

Original Article

# Interoception and pediatric occupational therapy practice: a protocol for a scoping review

## *Interocepção e prática da terapia ocupacional pediátrica: um protocolo para uma revisão de escopo*

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### Abstract

**Introduction:** Interoception is relatively new within pediatric occupational therapy practice. Interoception allows us to feel and interpret internal body sensations and is related to our ability to regulate emotions and behavior. It is associated with other functions including sensory processing, self-regulation and executive functioning, making it important for everyday participation in life activities. Pediatric occupational therapists are considering interoception as part of intervention but there is limited research to understand how and why occupational therapists use interoception in clinical practice. **Objectives:** The aim of this protocol is to describe the methodology and analyses to be used to undertake a scoping review. **Method:** This paper presents the protocol for a scoping review. A search of literature from ten electronic databases (Ovid Medline, Ovid Embase, Ovid PsycINFO, ERIC, Scopus, CINAHL, ProQuest Dissertations & Theses Global, AMED, OTDBASE and Google Scholar), grey literature and article reference searching was conducted. Title and abstract screening was completed before full-text review. Selected articles met stringent inclusion criteria. The PRISMA-ScR Checklist was used alongside the Crowe Critical Appraisal Tool to ensure robust data extraction and synthesis from selected studies. **Results:** A total of 2449 articles were retrieved. Eighteen articles were included in the review. A narrative synthesis approach will be used to synthesise data. **Conclusion:** Findings from this scoping review will inform future research related to interoception and pediatric occupational therapy practice to support clinicians to consider evidence to underpin practice.

**Keywords:** Occupational Therapy, Children, Review Literature as Topic.

### Resumo

**Introdução:** A interocepção é relativamente nova na prática da terapia ocupacional pediátrica. A interocepção nos permite sentir e interpretar sensações internas do

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corpo e está relacionada à nossa capacidade de regular emoções e comportamentos. Está associado a outras funções, incluindo processamento sensorial, autorregulação e funcionamento executivo, tornando-o importante para a participação diária nas atividades da vida. Os terapeutas ocupacionais pediátricos estão considerando a interocepção como parte da intervenção, mas há pesquisas limitadas para entender como e por que os terapeutas ocupacionais usam a interocepção na prática clínica.

**Objetivos:** O objetivo deste protocolo é descrever a metodologia e as análises a serem utilizadas para realizar uma revisão de escopo. **Método:** Este artigo apresenta o protocolo para uma revisão de escopo. Foi realizada uma pesquisa de literatura em dez bases de dados eletrônicas (Ovid Medline, Ovid Embase, Ovid PsycINFO, ERIC, Scopus, CINAHL, ProQuest Dissertations & Theses Global, AMED, OTDBASE e Google Scholar), literatura cinzenta e pesquisa de referências de artigos. A triagem do título e do resumo foi concluída antes da revisão do texto completo. Os artigos selecionados atenderam a critérios de inclusão rigorosos. A lista de verificação PRISMA-ScR foi usada juntamente com a Crowe Critical Appraisal Tool para garantir a extração e síntese robusta de dados dos estudos selecionados. **Resultados:** Foram recuperados 2.449 artigos. Dezoito artigos foram incluídos na revisão. Uma abordagem de síntese narrativa será usada para sintetizar os dados. **Conclusão:** Os resultados desta revisão de escopo informarão pesquisas futuras relacionadas à interocepção e à prática de terapia ocupacional pediátrica para apoiar os médicos a considerarem evidências para sustentar a prática.

**Palavras-chave:** Terapia Ocupacional, Crianças, Literatura de Revisão como Assunto.

## Introduction

Interoception refers to the process of feeling, recognising, and interpreting the internal condition of our body (Craig, 2002). It supports our ability to take note of our internal bodily sensations such as heart rate, breathing, muscle tension, hunger, thirst, blood pressure, body temperature, and urge to defecate and urinate (Hampl et al., 2020). In sum, it is directly involved in promoting and building our awareness of how our body *feels*. Interoception appears to be multifaceted, with interoceptive accuracy (the objective and precise monitoring of internal body sensation), interoceptive sensibility (the subjective and self-perception of interoceptive signals) and interoceptive awareness being three major components of it (Garfinkel et al., 2015; Khalsa et al., 2018). Specifically, interoceptive awareness brings interoceptive sensation into the conscious, metacognitive mind allowing us to link what we objectively and subjectively feel to our deeper emotional experiences (Schauder et al., 2015). Interoception is both distinct and intertwined with our other senses and is vital for engaging in everyday life (Mahler, 2017). Functional interoceptive awareness skills mean we are likely to act and engage in life in response to how our body feels. For example, eating something when we interpret hunger cues, putting on a jumper when we feel cold, taking deep breaths when we feel stressed or nervous to relax or taking a break when things get overwhelming around us.

## *Occupational therapy*

Studied extensively in neuroscience (Berntson & Khalsa, 2021; Garfinkel et al., 2015; Trevisan et al., 2019), the concept of interoceptive awareness is now being

examined in more detail in the applied sciences where links to sensory processing, executive functioning and overall participation have been identified (Bishop et al., 2023; Cheung et al., 2023; Clark et al., 2022; Dunn et al., 2022; Grist et al., 2023). Further, interoceptive awareness is associated with how we perceive and apply meaning to emotions (Mash et al., 2017), thus highlighting an important connection with self-regulation. This has been explored in the clinical and research literature (Cheung et al., 2023; Craig, 2014; Mahler et al., 2022), and gives rise to consideration for its use by healthcare professionals including occupational therapists.

Occupational therapy is a client-centred profession which aims to promote health and wellbeing across the lifespan (World Federation of Occupational Therapists, 2023). Occupational therapists support people to engage in meaningful and purposeful activities – referred to as occupations – to support participation in the context of everyday life activities (Kuhaneck & Case-Smith, 2020). Examples of daily occupations can include a one-year old child hand feeding themselves, a four year old child kicking a soccer ball, a 15 year old sending a text message to a friend, a mother caring for a newborn infant, a 35 year old adult working at a job full time position to earn a salary to pay the mortgage, or a retired person volunteering at a local animal shelter two days per week. Occupational therapists work with people experiencing health and wellbeing related problems, such as mental health diagnoses, traumatic or physical injury, neurological diagnoses, issues associated with aging or developmental delays.

Research has demonstrated that interoception and interoceptive awareness problems exists in these clinical populations, including autism spectrum disorder (Williams et al., 2023), attention deficit hyperactivity disorder (Kutscheidt et al., 2019), alexithymia (Scarpazza et al., 2022), various eating disorders (Khalsa et al., 2015; Willem et al., 2019) and chronic pain conditions. Further, as interoception plays a key role in homeostasis where the connection between body and mind is essential for everyday function (Bonaz et al., 2021; Craig, 2002), it is important to consider how interoception is related to somatic-visceral disorders such as chronic pain (Di Lernia et al., 2016) and musculoskeletal disorders (Bonaz et al., 2021).

With that in mind, a person's ability to perform and engage in their chosen daily occupations - termed occupational performance (Baum et al., 2015) - is considered within a collaborative therapeutic relationship between client and clinician. Pediatric occupational therapists work with children and families to support both child and family occupational performance, as well as promote child development and engagement in family routines (Occupational Therapy Australia, 2016). When focusing on interoception, a pediatric occupational therapist may consider how a child's interoceptive awareness might be impacting their occupational performance across many home, school and community occupations.

### ***Interoception and occupational therapy practice***

Executive functioning, self-regulation, problem solving, concentration, social skills, communication skills, and sensory processing, for example, have an impact on a child's participation within a school context (Ismael et al., 2018; Rosenberg & Avrech Bar, 2020) and would be readily supported by pediatric occupational therapists to maximise occupational performance. With links between these concepts and interoceptive

awareness, it seems timely to consider occupational therapists playing a role in childhood occupational performance when interoceptive awareness may be impacted. Despite this thought, pediatric occupational therapists are only recently considering interoceptive concepts into practice.

Presently, occupational therapy is considering interoception in both assessment (Dunn et al., 2022; Hample et al., 2020) and intervention practices (Hample et al., 2020; Mahler et al., 2022; Suárez-Iglesias et al., 2022) in both child and adult clinical populations, but is further behind the wider allied health professions in terms of consistency of use in practice where components of interoception have been considered for years (Khalsa et al., 2018; Price & Weng, 2021). For pediatric clients, a small body of literature exists discussing relationships between interoceptive awareness and various components pertinent to child development or areas of occupational performance an occupational therapist may support a child with (Bishop et al., 2023; Clark et al., 2022; Grist et al., 2023). A very limited body of literature exists to comment on the use of interoception-based programs in school environments (Hample et al., 2020; Lynch et al., 2020; Mahler et al., 2022) and no empirical literature exists discussing how community-based pediatric occupational therapists in general are using interoception-based intervention approaches with children in practice.

Therefore, following a preliminary search of the Ovid Medline and Cumulated Index to Nursing and Allied Health Literature (CINAHL) databases where little to no evidence provided insight into how pediatric occupational therapists are using interoception theory and evidence-based practice to support clinical work, a notable research knowledge gap was highlighted. This supports the need to explore the empirical literature further to collate a thorough outline of the ways in which pediatric occupational therapists are considering interoception in practice, and to inform future research projects on the topic.

### ***Research aim***

To complete a scoping review of the current research literature relating to interoception and interoceptive awareness relevant to pediatric occupational therapy clinical practice.

### ***Primary research question***

What are the primary findings reported in the current body of peer-reviewed research related to interoception, interoceptive awareness and interoception-based intervention programs that inform pediatric occupational therapy practice?

### ***Secondary research questions***

Secondary research questions posed include:

1. How are interoception and interoceptive awareness concepts being applied in pediatric occupational therapy practice?
2. What tools, scales or measures are being used to gather information about interoception and interoceptive awareness in pediatric occupational therapy practice?

3. How is the information and data being obtained by the interoception and interoceptive awareness tools, scales or measures being used or applied in pediatric occupational therapy practice?
4. How are pediatric occupational therapists considering interoception and interoceptive awareness as part of clinical practice and intervention?

## **Methods**

A scoping review is proposed to critically review the current research literature relating to interoception relevant to pediatric occupational therapy practice. The PRISMA Extension for Scoping Reviews (PRISMA-ScR) Checklist (Tricco et al., 2018) (see Appendix A) with consideration of the foundational five Stages of a Scoping Review originally published by (Arksey & O'Malley, 2005) were followed to comprehensively review the literature on the topic. The original PRISMA statement (Page et al., 2021) and PRISMA-ScR have been used extensively in occupational therapy research as reporting guides to appraise and synthesise research studies in a critical and systematic way (Pellerin et al., 2019; Windsor et al., 2023). Pertinent to the proposed review, the PRISMA-ScR was adapted by Tricco et al. (2018) from the original PRISMA statement and is comprised of a checklist of 22 items across seven sections. Designed to improve overall reporting of research specifically for scoping reviews, the PRISMA-ScR supports methodological rigor within research (Tricco et al., 2018). All the PRISMA-ScR Checklist items will be followed to guide this current scoping review. In particular, a critical appraisal of the selected studies will be conducted to further analyse and discuss the topic, as suggested by PRISMA-ScR Item 12 (Tricco et al., 2018).

## **Concepts**

This review considered three main concepts as part of the topic exploration: 1) interoception, 2) direct clinical practice outcomes, and 3) relevance to occupational therapy. Interoceptive awareness, interoceptive sensibility, and interoceptive accuracy were considered key factors related to interoception and hence were included as part of the scoping review search strategy (Garfinkel et al., 2015). Interoception and its related facets are relatively new concepts in clinical practice, and intervention to address internal sensation recognition and acknowledgement have been considered in the literature (Hample et al., 2020; Mahler et al., 2022; Price & Hooven, 2018). Clinical application of interoception across pediatric occupational therapy, including assessment and intervention with children, will be the focus of the scoping review to highlight the importance of outcomes and clinical application within practice.

## ***Types of sources included in the scoping review search***

No limitations were set for this scoping review as scoping reviews are used to present a wider perspective of literature related to an emerging topic and are less constrained by scope than systematic reviews (Munn et al., 2018; Tricco et al., 2016). Given the lack of evidence to underpin clinical practice related to interoception in comparison to other areas of occupational therapy practice, it was deemed important to capture a range of sources

clinicians might investigate to inform their clinical practice. Studies involving quantitative, qualitative, or mixed method design were included as part of the scoping review search strategy. Grey literature was also considered. Records were required to be published in English and accessible via online full-text format. Records published only between 2013-2023 were included to consider the contemporary and most recent information.

## **Search strategy**

A preliminary search using Ovid Medline and CINAHL was conducted to identify relevant articles and support development of key terms for the search. Literature was sourced from a total of ten electronic databases, including Ovid Medline, Ovid Embase, Ovid PsycINFO, Education Research Information Center (ERIC), Scopus, CINAHL, ProQuest Dissertations & Theses Global (PQDT™), Allied and Complementary Medicine Database (AMED), OTDBASE and Google Scholar. Reference list searching was also completed for those records selected for review to identify potentially additional relevant records. Both peer-reviewed and grey literature sources were included to capture a wider scope of information considering the novelty and emerging body of knowledge related to the topic (Dieter et al., 2017). Grey literature was identified using non peer-reviewed databases and general internet searching. Additionally, the first author's clinical knowledge was used to identify further grey literature sources through current knowledge of texts and resources related to interoception.

Databases were searched using the following key terms, which were adapted as appropriate for the context of searching in individual database platforms: *interocep\**, *mindful\**, *emotion\* process\**, *body scan\**, *meditation*, *body awareness*, *bod\* cue\**, *intervention*, *practice*, *treatment*, *program*, *therap\**, *approach*, *curriculum*, *program*, *assessment*, *measur\**, *tool*, *instrument*, *scale*, *occupational therapy*, *allied health*, *health care*. Subject headings were used across relevant databases to expand the search and capture all information. For the search, terms were widened from 'occupational therapy' to be able to capture any literature that may have occupational therapists included as professionals using interoception in practice but under a different role or position title.

Occupational therapists often work as part of multidisciplinary teams with collaborative interdisciplinary practice approaches in mind. Search terms related to health care and allied health were therefore used as it can be common for occupational therapists to expand their scope of practice beyond core occupational therapy knowledge and skills depending on the role and workplace context, for example case management, key worker practice, education support, research, health promotion, primary health care, and consultation (Chapman, 2016; Conneely, 2016; Dorsey, 2021, World Federation of Occupational Therapists, 2023). The term 'allied health' was used to encompass disciplines such as speech pathology and psychology where pediatric occupational therapists may work collaboratively. Further, such allied health disciplines practice as treatment-based rather than diagnostic and often in a similar way to that of occupational therapy.

Following the search strategy implementation, literature was uploaded to EndNote version 20 (The EndNote Team, 2013) for organising and the initial removal of duplicate records. Citations were subsequently exported to Covidence (Covidence systematic review software, n.d.), where further duplicates were removed that EndNote

had missed. Then initial screening of title and abstracts of the records was completed. Articles that did not meet the inclusion criteria at title and abstract review phase were excluded. Once this step was completed, then citation records still deemed eligible were selected for full text review. Articles included for final review were based upon strict inclusion and exclusion criteria, including:

***Inclusion criteria***

Strict inclusion and exclusion criteria have been applied for the search. Table 1 presents the inclusion and exclusion criteria for the search and a justification for each criterion.

**Table 1.** Inclusion and exclusion criteria for the search.

<b>Inclusion criteria</b>	<b>Exclusion criteria</b>	<b>Justification for consideration within the scoping review</b>
Published in English	Not published in English	Consistent terminology and understanding of interoception was pertinent to the aim of understanding how interoception is used in pediatric occupational therapy. Studies published in the English language were included to avoid translation challenges and cultural confusion.
Published since 2013	Published before 2013	Interoception consideration in pediatric occupational therapy is relatively new; therefore, only sources within a ten-year period were selected to ensure information remained current.
Specifically discussing child populations, included child populations alongside adults, or focused on occupations relevant across childhood	Specifically focusing on adult populations	A pediatric lens has been set for the scoping review. The review considered literature pertaining to children and pediatrics within an age range of 0-18 years. Some of the literature included had a lifespan consideration rather than a sole childhood focus or did not define a specific age group; however, studies of this nature were still included if the focus could be applicable to occupational performance for children.
Must focus on interoception and/or its related factors	Does not specifically focus on interoception and its related factors;  Mindfulness focus	Literature must focus on interoception and related concepts rather than other related topics. Literature pertaining to mindfulness was excluded. While inherently linked (Gibson, 2019 ), mindfulness theory and intervention focus more on stress reduction and being present in the moment. There is an element of body awareness (which links with interoception) but the overarching goal is to learn to accept the present, which often means focusing on unwanted experiences to learn to accept them. Interoception treatment on the other hand, focuses on body signals and teaches attention to be directed to inside the body to develop awareness of emotional states. It is this link to self-regulation (Cheung et al., 2023) and executive functioning (Bishop et al., 2023) which is distinguishable and ultimately used more exclusively within occupational therapy and therefore the reason why mindfulness literature was excluded.

**Table 1.** Continued...

Inclusion criteria	Exclusion criteria	Justification for consideration within the scoping review
Specifically related to the scope of pediatric occupational therapy clinical practice; including but not limited to, goal setting, assessment/information gathering, intervention provision, theory or concepts informing and underpinning clinical practice	<p>Medical or nursing (including pregnancy and antenatal) or other allied health or education disciplines involved;</p> <hr/> <p>Provides an anatomical, physiological, or biological understanding of interoception (including imaging);</p> <hr/> <p>Parenting programs or general parent advice</p>	<p>Occupational therapy practice was the focus of the scoping review, despite interoception-based practices being used across other allied health and education professions (Goodall, 2021; Price &amp; Hooven, 2018). Studies were then included if they considered a broader multidisciplinary approach in addition to occupational therapy and/or could be considered by occupational therapists as part of evidence-based practice inform their practice. Such studies were deemed relevant if the scope of the paper presented information relation to the use of assessment or intervention in a multi- or trans-disciplinary approach. Occupational therapists work may have a wide scope of practice pertinent to their role in any clinical setting so it was important to capture literature that could be applicable to differing practices. Medical-based studies (including medicine, nursing and imaging) were excluded as aims were related to diagnostic or biological/anatomical information. Parenting-related sources were considered outside the scope of this review as outcomes were not occupation-focused.</p>
Must be linked to considering and/or improving client outcomes of occupational performance or participation	Omitting client outcomes or occupational performance and participation because of interoception	Crucial to occupational therapy practice is outcomes of occupational performance and participation; therefore, studies needed to address occupational outcomes for clients.
Articles published in non-predatory journals;	Articles published in journals considered to be predatory	Peer-reviewed journals present high quality and rigorous research where information can be trusted; therefore journals considered to be predatory were omitted to ensure rigor. Grey literature has been included and Determined by not being on the following database: <a href="https://bealllist.net/standalone-journals/">https://bealllist.net/standalone-journals/</a> .
Grey literature relevant to pediatric occupational therapy practice		

**Data extraction**

A single researcher completed the review process, with any queries being reviewed by two other researchers. Decisions regarding inclusion and exclusion were made based on consensus of the three researchers. Data will be extracted to identify descriptive information about each record and to assist with the critical appraisal process. Specific information related to the author(s), year, country of origin, research aims and design, methodology, results or findings and study limitations will be summarised in a table format. Specific information related to assessment or measurement tools of interoception and interoceptive awareness, as well as information pertinent to intervention will be noted to answer the secondary research questions.

The Crowe Critical Appraisal Tool (v1.4) (CCAT) (Crowe, 2015) (see Appendix B) will be used to critically appraise the literature while the Johns Hopkins Evidence Level and Quality Guide (Johns Hopkins LoE) (Dang et al., 2022) (Appendix C) will be used to establish the level of evidence the retrieved studies represent. The CCAT is a widely



used tool in health research evaluation across both qualitative and quantitative methodologies and has established validity and reliability (Crowe & Sheppard, 2011; Crowe et al., 2011). It comprises of eight categories (including *Preliminaries, Introduction, Design, Sampling, Data collection, Ethical matters, Results and Discussion*) for researchers to consider as part of critically appraising literature (Crowe, 2013). The CCAT uses a six-point scale to score each category and uses descriptors to support ease of appraisal (Crowe, 2013), with a total score of 40 indicating a high score.

Extensively used also, the Johns Hopkins LoE has assisted researchers to appraise literature in broad healthcare domains, as well as occupational therapy (Archer et al., 2022; Tulliani et al., 2023). Pertinent to this review specifically are the Hierarchy of Evidence Guide (see Appendix C) which comprises of five levels research design can be categorised into (Johns Hopkins Health System, 2022). The Johns Hopkins LoE describes the level of evidence and can assist reporting of quality of research design across quantitative, qualitative and mixed method design (Johns Hopkins Health System, 2022). While not a specific requirement of scoping reviews these tools have been included to support a more thorough critical appraisal and to increase the robustness of the final review findings (Popay et al., 2006).

### ***Data analysis***

To analyse the retrieved studies, a narrative synthesis approach will be used. This approach supports an overall summary of the data to explain and synthesise information (Popay et al., 2006). Narrative synthesis is deeper than simply summarising data; rather it aims to explore data relationships to ultimately translate findings to inform practice (Lisy & Porritt, 2016) and has been used widely in health research (Farragher et al., 2020; Hamer et al., 2021; Malcolm et al., 2020). Further, numerous questions can be answered using a narrative synthesis which supports the multiple research questions of this study and will allow various themes to emerge and be explored to tell the story of the topic (Walthall et al., 2022). For this review, three stages of narrative analysis outlined by Popay et al. (2006) will be used: 1) preliminary analysis (i.e. organising and describing the findings from each study), 2) exploring data relationships (i.e. understanding relationships to explain differences or similarities between data), and 3) assessing data robustness (i.e. identifying and assessing strength of the evidence considered), which assist in providing deeper structure to the data analysis process.

## **Results**

A search of electronic research databases was conducted in June 2023 where a total of 2449 articles were retrieved, with 50 duplicates removed (three duplicates removed in EndNote and 47 duplicates removed in Covidence). Title and abstract screening resulted in 249 articles selected for full text review. The main reasons articles were excluded in line with inclusion and exclusion criteria included: 1) omitting client outcomes or occupational performance and participation because of interoception, 2) specifically focusing on adult populations, 3) published before 2013, and 4) medical, nursing, parenting or other allied health focus (including focusing on anatomy/physiology/imaging). A total of 18 articles were deemed to meet the inclusion criteria for data extraction (see Figure 1). A final

manuscript presenting the results and discussion of this scoping review is expected in December 2023 and will be submitted for consideration and peer-review to a topic-related journal.

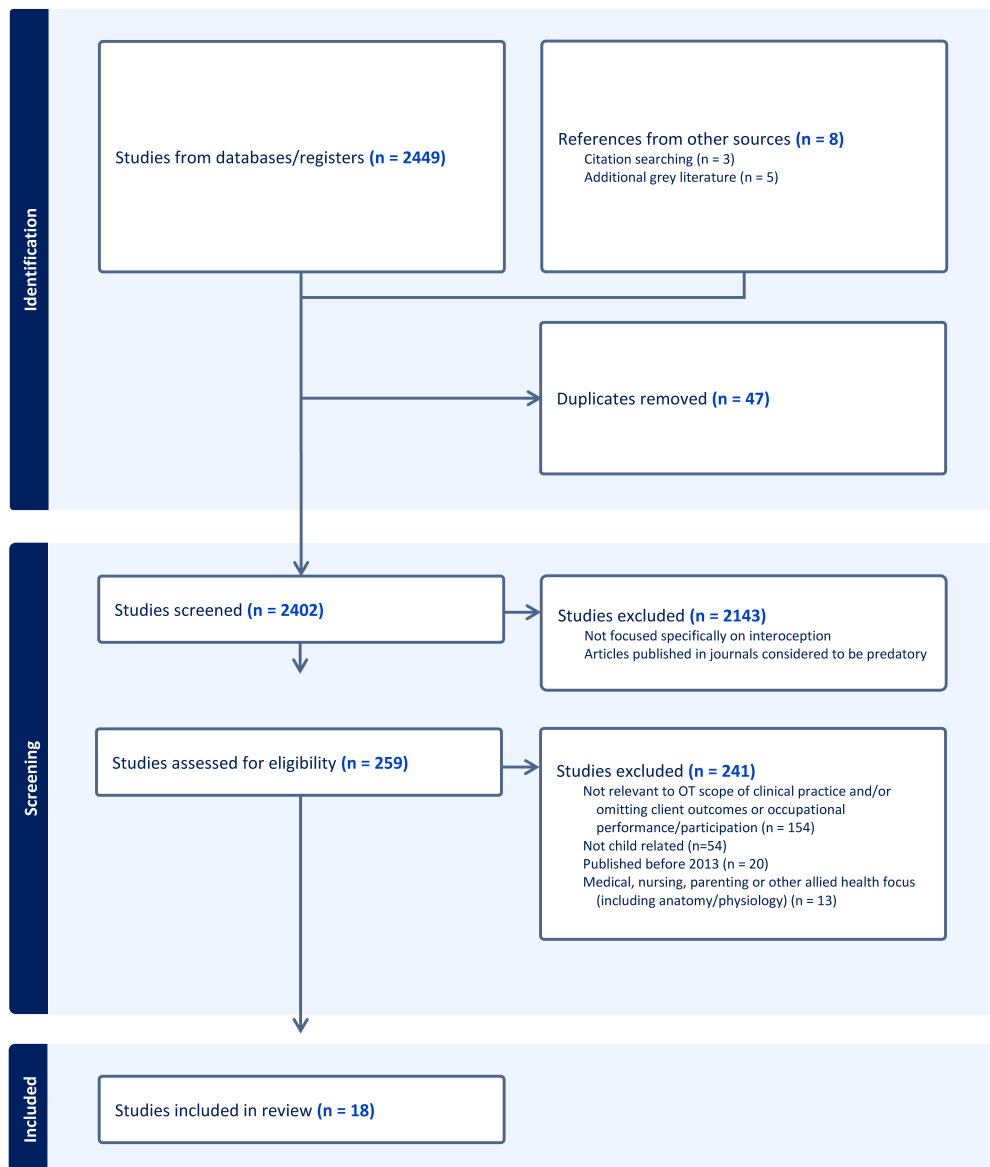


Figure 1. Study selection process.

## Discussion

The findings from the scoping review will seek to explore and discuss the literature relating to interoception and interoceptive awareness in pediatric occupational therapy practice. The extracted data from the selected studies will be analysed using narrative synthesis. Key findings will be used to inform future research projects relating to occupational therapy and interoception, specifically within pediatric populations, but

to also inform clinical practice for improving client outcomes for occupational performance and participation.

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#### Author's Contributions

Emma Clark was responsible for designing, writing the protocol and conducting the search. Ted Brown and Mong-Lin Yu contributed to the inception, scoping review protocol design and the data synthesis process. All authors approved the final version of the text.

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**Appendix A. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist (Tricco et al., 2018).**

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
<b>TITLE</b>			
Title	1	Identify the report as a scoping review.	
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	
<b>METHODS</b>			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	
<b>RESULTS</b>			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	
<b>DISCUSSION</b>			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	
Limitations	20	Discuss the limitations of the scoping review process.	
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	
<b>FUNDING</b>			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	

JBIG = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\*Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

†A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

‡The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).



## Appendix B. Crowe Critical Appraisal Tool (CCAT) Form (v1.4) (Crowe, 2015).

**Crowe Critical Appraisal Tool (CCAT) Form (v1.4)** Reference  Reviewer

This form must be used in conjunction with the CCAT User Guide (v1.4); otherwise validity and reliability may be severely compromised.

Citation	
<input type="text"/>	Year <input type="text"/>

Research design (add if not listed)	
<input type="checkbox"/> Not research	Article   Editorial   Report   Opinion   Guideline   Pamphlet   ...
<input type="checkbox"/> Historical	...
<input type="checkbox"/> Qualitative	Narrative   Phenomenology   Ethnography   Grounded theory   Narrative case study   ...
<input type="checkbox"/> Descriptive, Exploratory, Observational	A. Cross-sectional   Longitudinal   Retrospective   Prospective   Correlational   Predictive   ...
	B. Cohort   Case-control   Survey   Developmental   Normative   Case study   ...
Experimental	<input type="checkbox"/> True experiment Pre-test/post-test control group   Solomon four-group   Post-test only control group   Randomised two-factor   Placebo controlled trial   ...
	<input type="checkbox"/> Quasi-experiment Post-test only   Non-equivalent control group   Counter balanced (cross-over)   Multiple time series   Separate sample pre-test post-test [no Control] [Control]   ...
	<input type="checkbox"/> Single system One-shot experimental (case study)   Simple time series   One group pre-test/post-test   Interactive   Multiple baseline   Within subjects (Equivalent time, repeated measures, multiple treatment)   ...
<input type="checkbox"/> Mixed Methods	Action research   Sequential   Concurrent   Transformative   ...
<input type="checkbox"/> Synthesis	Systematic review   Critical review   Thematic synthesis   Meta-ethnography   Narrative synthesis   ...
<input type="checkbox"/> Other	...


Variables and analysis		
Intervention(s), Treatment(s), Exposure(s)	Outcome(s), Output(s), Predictor(s), Measure(s)	Data analysis method(s)
<input type="text"/>	<input type="text"/>	<input type="text"/>

Sampling					
Total size	Group 1	Group 2	Group 3	Group 4	Control
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Population, sample, setting					
<input type="text"/>					

Data collection (add if not listed)	
Audit/Review	a) Primary   Secondary   ... b) Authoritative   Partisan   Antagonist   ... c) Literature   Systematic   ...
Observation	a) Participant   Non-participant   ... b) Structured   Semi-structured   Unstructured   ... c) Covert   Candid   ...
Interview	a) Formal   Informal   ... b) Structured   Semi-structured   Unstructured   ... c) One-on-one   Group   Multiple   Self-administered   ...
Testing	a) Standardised   Norm-ref   Criterion-ref   Ipsative   ... b) Objective   Subjective   ... c) One-on-one   Group   Self-administered   ...

Scores					
Preliminaries	Design	Data Collection	Results	Total	[/40]
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Introduction	Sampling	Ethical Matters	Discussion	Total	[%]
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

General notes
<input type="text"/>

 Crowe Critical Appraisal Tool (CCAT) :: Version 1.4 (19 November 2013) :: Michael Crowe (michael.crowe@my.jcu.edu.au)  
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Page 1 of 2

Appraise research on the merits of the research design used, not against other research designs.

Category Item	Item descriptors [☐ Present; ☒ Absent; ■ Not applicable]	Description (Important information for each item)	Score (0-5)
<b>1. Preliminaries</b>			
Title	1. Includes study aims ☐ and design ☐		
Abstract (assess last)	1. Key information ☐ 2. Balanced ☐ and informative ☐		
Text (assess last)	1. Sufficient detail others could reproduce ☐ 2. Clear/concise writing ☐, table(s) ☐, diagram(s) ☐, figure(s) ☐		
			Preliminaries [/5]
<b>2. Introduction</b>			
Background	1. Summary of current knowledge ☐ 2. Specific problem(s) addressed ☐ and reason(s) for addressing ☐		
Objective	1. Primary objective(s), hypothesis(es), or aim(s) ☐ 2. Secondary question(s) ☐		
Is it worth continuing?			Introduction [/5]
<b>3. Design</b>			
Research design	1. Research design(s) chosen ☐ and why ☐ 2. Suitability of research design(s) ☐		
Intervention, Treatment, Exposure	1. Intervention(s)/treatment(s)/exposure(s) chosen ☐ and why ☐ 2. Precise details of the intervention(s)/treatment(s)/exposure(s) ☐ for each group ☐ 3. Intervention(s)/treatment(s)/exposure(s) valid ☐ and reliable ☐		
Outcome, Output, Predictor, Measure	1. Outcome(s)/output(s)/predictor(s)/measure(s) chosen ☐ and why ☐ 2. Clearly define outcome(s)/output(s)/predictor(s)/measure(s) ☐ 3. Outcome(s)/output(s)/predictor(s)/measure(s) valid ☐ and reliable ☐		
Bias, etc	1. Potential bias ☐, confounding variables ☐, effect modifiers ☐, interactions ☐ 2. Sequence generation ☐, group allocation ☐, group balance ☐, and by whom ☐ 3. Equivalent treatment of participants/cases/groups ☐		
Is it worth continuing?			Design [/5]
<b>4. Sampling</b>			
Sampling method	1. Sampling method(s) chosen ☐ and why ☐ 2. Suitability of sampling method ☐		
Sample size	1. Sample size ☐, how chosen ☐, and why ☐ 2. Suitability of sample size ☐		
Sampling protocol	1. Target/actual/sample population(s): description ☐ and suitability ☐ 2. Participants/cases/groups: inclusion ☐ and exclusion ☐ criteria 3. Recruitment of participants/cases/groups ☐		
Is it worth continuing?			Sampling [/5]
<b>5. Data collection</b>			
Collection method	1. Collection method(s) chosen ☐ and why ☐ 2. Suitability of collection method(s) ☐		
Collection protocol	1. Include date(s) ☐, location(s) ☐, setting(s) ☐, personnel ☐, materials ☐, processes ☐ 2. Method(s) to ensure/enhance quality of measurement/instrumentation ☐ 3. Manage non-participation ☐, withdrawal ☐, incomplete/lost data ☐		
Is it worth continuing?			Data collection [/5]
<b>6. Ethical matters</b>			
Participant ethics	1. Informed consent ☐, equity ☐ 2. Privacy ☐, confidentiality/anonymity ☐		
Researcher ethics	1. Ethical approval ☐, funding ☐, conflict(s) of interest ☐ 2. Subjectivities ☐, relationship(s) with participants/cases ☐		
Is it worth continuing?			Ethical matters [/5]
<b>7. Results</b>			
Analysis, Integration, Interpretation method	1. A.I.I. method(s) for primary outcome(s)/output(s)/predictor(s) chosen ☐ and why ☐ 2. Additional A.I.I. methods (e.g. subgroup analysis) chosen ☐ and why ☐ 3. Suitability of analysis/integration/interpretation method(s) ☐		
Essential analysis	1. Flow of participants/cases/groups through each stage of research ☐ 2. Demographic and other characteristics of participants/cases/groups ☐ 3. Analyse raw data ☐, response rate ☐, non-participation/withdrawal/incomplete/lost data ☐		
Outcome, Output, Predictor analysis	1. Summary of results ☐ and precision ☐ for each outcome/output/predictor/measure 2. Consideration of benefits/harms ☐, unexpected results ☐, problems/failures ☐ 3. Description of outlying data (e.g. diverse cases, adverse effects, minor themes) ☐		
			Results [/5]
<b>8. Discussion</b>			
Interpretation	1. Interpretation of results in the context of current evidence ☐ and objectives ☐ 2. Draw inferences consistent with the strength of the data ☐ 3. Consideration of alternative explanations for observed results ☐ 4. Account for bias ☐, confounding/effect modifiers/interactions/imprecision ☐		
Generalisation	1. Consideration of overall practical usefulness of the study ☐ 2. Description of generalisability (external validity) of the study ☐		
Concluding remarks	1. Highlight study's particular strengths ☐ 2. Suggest steps that may improve future results (e.g. limitations) ☐ 3. Suggest further studies ☐		
			Discussion [/5]
<b>9. Total</b>			
Total score	1. Add all scores for categories 1-8		
			Total [/40]

**Appendix C. Hierarchy of Evidence Guide (Johns Hopkins Evidence-based Practice Model for Nursing and Healthcare Professionals. © 2022 Johns Hopkins Health System/Johns Hopkins School of Nursing).**

Evidence Level	Types of Evidence
<b>Research Evidence</b>	Experimental study, randomized controlled trial (RCT)
	<b>Level I</b> Explanatory mixed methods design that includes only a Level I quantitative study
	Systematic review of RCTs, with or without meta-analysis
	<b>Level II</b> Quasi-experimental study
	Explanatory mixed methods design that includes only a Level II quantitative study
	Systematic review of a combination of RCTs and quasi-experimental studies, or quasi-experimental studies only, with or without meta-analysis
	<b>Level III</b> Nonexperimental study
	Systematic review of a combination of RCTs, quasi-experimental and nonexperimental studies, or nonexperimental studies only, with or without meta-analysis.
	Exploratory, convergent, or multiphasic mixed methods studies
	Explanatory mixed methods design that includes only a Level III quantitative study
<b>Non-research Evidence</b>	Qualitative study
	Systematic review of qualitative studies with or without meta-synthesis
	<b>Level IV</b> Opinion of respected authorities and/or nationally recognized expert committees or consensus panels based on scientific evidence. Includes:
	<ul style="list-style-type: none"> <li>Clinical practice guidelines</li> <li>Consensus panels/position statements</li> </ul>
	Based on experiential and non-research evidence. Includes:
	<ul style="list-style-type: none"> <li>Scoping reviews</li> <li>Integrative reviews</li> <li>Literature reviews</li> <li>Quality improvement, program or financial evaluation</li> <li>Case reports</li> <li>Opinion of nationally recognized expert(s) based on experiential evidence</li> </ul>
	<b>Level V</b>