less often and included emotional well-being of the communication partner,[30] and social participation and quality of life of the person with TBI.[38]

Effectiveness of Communication Partner Training

Three of the eight studies met the stringent criteria for synthesis of results (Table 6): two group studies whose results were pooled into a meta-analysis,[30,34-36] and a single-case design.[38]

Communication partners trained were either familiar (e.g., family members, friends)[34,38] or unfamiliar to the person with TBI (i.e. paid carers).[30] All three studies used the same manualised programme *TBI Express*[44] with two studies using an adapted form of the programme.[30,38] The largest group-level study trained 14 people with severe TBI with their communication partners over 10-weeks comprising a weekly group 2.5-hour session and individual 1-hour session (35 hours).[34-36] The adapted forms of the training ranged from six group-based sessions over 6 weeks (17 hours)[30] to individual training delivered via videoconferencing in weekly 1.5 hour sessions over 10 weeks (15 hours).[38]

All studies rated the skills of the person with TBI and the communication partner using rating scales of conversation or self-rated questionnaires. Overall, positive changes were observed in the participation of the person with TBI as measured by the Measure of Participation of Conversation (MPC) in one group study (d=0.80-1.13)[34] and in the participation of the communication partner as measured by the Measure of Supported

Conversation (MSC) in the two group studies (*d*=1.16-2.09).[30,34] Positive changes to the overall impression of the conversation were observed in one group study (*d*=0.71-1.48).[30] Perceived communicative ability as rated by the communication partner but not the person with TBI positively changed (*d*=-1.02) in one group study.[35] In the single case design,[38] clinically meaningful change was observed in the MPC, MSC and the impression scales and statistical change (reliable change index >1.96) for ratings of perceived communicative ability (LCQ-Self; LCQ-Other) however for only one (of two) dyads.

All three studies included follow-up after the intervention, either at 6-months,[30,34-36] or between 3 and 9 months.[38] Positive improvements made at the post-intervention time point were maintained at follow-up for the group level studies[34-36] with mixed results for the single-case design.[38]

For the two group-level studies included in the meta-analysis[30,34] data from 39 people with TBI and 39 communication partners was pooled (19 in the trained group, 20 in the control group). Figure 2 shows the findings. The outcome used in both studies to rate the skills of the person with TBI was the MPC (Interaction and Transaction subscales). The skills of the communication partner were rated with the MSC (Acknowledging and Revealing Competence subscales). Also, the results of one study were based on structured conversations[30] while the second was based on unstructured (i.e. casual) conversations.[34] Moderate-to-large effects were found for both studies with standardised mean differences of 0.39 to 1.05, favouring the intervention. Overall, moderate effects were found on the skills of people with TBI for interaction (SMD=0.31, 95% CI -0.24-1.01, p=0.22) and transaction (SMD=0.50, 95% CI -0.14-1.13, p=0.12). However, confidence intervals crossed the no-effect line (i.e. 0) and the effects were non-significant suggesting that the evidence is unclear as to whether intervention improves the skills of people with TBI. Large effects were

found on the skills of communication partners for acknowledging competence (SMD=0.972 favouring intervention, 95% CI 0.32-1.63, p=0.005) and revealing competence (SMD=1.05, 95% CI 0.38-1.71, p=0.003). The confidence intervals did not cross the no-effect line, suggesting that intervention had a positive effect on improving the skills of the communication partner.

[insert Figure 2 around here]

DISCUSSION

The objective of this systematic review was to describe the characteristics of communication partner training programmes and determine their effectiveness. Eight studies (from 10 articles) were reviewed including three RCTs,[30,31,33] two non-randomised studies (one study described across three articles)[32,34-36] and three SCED studies.[37-39] Methodological quality criteria ranged 1-7/10 for group-level studies, and 11-22/30 for single-case studies.

The studies reported on 328 communication partners and 258 people with TBI. Communication partners tended to be female and familiar however unfamiliar partners included paid carers, police recruits and shop assistants. Description of participants was inconsistent, which highlights the need for standard reporting of key variables in this population.[45] Such information is important to determine the outcome of training, enable comparison across studies and identify the best candidates for training.

Characteristics of communication partner training programmes

Interventions ranged from training the communication partner alone or in groups with or without people with TBI, or within a dyad. Content predominantly focused on education around the impact of brain injury and training positive communication strategies (e.g. pause, take the time to respond, ask positive questions). Group-level studies of fair-to-excellent quality described training that lasted on average 6.25 weeks (range 1-10 weeks) and 17 hours (range 4-35 hours).[30,31,33,34] Such variability makes it difficult to reach firm conclusions about optimal dosage and length of training. Methodologically stronger studies involved group delivery for communication partners[30,31,33] or communication partners with people with TBI (with added individual sessions).[34-36] Group-based interventions are commonly represented in the literature for people with TBI.[9,19] However, recent studies that have adopted a single-case methodology show potential for individualised person-centred dyad training that use videotaping[39] and are delivered via telehealth.[38] Further research of the best delivery methods for training is needed.

Overall, intervention description across studies was poor consistent with other reviews that have reported poor intervention description.[46-48]. Specifically, information about tailoring and modification of interventions, and intervention materials and where they could be accessed. However studies included in the synthesis did report intervention materials with use of the manualized program *TBI Express*[30,34]and *TBIConneCT*.[38] Explicitly reporting fidelity, which is important to understanding whether an intervention was implemented as intended, was also rarely reported, consistent with other communication-related studies.[49,50] Clear description of interventions is important in comparing and replicating interventions and in translating interventions into clinical practice.[51] Positively, recent studies were more clearly described; most likely the result of the introduction of the

TIDieR framework for reporting interventions as endorsed by the EQUATOR network (https://www.equator-network.org/).

Effectiveness of communication partner training

The results of the review provide limited evidence for the effectiveness of communication partner training. Most studies showed significant improvement for conversation participation or self-report outcomes for at least one outcome. However, common limitations across studies included small sample sizes, unblinded subjects and therapists and to a lesser extent, no blinded assessors, no adequate follow-up nor use of intention-to-treat analyses. For the synthesis of results the evidence was drawn from three studies that trained a total of 21 communication partners and 16 people with TBI. Such small numbers make it difficult to reach firm conclusions about the effectiveness of communication partner training.

In group level studies of at least fair methodological quality, effect sizes were small-to-large for significant outcomes. Significant effects (and large effect sizes) were reported in longer programmes.[30,33-36] Shorter training programmes tend to use less active skill-building techniques which may impact the extent to which people can change their communicative behaviour.[52] Highly significant effects were reported in a non-randomised trial which involved training communication partners with people with TBI over 35 hours (in 10 weeks).[34-36] Small effect sizes were noted in one study[31] that used bespoke measures that were not psychometrically tested. The remaining studies were methodologically strong, however, they contained smaller sample sizes and involved training communication partners without the person with TBI, lasting between 12 hours (over six weeks) to police officers[33] to 17 hours (over eight weeks) to paid carers.[30] Longer training (> 6 weeks, >12

hours) seems to be needed although whether the person with TBI needs to be included in the training is not clear at present.

A lack of well controlled studies is an issue in this field. Togher et al[34] had intended to conduct an RCT but due to recruitment problems, modified the design to a non-randomised study. Consideration should be given to alternative designs such as waitlist-controlled designs. In addition, strategies to maximise recruitment need to be identified early, such as multiple sites from across a region or country, as was the case for one study which recruited 200 participants.[32] Single-case designs give preliminary data for exploring communication partner training but should be scaled up to show effectiveness as for one study[38] which formed the basis of an RCT in progress with 36 participants.[53] Also follow-up measures, which were used in less than half of the studies should be included more often to explore maintenance of improvement particularly for communication partners.

The use of many different outcome measures makes comparability of studies difficult. Many studies used an objective measure of conversation participation with methods including conversational rating scales (MPC, MSC, Impression scales), linguistic analyses (exchange structure analysis, generic structure potential and productivity analyses) and frequency of defined target behaviours. Moreover, the type of conversation used to rate participation also varied (e.g. casual, structured, purposeful, news-related). Recently, assessment tools have been identified which may provide an avenue for developing a core outcome set for communication measures for people with TBI and their communication partners including, the type of conversations.[54-56]

Self-report measures of communicative ability completed by people with TBI and their communication partners were used with mixed results. Even when the same outcome of perceived communicative ability was used, not all studies noted improvement. Few

studies considered psychological health, social participation or quality of life despite previous studies highlighting the importance of communication skills on impacting these areas.[4,8] Inclusion of much broader outcomes should be a key consideration in demonstrating the impact of improved communication beyond the training environment into real-life contexts.

Limitations

Communication partner training is relatively under-researched in the field of TBI with only a small number of studies identified, and the meta-analysis was limited to two studies with relatively small sample sizes. There was also variability with study designs, interventions and outcomes, with fewer than half of the studies including a follow-up assessment. There was a lack of consistent outcome measures across studies, an issue also identified in communication partner training in stroke.[57] This review also only included articles in English. Lastly, a potential limitation was that two of the authors were highly familiar with this field, and some of their publications were included. To minimise bias, the earlier stages of the review process were conducted by independent assessors and authors did not review their own publications.

CONCLUSIONS

Training communication partners is an important treatment approach that has the potential to improve the communication skills of people with TBI. Compared to stroke and aphasia,[20,21] this area in TBI is relatively under-researched, with only eight studies in this systematic review. The initial evidence drawn from these studies is encouraging though limited. Most studies reported some positive change from training communication

partners, with small to large effects in the RCTs and non-RCTs. However, variability in the treatment length and intensity, and inconsistency of positive findings across all outcomes suggest more research is needed in order to reach firm conclusions about the effectiveness of training. Future studies need to adopt greater methodological rigour, larger sample sizes, clearer consensus on the most appropriate outcomes to use, inclusion of follow-up measures, and more clearly described interventions.

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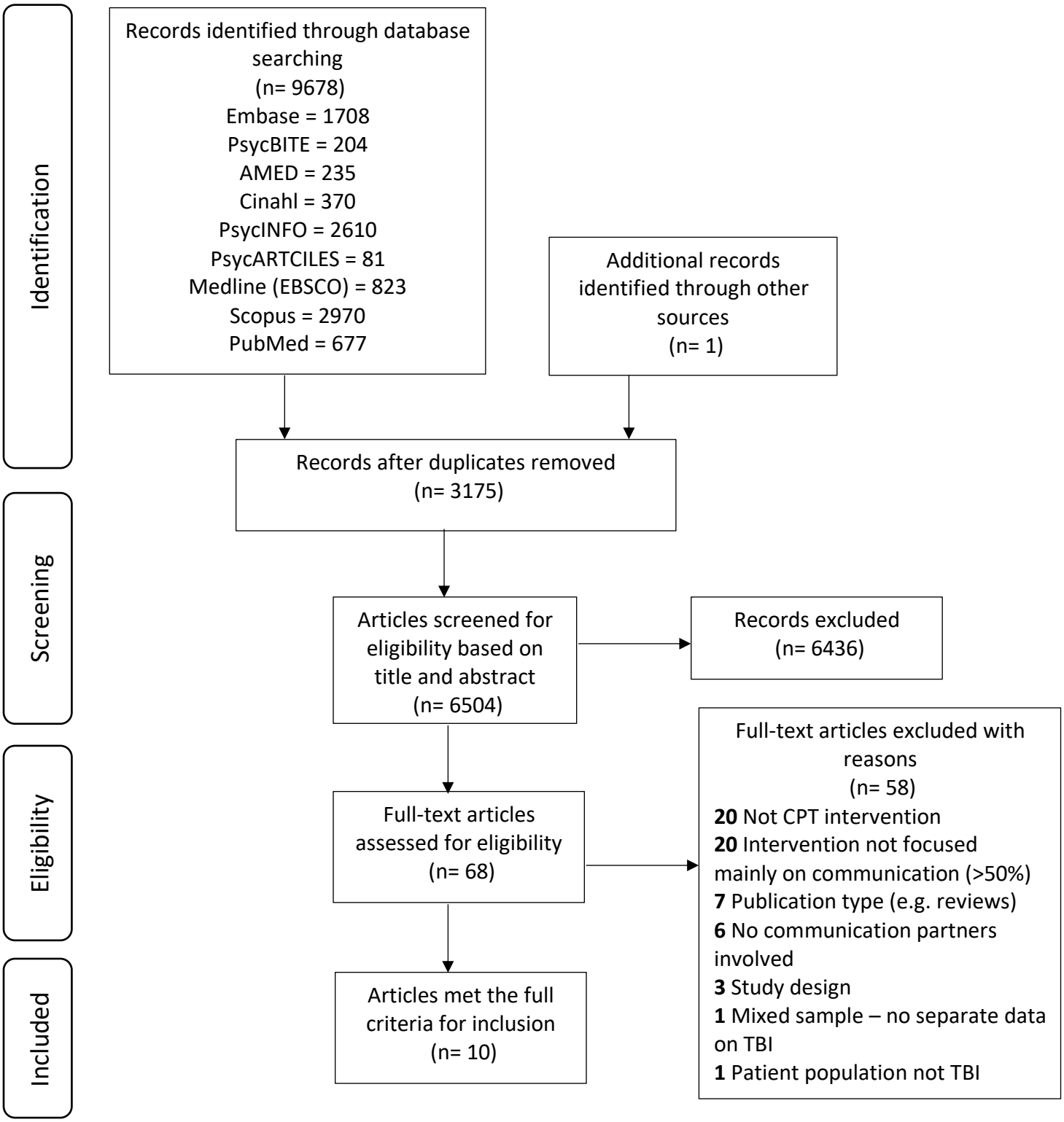
Identification
Screening
Eligibility
Included
Records identified through database searching
(n= 9678)
Embase = 1708
PsycBITE = 204
AMED = 235
Cinahl = 370
PsycINFO = 2610
PsycARTCILES = 81
Medline (EBSCO) = 823
Scopus = 2970
PubMed = 677
Additional records identified through other sources
(n= 1)
Records after duplicates removed
(n= 3175)
Articles screened for eligibility based on title and abstract
(n= 6504)
Records excluded
(n= 6436)
Full-text articles assessed for eligibility
(n= 68)
Full-text articles excluded with reasons
(n= 58)
20 Not CPT intervention
20 Intervention not focused mainly on communication (>50%)
7 Publication type (e.g. reviews)
6 No communication partners involved
3 Study design
1 Mixed sample – no separate data on TBI
1 Patient population not TBI
Articles met the full criteria for inclusion
(n= 10)

Figure 1. Flow diagram of study selection

Table 1. Quality ratings of group-level designs using the PEDRo scale

PEDro item		Behn et al., 2012	Goldblum & Alant, 2009	Manko et al., 2012	Togher et al., 2004	Togher et al., 2013
1.	Eligibility specified[a]	Y	N	N	N	Y
2.	Random allocation	Y	Y	N	Y	N
3.	Concealed allocation	N	N	N	Y	N
4.	Baseline comparability	Y	Y	N	Y	Y
5.	Blind subjects	N	N	N	N	N
6.	Blind therapists	N	N	N	N	N
7.	Blind assessors	Y	N	N	Y	Y
8.	Adequate follow-up	Y	Y	N	N	Y
9.	Intention-to-treat analyses	Y	N	N	Y	Y
10.	Between-group comparisons	Y	Y	Y	Y	Y
11.	Point estimates and variability	Y	Y	N	Y	Y
TOTAL		7/10	5/10	1/10	7/10	6/10
METHODOLOGICAL QUALITY		Good	Fair	Poor	Good	Good

[a]This criterion is not included in the total score
Y: yes; No: no

Table 2. Quality ratings of single-case experimental designs using the RoBiN-T scale

RoBiN-T scale		Arco et al., 2002	Hoepner & Olsen, 2018	Rietdijk et al., 2018
Internal validity				
1.	Design with control	2	0	1
2.	Randomisation	0	0	0
3.	Sampling of behaviour	0	0	1
4.	Blinding of people in intervention	0	0	0
5.	Blinding of assessor(s)	1	2	1
6.	Interrater agreement	1	0	2
7.	Treatment adherence	0	0	2
External validity				
8.	Baseline characteristics	1	2	2
9.	Setting	2	1	2
10.	Dependent variable (target behaviour)	2	1	2
11.	Independent variable (therapy)	2	2	2
12.	Raw data record	2	2	2
13.	Data analysis	2	1	2
14.	Replication	0	0	1

15. Generalisation	2	0	2
TOTAL	17/30	11/30	22/30
METHODOLOGICAL RIGOR CLASSIFICATION[a]	Low	Very low	Moderate

2=present; 1=partial; 0=absent

[a]Methodological rigor classification is based on an algorithm for internal validity items developed by Perdices et al[29]

Table 3. Characteristics of people with Traumatic Brain Injury (TBI) (n=258)

Study name, Country	**N**	**Age (years) Mean ± SD (+/- range)**	**Sex (% males)**	**TPO (years) Mean ± SD (range)**	**Education (years) Mean ± SD (+/- range)**	**Cause of TBI**	**Severity**
Group designs							
Behn et al., 2012,[30] United Kingdom	N=5	29.2 ± 11.65 (19 – 48)	60%	6.8 ± 4.44 (2 – 12)	NR	4 MVA; 1 assault	Severe
Goldblum & Alant, 2009,[31] South Africa	No people with TBI were involved						
Manko et al., 2012,[32] Poland	N=200 (101 Group A with PTSD, 99 Group B without PTSD)	Group A: 24.1 ± 11.02 (men) 22.11 ± 4.52 (women) Group B: 25.10 ± 12.37 (men) 23.11 ± 7.43 (women)	59%	NR	Group A: 13.98 ±2.37 (men) 12.92 ± 3.11 (women) Group B: 12.98 ± 3.46 (men) 13.41 ± 4.23 (women)	NR	Severe
Sim et al., 2013;[36] Togher et al., 2013;[34] Togher et al., 2016[35] Australia;	N=44 (14 Treatment, 15 Control, 15 Solo[a]))	Treat: 30.3 ± 13.98 (18-62) Control: 38.1 ± 15.06 (19-68)	82.8%	Treat: 8.0 ± 5.10 (1-21) Control: 9.7 ± 6.70 (2-23)	Treat: 12.0 ± 2.25 (7-15) Control: 12.7 ± 3.17 (8-18)	Treat: 10 MVA; 1 assault; 1 hit as pedestrian; 1 work accident; 1 other Control: 6 MVA; 1 assault; 4 hit	Severe

Study name, Country	N	Age (years) Mean ± SD (+/- range)	Sex (% males)	TPO (years) Mean ± SD (range)	Education (years) Mean ± SD (+/- range)	Cause of TBI	Severity
						as pedestrian; 3 falls; 1 Other	
Togher et al., 2004,[33] Australia	N=20 (10 Treatment; 10 Control)	Treat: 37.2 ± 8.60 (19-52) Control: 36.3 ± 9.71 (24-53)	100%	Treat: 6.86 ± 5.44 (0.60-15) Control: 10.75 ± 5.38 (1.2-20)	NR	Treat: 2 MVA; 3 hit as pedestrian; 2 assault; 2 falls; 1 gunshot Control: 5 MVA; 3 hit as pedestrian; 1 boxing; 1 motorcycle accident	Severe
Single-case-experimental designs							
Arco et al., 2002,[37] Australia	N=1	31	100%	NR	NR	NR	Severe
Hoepner et al., 2018,[39] United States	N=1	53	100%	2.25	NR	MVA	Moderate-severe
Rietdijk et al., 2018,[38] Australia	N=2	28.5 ± 6.36 (24-33)	50%	4.79 ± 2.89 (2.75-6.83)	12 & 14	1 MVA; 1 motorcycle accident	Severe

[a]The 15 people with TBI who were trained alone (i.e. solo) were not part of this review

Note. TPO=time post-onset; MVA=motor vehicle accident; NR=not reported

Table 4. Characteristics of communication partners (n=328)

Study name	N	Age (years) Mean ± SD (range)	Sex (% males)	Education (years) Mean ± SD (range)	Relationship	Relationship length (y)	Occupation
Group-level designs							
Behn et al., 2012[30]	N=10 (5 treatment; 5 control)	Treat: 38.6 ± 17.56 (19-58) Control: 24.2 ± 3.83 (20-29)	0	Treat: 12.6 ± 1.34 (11-14) Control: 12.6 ± 1.52 (11-14)	Paid carer	Experience in TBI (y) Treat: 1.9 ± 1.2 (1 – 3.5) Control: 2.3 ± 1.3 (0.16-3.5)	Paid carer
Goldblum & Alant, 2009[31]	N=64 (31 treatment; 33 control)	Treat: 38.4 ± 9.3 (23-59) Control: 41.9 ± 8.96 (23-58)	3.1%	NR	Shop assistants	0	21 Customer Service Managers; 22 Customer Care Assistants; 21 Deli/Bakery Sales Assistants
Manko et al., 2012[32]	N=200 (101 Group A, 99 Group B)	NR	NR	NR	Spouse/partner	NR	NR
Sim et al., 2013;[36] Togher et al., 2013;[34] Togher et al., 2016[35]	N=44 (14 Treatment; 15 Control; 15 Solo[a])	Treat: 50.3 ± 11.26 (24-64) Control: 49.7 ± 19.42 (21-79)	24.1%	Treat: 13.1 ± 3.06 (10-19) Control: 12.4 ± 2.29 (10-16)	Treat: 4 partners, 8 parents, 2 carers Control: 3 partners, 5 parents, 2 siblings, 1 friend, 4 carers	NR	NR
Togher et al., 2004[33]	N=20 (10 treatment; 10 control)	Treat: 33 ± 10.53 (20-52) Ctrl: 27 ± 4.02 (22-34)	100%	Treat: 18.6 ± 2.41 (15-23) Control: 17.1 ± 1.21 (16-19)	Police recruits	0	Police recruits

Study name	N	Age (years) Mean ± SD (range)	Sex (% males)	Education (years) Mean ± SD (range)	Relationship	Relationship length (y)	Occupation
Single-case experimental designs							
Arco et al., 2002[37]	N=2	24, 46	0	Highschool; Diploma	Paid therapy assistants	Experience in TBI: 0.08, 3	Paid therapy assistants
Hoepner et al., 2018[39]	N=1	50	0%	NR	Spouse	NR	Works at a local newspaper
Rietdijk et al., 2018[38]	N=2	36, 42	0%	16, 18	Friend, mother	2, 24	Professional level

[a]The 15 communication partners who were not trained in the solo treatment group were not part of this review
Note. TBI=traumatic brain injury; NR = not reported

Table 5. Total TIDieR item reporting by checklist item for each included study (N=8)

Study name	TIDieR checklist items												Total Yes
	1	2	3	4	5	6	7	8	9	10	11	12	
Group-level designs													
Behn et al., 2012[30,a]	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	9
Goldblum & Alant, 2009[31]	N	Y	N	Y	N	Y	Y	Y	N	N	N	N	5
Manko et al., 2012[32]	Y	Y	N	N	N	N	Y	N	N	N	N	N	3
Togher et al., 2004[33]	N	Y	N	Y	N	Y	N	Y	N	N	N	N	4
Togher et al., 2013,[34] 2016;[35] Sim et al., 2013[36,b]	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N	N	8
Single-case experimental designs													
Arco et al., 2002[37]	N	Y	N	Y	Y	Y	Y	Y	N	Y	N	N	7
Hoepner & Olsen, 2018[39]	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y	Y	9
Rietdijk et al., 2018[38]	Y	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	9
Total (n=8)	5	8	3	7	3	7	5	7	2	3	2	2	
Total (% of 8)	**63%**	**100%**	**38%**	**88%**	**38%**	**88%**	**63%**	**88%**	**25%**	**38%**	**25%**	**25%**	

TIDieR criteria are as follows: (1) Brief name; (2) Rationale of essential elements of intervention; (3) What – materials; (4) What – procedures; (5) Who provided; (6) How; (7) Where; (8) When and how much; (9) Tailoring; (10) Modification; (11) How well – planned; (12) How well – actual.

Y=yes, N=no.

[a]A qualitative publication was used to retrieve additional information to ensure completeness of intervention description[40]

[b]A qualitative publication was used to retrieve additional information to ensure completeness of intervention description[41]

Table 6. Details of communication partner training interventions (studies in italics not included in the synthesis of results)

Study name/ Country	TBI included	Design (quality score)	Provider, Setting	Intervention delivery, dosage, duration	Content of intervention	Outcomes	Main results[a]	Follow-up (maintenance)
Group-level designs								
Behn et al., 2012,[30] United Kingdom	No	RCT (PEDro 7/10)	SLT, Quiet room in residential rehabilitation centre	Six group sessions comprising 17 hours over 8 weeks	Training in positive communication strategies to use in workplace situations: group discussion, role-play, verbal feedback, rehearsal, video observations and review of tape-recorded conversations.	MPC[b], MSC[c], Impression scales[d], LCQ-Self, LCQ-Other, Modified Burden Scale	Greater change for trained communication partners on both MSC scales (*d* = 2.04-2.09) and 3 (of four) impression scales (*d* = 0.71-1.48) in structured but not casual conversation. No other significant changes.	6 months (yes)
Goldblum & Alant, 2009,[31] South Africa	*No*	*RCT (PEDro 5/10)*	*Researcher and research assistant, Conference room of large super-market chain*	*Single Group 4-hour training session*	*Education of barriers and facilitators for serving customers with TBI using video observation and group discussion of issues*	*Knowledge & Confidence Questionnaires*	*Trained group had greater confidence and knowledge post-training than control group for one (of two) questionnaire forms (d = 0.29-0.30).*	*None*
Manko et al., 2012,[32] Poland	*Yes*	*Non-randomised CT (PEDro 1/10)*	*NR, Brain injury centre(s)*	*6-months (unknown dose and intensity)*	*Education about brain injury and support options with strategies for managing difficult situations. Communication boards*	*Communication Functions Scale[e]; Family Ties Scale; Social Isolation Scale[e]*	*No significant changes between groups.*	*None*

					given to help people with TBI initiate conversation.			
Sim et al., 2013;[36] Togher et al., 2013;[34] Togher et al., 2016;[35] Australia	Yes	Non-randomised CT (PEDro 6/10)	SLTs, Brain injury centre(s)	Weekly group sessions of 2.5 hours and individual session of 1-hour for 10 weeks	Education about brain injury and communication, and training in positive communication strategies for everyday discourse. Role-plays, video feedback, cues for self-monitoring and feedback on tape - recorded conversations.	MPC[b], MSC[c], ESA[f], PA[g], LCQ-Self, LCQ-Other	Significant changes between groups in MPC (casual and purposeful conversation) (*d* = 0.80-1.13) and MSC (casual conversation only)(*d* = 1.16-1.28). Some significant improvements for the trained group compared to controls on ESA and PA (*d* = 0.79). Significant improvement on LCQ-Other in trained group compared to control group (*d* = -1.02).	6 months for MPC, MSC and LCQ only (yes)
Togher et al., 2004,[33] Australia	*No*	*RCT (PEDro 7/10)*	*NR*	*Six weekly 2-hour group sessions*	*Education about brain injury and communication for commonly occurring telephone enquiries using video observation, case studies, role-plays, group discussion and practice with people with TBI.*	*GSP[h]*	*Trained police officers spent increased time establishing nature of enquiry (d = 1.38) and length of goodbye comments (d = 1.51) compared to control group.*	*None*
Single-case experimental designs								
Arco et al., 2002[37],	*No*	*SCED*	*Clinical Psychologist,*	*13-15 individual sessions over ~8-14*	*Training in effective communication skills:*	*Target behaviours – indicate yes/no,*	*One trained staff member achieved competency for 2*	*Over ~7-22 weeks*

Australia		*(RoBiN-T 17/30)*	*Nursing home*	*weeks and 2-hour group workshop*	*modelling, verbal feedback and praise, and paper recording of task performance to facilitate self-monitoring.*	*imitating, follow instructions*	*target behaviours (indicate yes/no, imitating). The second achieved competency for one behaviour (indicate yes/no).*	*(yes for one staff member)*
Hoepner et al., 2018,[39] United States	*Yes*	*SCED (RoBiN-T 11/30)*	*Researcher/coach, NR*	*Weekly individual 50-minute sessions for 16-weeks*	*Video self-modelling: recorded and reviewed home and community conversations using a hierarchy of prompts and joint discussion to encourage self-reflection.*	*Accuracy of on-target responses to structured prompts about communicative behaviours, MPC[b], MSC[c], LCQ-Self, LCQ-Other*	*Improved post-treatment scores for MPC and MSC. Judgment accuracy was 75% for person with TBI and 82% for communication partner. LCQ-Other scores stable post-treatment but participant scored higher (suggesting increased awareness).*	*None*
Rietdijk et al., 2018,[38] Australia	Yes	SCED (RoBiN-T 22/30)	Clinician, Videoconferencing	Weekly individual sessions of 1.5 hours for 10 weeks	Education about brain injury and communication, and training in positive communication strategies using didactic instruction, role-plays, practice of conversations and review of video recordings.	ESA[i], MPC[b], MSC[c], Impression scales[d], LCQ-Self, CCRSA, QOLIBRI, PART-O, LCQ-Other	No stable baseline pattern for ESA so not analysed. Some clinically meaningful positive changes on MPC, MSC and Impression scales (more for 1 participant). Some statistically positive changes on the LCQ-Self and Other, CCRSA, QOLIBRI; No changes on the PART-O.	3 months for one dyad; 9 months for second – questionnaires only (yes)

[a]Effect sizes calculated for significant results at group-level according to guidelines by Morris[42] using an online calculator[43]
[b]Measure contains two scales – interaction and transaction
[c]Measure contains two scales – acknowledging and revealing competence

[d]Measure contains four individual scales – Appropriate, interesting, effort, rewarding
[e]These scales are sub-scales of much broader outcomes
[f]Analyses are comprised 4 move types
[g]Analyses are comprised 2 elements
[h]Analyses are comprised 12 elements
[i]This form of the analyses is based on a single move type from exchange structure analysis

CCRSA = Communication Confidence Rating Scale for Aphasia; CT = Controlled Trial; ESA = Exchange Structure Analysis; GSP = Generic Structure Potential; LCQ = La Trobe Communication Questionnaire; MPC = Measure of Participation in Conversation; MSC = Measure of Support in Conversation; NR = Not reported; PA = Productivity Analyses; PART-O = Participation Assessment of Recombined Tools – Objective; QOLIBRI = Quality of Life in Brain Injury; RCT = Randomised Controlled Trial; SCED = Single Case Experimental Design; SLT = Speech and Language Therapist