

Nonverbal Expression of Empathy in Healthy Human Populations: A Scoping Review Protocol

Authors

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Introduction

The Conceptualization of Empathy

People commonly experience empathy in daily life (Depow et al., 2021), which is the ability to understand, feel, and share another person's perspective and feelings while maintaining self-other differentiation (Cuff et al., 2016; Decety & Jackson, 2004). This multidimensional construct involves both cognitive and affective mechanisms (Cuff et al., 2016; Eklund & Meranius, 2021) and encompasses three functional dimensions that dynamically interact to produce the experience of empathy in humans (Cuff et al., 2016; de Waal & Preston, 2017; Decety & Jackson, 2004). To be empathic, an individual must have: 1) the cognitive capacity to understand others' perspective (i.e., the cognitive dimension), 2) the emotional capacity to share what someone else feels (i.e., the affective dimension), and 3) various regulatory processes to prevent from being overwhelmed by the emotions of others and sliding into a state of distress (B. Tremblay et al., 2018; Decety & Jackson, 2004; Decety et al., 2007). Self-other differentiation is a prerequisite for empathy since it allows an individual to distinguish between oneself and others and avoid any confusion between the feelings and mental states of others and their own (Decety & Jackson, 2004; Eklund & Meranius, 2021). By witnessing the suffering of others, the experience of empathy can lead to empathic concern (or a compassionate state), which is a feeling of concern for another person's suffering accompanied by the motivation to help (Goetz et al., 2010; Segal et al., 2017). This empathic reaction to the suffering of others might be seen as an emotion regulation strategy since it buffers a negative affect by actively generating a positive affect (Preckel et al., 2018; Singer & Klimecki, 2014). It can also be viewed on the same continuum as empathy (i.e., from perception to action) by moving people from empathizing to helping others (Riess, 2017), potentially resulting in multiple social benefits.

The Benefits of Empathy

Empathy is critical to social interactions and human evolution due to its multiple benefits of survival and reproduction (e.g., motivation to help others in distress, cooperation within species, and attachment to others; Decety, 2014; Decety & Cowell, 2018; Ringwald & Wright, 2021). In clinical interactions, empathic communication between physicians and their patients strengthens patients' satisfaction, adherence, and enablement. It also improves diagnoses and clinical outcomes and reduces patients' anxiety and distress (Derksen et al., 2013; Elliott et al., 2018). A few laboratory studies further suggest that conveying empathy could have an analgesic effect on the pain experience (Fauchon et al., 2017, 2019; Ruben et al., 2017). Virtual humans (i.e., computer-generated or -controlled characters with a human-like physical appearance; Ma et al., 2019) can act as empathizers in virtual settings. Besides eliciting socioemotional benefits (e.g., a generally improved affect; Pauw et al., 2022), they can enhance the user experience (Curtis et al., 2021), engagement, and motivation (Lisetti et al., 2013). However, to obtain such benefits in simulated or real social interactions, empathy must be communicated in a way that is understood by others.

The Interaction Cycle of Empathy

As with other facets of social interactions (e.g., social communication of pain; Craig, 2015), empathy is interactionally constructed, and its communication is dynamic (e.g., Eklund & Meranius, 2021; Elliot et al., 2018; Finset & Ørnes, 2017; MacFarlane et al., 2017; Wynn & Wynn, 2006). Several models have been proposed to describe the cyclical nature of empathic communication (e.g., Barrett-Lennard, 1981; Grondin et al., 2019). These generally encompass four steps between an empathizer (i.e., the person who experiences empathy) and a target (i.e., the person who triggers empathy in others; de Vignemont & Singer, 2006;

Nebi et al., 2022). Independent observers (i.e., individuals outside the dyad) can also watch the interaction. The empathic interaction begins with the target emitting socioemotional cues, either consciously or unconsciously (e.g., a facial expression of pain; step one). By perceiving these cues, the empathizer might experience empathy for the target (step two) and express it (step three). The empathy target (or independent observers) may perceive displays of empathy (i.e., being attuned and responsive to expressions of empathy; step four). This last step can change the affective state of the empathy target before re-engaging in communication and triggering other cycles of empathic responses. Through a feedback loop, an empathizer could detect the effects of their initial empathic response and adapt their response accordingly (Shamay-Tsoory & Hertz, 2022). Therefore, a target is not merely a passive recipient of the conveyed empathy but rather an active participant in this cycle. A target triggers empathy in the empathizer, interprets the transmitted empathy according to its characteristics (e.g., gender, age, and level of education; Borracci et al., 2017), and may influence the possible consequences of the empathic interaction. Possible discrepancies may arise between the empathizer's ability to convey a high level of empathy and the target's ability to accurately perceive the transmitted level of empathy (Bernardo et al., 2018; Elliott et al., 2018; Ogle et al., 2013). One way to understand these possible discrepancies is to address the channels through which empathy is expressed.

The Nonverbal Expression of Empathy

Feelings of empathy can be conveyed verbally and nonverbally to others (e.g., Haase & Tepper, 1972; Sauter et al., 2017; Vogel et al., 2018). As nonverbal and verbal channels are often considered together to understand conveyed meanings (Hall et al., 2018), the need to rely on both verbal and nonverbal channels has been highlighted when expressing empathy, especially within a clinical context (Riess & Kraft-Todd, 2014). Although a comprehensive understanding of the expression of empathy should also consider verbal behavior, this review focuses only on nonverbal cues due to the ease and speed individuals perceive these cues and make social attributions (Todorov et al., 2015). Nonverbal communication refers to the nonlinguistic and informative aspects of behavior (e.g., head and body movements, touch, interpersonal distance, paralanguage) to which a perceiver may respond or from which they may draw an inference (adapted from Hall et al., 2018). A systematic study of the expression of empathy via different nonverbal behaviors is essential to understand their respective impact in creating the overall impression of empathy for everyone involved in the empathic interaction (Hall & Schwartz, 2018). These markers of empathy could also be integrated into the training of healthcare professionals to optimize clinical benefits (Halim et al., 2019; Riess & Kraft-Todd, 2014) and competence (Ogle et al., 2013). They could also help the design of virtual humans to simulate empathy in their interactions with humans (e.g., Paiva et al., 2017) and provide virtual care with empathy (e.g., Lisetti et al., 2013).

Prior Reviews on Nonverbal Behaviors and Expression of Empathy

Based on an initial literature review (e.g., searches in CINAHL, MEDLINE, PsycINFO, JBI Systematic Review Register, Prospero, Cochrane Library), there are a few narrative, systematic, and scoping reviews that examined the overlap between nonverbal communication and the expression of empathy. Some reviews summarized findings on only one or two nonverbal behaviors, such as physical touch, direct eye contact, and behavioral mimicry, or the link between nonverbal behaviors and therapeutic relationships or social consequences, including empathy (e.g., Chartrand & Lakin, 2013; Kerr et al., 2019; Wiltshire et al., 2020). Other related reviews have focused on either specific populations (e.g., nurses and older adults; Wanko Keutchafo et al., 2020), types of sources (e.g., quantitative articles for a meta-analysis of correlations; Holland et al., 2021), or settings (e.g., clinical or medical education; Lorié et al., 2017; Patel et al., 2019). However, no protocol or review has intended to summarize the evidence on the nonverbal expression of empathy from all

disciplines, populations, settings, and sources. Most current reviews examine the nonverbal expression of empathy in isolation from the empathy target's perspective (Shamay-Tsoory & Hertz, 2022). Thus, researchers are not considering the different steps of an empathic interaction cycle (i.e., differentiating how and by whom empathy is assessed and distinguishing feeling from perceiving empathy). There are conceptual and methodological issues commonly associated with empathy research that researchers do not consider (Hall & Schwartz, 2018, 2022; Schwartz et al., 2021). For example, authors often fail to define key constructs and use instruments that match their definitions. To acknowledge and embrace the complexity of empathy, researchers need to carefully position their work concerning the definition and context (Xiao et al., 2016).

Present Research

An initial literature assessment helped to determine a suitable review method. This first step highlighted various scientific disciplines (e.g., health sciences, psychology, engineering), study designs, settings (e.g., clinical, virtual), measures (e.g., various behaviors and operationalizations of empathy), and target populations (e.g., age groups, healthcare professionals) related to the theme of nonverbal expression of empathy. A systematic review appeared unsuitable because this method typically focuses on precise questions, restrictive inclusion criteria, and specific study designs identified in advance (Arksey & O'Malley, 2005; Munn et al., 2018). A scoping review method was best suited to combine evidence from heterogeneous sources and answer questions regarding the nature and diversity of the evidence/knowledge available (Peters et al., 2020; Munn et al., 2022). Compared to systematic reviews, scoping reviews offer opportunities for researchers to map, describe, and analyze a much wider body of literature (e.g., a range of methods). Scoping reviews also follow a more rigorous method than traditional narrative literature reviews (Bradbury-Jones et al., 2022). The present scoping review aims to understand the extent and type of evidence related to the nonverbal expression of empathy (and empathic concern) in healthy human (or human-like) empathizers across contexts.

Review Question

What evidence is available on the nonverbal expression of empathy in healthy human (or human-like) empathizers?

More specific research questions will guide this process:

1. Which study designs and measures are used?
2. What are the central study populations and settings?
3. Which nonverbal behaviors are identified as markers of empathy?
4. What are the main lines of research on the nonverbal expression of empathy?
5. What are the gaps and areas in need of further research?

Keywords

Empathy; Compassion; Caring; Expression; Nonverbal communication; Behaviors; Review; Healthy; Human.

Eligibility Criteria

The Joanna Briggs Institute (JBI) framework of Population, Concept, and Context (PCC) will be used to determine the eligibility of the research question for this review.

Participants

This review will include empirical research on healthy human subjects, regardless of other individual differences (e.g., gender, age, ethnicity). Therefore, studies involving nonhumans (e.g., animals) or individuals with any disorder (e.g., developmental, neurological, psychiatric) will be excluded.

Concept

The central concept of this review is the nonverbal expression of empathy which refers to nonverbally conveying one's feeling of empathy to the target individual. Studies not examining the nonverbal expression of human empathy (or at least one of its dimensions) will be excluded, as well as studies on sign languages, massages, or artistic expressions.

Context

This review will consider studies from all settings and contexts, regardless of country of origin or sociocultural background.

Types of Sources

This review will consider empirical research from quantitative and qualitative designs, regardless of publication status. Studies that do not report original data (e.g., commentaries, literature reviews, replies, and theoretical articles) will be excluded. Due to resource limitations, only sources in English or French will be included.

Methods

The proposed scoping review will be conducted following the JBI methodology for scoping reviews (Peters et al., 2020), which expands on the work of Arksey and O'Malley (2005) and Levac et al. (2010). This scoping review will be reported in line with the Preferred Reporting Items for Systematic reviews and Meta-Analyses literature search extension (PRISMA-S; Rethlefsen et al., 2021) and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR; Page et al., 2021; Tricco et al., 2018). Covidence, a web-based collaboration software platform, will streamline the production of this scoping review (Veritas Health Innovation Ltd, Melbourne, Australia. Available at www.covidence.org). This protocol is based on the template presented in the *JBI Manual for Evidence Synthesis* (Peters et al., 2020) and on the adaptation for scoping reviews (Peters et al., 2022; see Appendix I for the adapted items) of the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols checklist (PRISMA-P; Moher et al., 2015; Shamseer et al., 2015). It will be registered on Corpus^{UL}, the institutional repository of Université Laval.

Search Strategy

The search strategy for electronic databases will be developed iteratively with a librarian specializing in knowledge syntheses from specific concepts (i.e., empathy and nonverbal communication) and relevant articles to locate both published and unpublished literature. There is a conceptual and measurement overlap between empathy and other interpersonal constructs such as rapport (e.g., Harrigan & Rosenthal, 1983) and caring (e.g., Halim et al., 2019). Therefore, several closely related terms to empathy will be added to the search strategy to reduce the probability of missing any relevant studies. The final version of the search strategy will first be applied to the PsycINFO database and then adapted for each subsequent database. The electronic databases to be searched include PsycINFO (Ovid), CINAHL (EBSCOhost), MEDLINE (Ovid), Embase (Embase.com), and Web of Science (www.webofknowledge.com), ACM Guide to Computing Literature (ACM Digital Library), and IEEE Xplore (IEEE; see Appendix II for one of the full search strategies). Given the particularities of the IEEE and ACM Digital Library databases, the search strategies will be broken down into several elements that will be recombined using the search history. Before data analysis, the searches will be rerun. The reference list of related review articles and sources of evidence included in this scoping review will be manually screened for potentially eligible studies (i.e., backward citation searching; Lefebvre et al., 2022). Sources of unpublished studies to be searched include ProQuest Dissertations and Theses (ProQuest), ClinicalTrials.gov, and Google Scholar using the search terms from our electronic databases' search. Google Scholar searches will be conducted in incognito mode, with location and trending searches disabled. At least the first 200 relevant references will be reviewed, as recommended by Bramer et al. (2018). No time limit will be placed on the search. While studies of all languages will be included in the search, only those in English or French will be reviewed for feasibility reasons.

Study/Source of Evidence Selection

Following the search, all identified citations will be collated and uploaded into Covidence (Veritas Health Innovation Ltd, Melbourne, Australia. Available at www.covidence.org) to facilitate screening and remove duplicates. As recommended by the JBI guidance (Peters & al., 2020), a pilot testing of source selectors will be executed before moving to source selection. The framework for pilot testing (titles and abstracts as well as full texts) is described below:

- A random sample of 25 sources will be selected;
- The reviewers will screen these sources using the eligibility criteria, a glossary of terms, and a screening tool that will be developed following established guidelines (Polanin et al., 2019);
- They will meet to discuss discrepancies and, if necessary, modify the eligibility criteria, the glossary of terms, and the screening tool;
- The reviewers will only start screening when achieving 0.60 (or greater) Gwet's AC1 coefficient (i.e., an alternative and more stable agreement statistic that resists the paradoxes of the Kappa coefficient in the case of multiple raters; Gwet, 2008, 2021)

Following the pilot testing, a random dyad of potential independent reviewers will screen the titles and abstracts for assessment against the inclusion criteria for the review. The decision of a third reviewer external to the dyad will solve disagreements. Potentially relevant sources will be retrieved in full text and uploaded into Covidence (Veritas Health Innovation Ltd, Melbourne, Australia. Available at www.covidence.org), and their citation details will be saved. Following other pilot tests, two reviewers will independently assess the full text of selected citations in detail against the inclusion criteria. A third reviewer will resolve any discrepancies. Reasons for excluding sources of evidence at full-text screening that do not meet the inclusion criteria will be recorded and written in the scoping review. The search

results and the study inclusion process will be reported in full in the final scoping review and presented in a PRISMA 2020 flow diagram (Tricco et al., 2018).

Data Extraction

Data will be extracted from papers included in the scoping review using a modified JBI template data extraction instrument (Peters et al., 2020) to answer the specific research questions. A draft data extraction form is provided (see Appendix III). The data extracted will include details about the participants, concepts, context, study methods, and key findings relevant to the review questions. The Extraction 2.0 tool of Covidence will help create and publish the data extraction template for all included studies. After piloting the extraction tool on three included studies, two reviewers will independently extract data, and an additional reviewer will resolve disagreements. The data extraction tool could be modified and revised as necessary while extracting data from each included evidence source. Modifications will be detailed in the scoping review. If appropriate, authors of papers will be contacted to request missing or additional data, where required. Critical appraisal of individual evidence sources will not be performed per the guidelines for scoping reviews (Peters et al., 2020; 2022).

Data Analysis and Presentation

The PRISMA 2020 flow diagram will detail the study inclusion process. The data will be exported from Covidence into a CSV format for analysis. Data analysis will involve mapping and summarizing the evidence on the nonverbal expression of empathy following the research questions of the scoping review. The synthesis will include quantitative analysis (e.g., frequency analysis) and qualitative analysis (i.e., content analysis) of the participants, concepts, contexts, types of sources, and other extracted data fields. The results will be classified under two sections (characteristics of included studies and review findings) and presented graphically using figures, illustrative charts, and tables. A narrative summary of the data will present the findings and describe how the results relate to the review questions.

A specific approach to presenting the data, likely to evolve according to the scoping review results, is planned. More precisely, the included studies' descriptions (e.g., study designs, samples, settings) will be presented in tabular format. A stacked area chart will depict the distribution of sources of evidence by year and study design. Population pyramids will display the population for each interaction's role (i.e., empathizer, target, and, if applicable, other perceivers) by age and sex. A bubble chart will map the countries where nonverbal expression of empathy research has been conducted according to the number of included studies. All this information will be analyzed to uncover gaps in the types of studies (quantitative, qualitative, or mixed-method design) and geographical context for further research. The review findings (e.g., specific nonverbal behaviors, measures of empathy, key findings, knowledge gaps, and recommendations for future research) will be summarized and tabulated. An illustration diagram of a human body will map the specific nonverbal behaviors and their measures. A diagram inspired by the lens model (Brunswik, 1956) will display the number of studies (i.e., by the thickness of the lines) providing evidence of the relationships between nonverbal behaviors (i.e., in the center of the lens) and steps of an empathic interaction, either feeling (by empathizers) or perceiving empathy (by perceivers). Distinguishing these steps in the diagram will help better understand the nonverbal cues related to feeling empathy and the cues that observers use to infer empathy. It will also facilitate the identification of associations between certain nonverbal behaviors and empathy (felt or perceived) for which studies are lacking. A frequency analysis of co-occurrences between specific nonverbal behaviors and measures of empathy, steps of the interaction implied, and the targeted dimensions of empathy will be performed.

A discussion of the scoping review objectives will follow. We will identify overlaps and gaps in the literature and discuss the implications for future research.

Study Status

At the time of submission of this protocol, the formal screening of search results against eligibility criteria has started.

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A.M.: Conceptualization, Methodology, Investigation, Writing – Original Draft Preparation, Writing – Review & Editing, Visualization, Project Administration; M.-H.T.: Methodology, Investigation, Writing – Review & Editing; W.-G.J.: Investigation, Writing – Review & Editing; C.P.: Investigation, Writing – Review & Editing; E.P.R.: Methodology, Validation, Writing – Review & Editing; M.-P.B.-T.: Conceptualization, Writing – Review & Editing; P.L.J.: Conceptualization, Methodology, Resources, Supervision, Writing – Review & Editing, Funding Acquisition; Guarantor.

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Conflicts of Interest

There is no conflict of interest in this project.

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Appendices

Appendix I: Recommended items to address in a scoping review protocol*

Section and topic	Item No	Checklist item	Page#
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a scoping review	1
Update	1b	If the protocol is for an update of a previous scoping review, identify as such	n/a
Registration	2	If registered, provide the name of the registry (such as JBI) and registration number	5
Authors:			
Contact	3a	Provide name, institutional affiliation, email address of all protocol authors; provide physical mailing address of corresponding author	1
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	8
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	n/a
Support:			
Sources	5a	Indicate sources of financial or other support for the review	8
Sponsor	5b	Provide name for the review funder and/or sponsor	8
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	8
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known (Note: Consider providing a rationale for the choice of conducting a scoping review as compared to other evidence synthesis approaches)	2-4
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to the inclusion/exclusion criteria	4
METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, timeframe) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	5
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other gray literature sources) with planned dates of coverage	6
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	19
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	5-7

Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion)	5-7
Data collection process	11C	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	7
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any preplanned data assumptions and simplifications (Note: Scoping reviews may not use PICO and instead may use JBI's Population, Concept, and Context [PCC] or another approach to reporting eligibility criteria)	20-22
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale (Note: Scoping reviews may not extract outcome data, so this can refer to whichever data items are extracted)	n/a
Risk of bias in individual studies	14	If this is to occur, describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis (Note: Scoping reviews typically do not include risk of bias assessment, but this information should be described if it will occur)	n/a
Data synthesis	15a	Describe criteria under which study data will be presented (Note: Scoping reviews do not typically include quantitative synthesis of study data, but should still describe in advance how extracted data are anticipated to be presented in the resulting review)	7-8
	15b	Describe the planned approach to how extracted data will be presented (such as figures, tables, evidence gaps maps)	7-8
	15c	Describe any proposed additional analyses (such as thematic analyses) (Note: The JBI methodological guidance does not recommend undertaking thematic analysis as this synthesis of data should ideally occur following methodological appraisal of the included sources)	7-8
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	7-8
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies) (Note: Scoping reviews typically do not include assessment of meta-bias[es], but this information should be described if it will occur)	n/a
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE; Note: GRADE for scoping reviews currently does not exist, and at this stage it is unclear if a variation on GRADE would be useful)	n/a

GRADE, Grading of Recommendations, Assessment, Development and Evaluation; PICO, participants, intervention, comparator, outcomes; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, et al.; PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ*. 2015;349:g7647. CC BY 4.0.

*—This checklist is based on the PRISMA for systematic review protocols (PRISMA-P) checklist.ⁱ It is strongly recommended that this checklist be read in conjunction with the best practice guidance and reporting items for the development of scoping review protocols for important clarification on the items,ⁱⁱ and the JBI updated methodological guidance for the conduct of scoping reviews.ⁱⁱⁱ Amendments to a scoping review protocol should be tracked and dated.

ⁱMoher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statement. *Syst Rev*. 2015;4(1):1.

ⁱⁱPeters MDJ, Godfrey C, McInerney P, Khalil H, Larsen P, Marnie C, et al. Best practice guidance and reporting items for the development of scoping review protocols. *JBI Evid Synth*. 2021. [Epub ahead of print]

ⁱⁱⁱPeters MDJ, Marnie C, Tricco AC, Pollock D, Munn Z, Alexander L, et al. Updated methodological guidance for the conduct of scoping reviews. *JBI Evid Synth*. 2020;18 (10):2119-26.

Appendix II: One of the Full Search Strategies

PsycINFO (OVID) Search Strategy (Last search: 4,938 on October 28, 2020)

#	Search	Records
1	exp Empathy/ or Sympathy/	16,143
2	(empath* or compassion* or solicitude or benevolen* or caring or sympathy or rapport).ab,id,ti.	76,293
3	1 or 2	76,767
4	exp Nonverbal Communication/ or Posture/ or Crying/ or Laughter/ or Physical Contact/ or Personal Space/	37,539
5	(nonverbal* or "non-verbal*" or nonspeech or "non-speech posture*" or ((body or physical) adj2 (language* or movement* or postur* or orientation* or congru* or distance)) or kinesic* or ((eye* or visual*) adj3 contact*) or (ocular adj2 (convergence* or focus* or fixat*)) or gaze* or gazing or "eye* movement*" or ((face or facial*) adj3 expressi*) or mimic* or "imitat* behavior?" or gesture* or "manual communication*" or hug or hugs or hugging or touch* or tacti* or haptic* or blush* or crying or cry or cries or smile* or smiling* or laugh* or position or ((tilt* or lean* or bend*) adj3 (body or head or trunk or postur*)) or ((arm or arms) adj2 (cross* or plac*)) or proxem* or "personnal spac*" or "interpersonal distance*" or presencing or (communicat* adj4 "without word*")).ab,id,ti.	239,151
6	4 or 5	251,029
7	3 and 6	4,938

Appendix III: Data Extraction Instrument

Characteristics of Included Studies				
Author(s)				
Year				
Aims/Purpose				
Country				
Context	Specific setting	Clinical setting Virtual setting Laboratory setting School setting Family setting Other		
	Primary discipline(s)	Business (e.g., accounting, economics, finance, management, marketing) Humanities (e.g., art, history, languages, literature, music, philosophy, religion, theater) Natural and applied sciences (e.g., biology, chemistry, computer science, engineering, geology, mathematics, physics, medicine) Social sciences (e.g., anthropology, education, geography, law, political science, psychology, sociology) Multidisciplinary		
Types of evidence source/	Publication status	Published Unpublished		
Methods	Study design	Quantitative study	Experimental/Quasi-experimental	Randomized controlled trials Non-randomized controlled trials Interrupted time-series studies
			Analytical observational studies	Prospective cohort studies Retrospective cohort studies Case-control studies Analytical cross-sectional studies
			Descriptive observational study designs	Case series Individual case reports Descriptive cross-sectional studies
		Qualitative study	Phenomenology Grounded theory Ethnography Qualitative description Action research Feminist research Others	
		Mixed methods study		
Population and sample size	Interaction's role	Empathy target(s)	Affective state	Physical Pain Social Pain Sadness Happiness

			Others
	Empathizer(s)	Age group	Infants Children Adolescents Adults Elderly Mixed
		Sex	Women Men Others
		Number Any specific role (e.g., health professional)	
	Perceiver(s)	Empathy target or not	Yes No
		Age group	Infants Children Adolescents Adults Elderly Mixed
		Sex	Women Men Others
		Number Any specific role (e.g., health professional, patient, independent observer) Assessing nonverbal behaviors? (Yes/No) Assessing empathy? (Yes/No) Assessing empathic concern? (Yes/No)	

Results Extracted from Sources of Evidence

Author(s)			
Year			
Aims/Purpose			
Study design			
Intervention	Nonverbal behaviors (or cues that are seen/heard)	Head	Facial expression (e.g., mimicry) Eye contact (e.g., pupil activity, gaze pattern) Mouth (e.g., smile) Paralanguage (e.g., frequency, amplitude, rate, pitch, cries) Head nod Others
		Body	Posture (e.g., forward lean, open body position) Hands (e.g., touch, gestures) Interpersonal space (e.g., < 1m) Hugging Others
	Measure	Questionnaire	Self-reported Other-reported
		Behavioral measure	

Main outcomes	Empathy or Empathic concern	Neurophysiological measure	Brain imaging method Physiological tool	
		Measure	Questionnaire	Self-reported Other-reported
			Behavioral measure	
			Neurophysiological measure	Brain imaging method Physiological tool
		Steps of the interaction cycle implied	Feeling Perceiving	
		Targeted dimension(s) for empathy	Affective resonance Perspective-taking Emotion regulation	
Key findings regarding the nonverbal expression of empathy (or empathic concern)				
Identified knowledge gaps (reported by authors)				
Recommendations for future research (reported by authors)				