Clinical findings that guide musculoskeletal physiotherapists' decision-making in the treatment of patients with non-specific neck pain. An international e-Delphi study

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Clinical findings that guide musculoskeletal physiotherapists' decision-making in the treatment of patients with non-specific neck pain. An international e-Delphi study

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ABSTRACT

Objective: To identify clinical criteria for prioritizing manual therapy or exercise in the management of patients with nonspecific neck pain (NSNP).
Design: e-Delphi study (three rounds).
Methods: International researchers and clinicians involved in teaching in postgraduate musculoskeletal education were invited to participate. In Round 1, 29 participants answered open-ended questions to identify clinical features of NSNP patients, with responses content analyzed and grouped. In Rounds 2 (24) and 3 (25), experts rated these criteria using a 5-points Likert scale, aiming for consensus set at 75% agreement.
Results: Experts believed that manual therapy and exercise are often best used in combination but should be tailored to each patient's unique clinical presentation. They agreed on a total of 16 and 11 clinical criteria to indicate the use of manual therapy and exercise, respectively. These included movement limitations, muscle weakness, altered sensorimotor control, directional preference, pain types, and patient preferences.
Conclusion: While international experts typically seek to combine exercise and manual therapy to manage NSNP, they agree on several criteria to guide individualized intervention. Further research should assess the reliability and effectiveness of these criteria.

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KEYWORDS
Neck pain; clinical reasoning; manual therapy; exercise

1. Introduction

Neck pain is a common and often disabling condition, contributing significantly to pain, disability, and economic costs [1]. Nonspecific neck pain (NSNP) includes cases unrelated to trauma, without major underlying pathologies or cervical radiculopathies, and represents about 90% of neck pain cases [2]. NSNP is considered a multifactorial and clinically heterogeneous condition, with over 50% becoming chronic, making management challenging [3]. Current guidelines suggest exercise and manual therapy as the primary treatments for NSNP [4–7] but lack clear guidance on selecting these approaches. To effectively tailor treatment based on individual clinical features, a personalized approach has been recommended [8,9]. Clinical criteria to identify patients who may respond better to manual therapy or exercise remain unclear. Qualitative studies and Delphi investigations each offer distinct yet complementary contributions to clinical reasoning research; qualitative methods provide in-depth understanding of clinicians' cognitive processes and contextual influences, while Delphi techniques facilitate the development of structured expert consensus [10,11]. Although Delphi studies have been effective in classifying NSNP subgroups and organizing physiotherapy interventions, they have consistently fallen short in generating strong consensus on clinical reasoning pathways for patient management [12–14]. This study utilized a three-round Delphi process to gather consensus from international experts on clinical criteria that inform decision-making when treating patients with NSNP.

2. Method

2.1. Study design

An unregistered three-round e-Delphi study, administered via Qualtrics survey platform, was conducted and reported according to the Guidance on Conducting and Reporting Delphi studies (CREDES) [15] and the Accurate Consensus Reporting Document (ACCORD) [16] recommendations. Ethical approval was obtained by the Sheffield Hallam University Ethics Committee (ER70979620). This study was informed by previous literature reviews and qualitative interviews, with the e-Delphi approach chosen as an efficient method of

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seeking consensus from a geographically disparate group of experts [17].

2.2. Participant selection and recruitment

The panel of experts was selected following the criteria of knowledge, experience, and policy influence [18]. To ensure heterogeneity of the sample, the principal investigator (PM) recruited experts via the contact sections of websites of universities offering programs recognized by International Federation of Orthopedic Manipulative Physical Therapists (IFOMPT), as well as through international associations representing post-graduate program instructors, and by reaching out to authors of relevant books and scholarly articles. The inclusion criteria for the panelists were either: (a) physiotherapists with at least 10 years of clinical experience who teach post-graduate education programmes recognised by the IFOMPT, or (b) authors of relevant books or at least one peer-reviewed relevant publication. Six hundred three such experts were identified and were contacted through an initial e-mail invitation. Those willing to participate were given access to a Qualtrics (Qualtrics, Provo, UT) survey tool where they found a participant information sheet, a consent form to e-sign, and the Round 1 questionnaire with demographic information. The information sheet outlined the study's purpose, benefits, and potential risks, clarifying that while full anonymity could not be guaranteed, participants' identities would be protected through coded pseudonyms [19].

2.3. Procedure

In Round 1, participants were asked to complete a set of open-ended questions to identify clinical features of NSNP patients who might benefit from manual therapy or exercise (Table 1). A demographic form collected data on participants' sex, age, clinical background, and the approximate percentage of NSNP patients in their caseload. Round 1 responses were independently content-analyzed by two researchers (PM and SM) to consolidate synonyms and group similar clinical features into a set of items organized by history-taking and physical examination criteria (Figure 1). Results were compared, and any disagreements were discussed with a third researcher (GP) (Morse, 2015).

In Round 2, experts received a questionnaire that included criteria emerging from Round 1 as well as criteria from unpublished qualitative interviews with Italian OMPT-registered physiotherapists (Mastromarchi et al. unpublished data) (Appendix 1), if not previously mentioned. In Round 2 and 3, the experts were asked to rate each criterion using a 5-point Likert (1 = Strongly Agree, 2 = Agree, 3 = Neither Agree nor Disagree, 4 = Disagree, 5 = Strongly Disagree) [20].

Round 3 focused on achieving consensus on items not agreed upon in Round 2. Experts could re-rate undecided criteria while viewing group response statistics (median and interquartile range (IQR)) and their previous responses. We adopted evidence-based strategies to maximize response, including a brief invitation letter, giving clear deadlines for responses, minimizing questionnaire length, and using clear formatting [21]. A follow-up reminder, including the link to the Qualtrics questionnaire, was sent 2 weeks later to participants who had not yet responded to each round.

2.4. Data analysis

Quantitative data from Rounds 2 and 3 were analyzed using IBM SPSS Statistics V.28, employing descriptive statistics to calculate the percentage of group responses, medians, and IQRs for each clinical feature. Consensus on clinical relevance was defined as 75% or more agreement for 'Strongly Agree' or 'Agree' (classified as Clinically Relevant, CR) or 'Strongly Disagree' or 'Disagree' (Clinically Not Relevant, CNR) [15]. If consensus was not reached, items were labeled 'Undecided' (U) and re-rated in Round 3. Medians were used as a central tendency measure, and IQRs reflected consensus spread. As Likert-scale data are ordinal and may not follow a normal distribution, non-parametric statistical methods were applied [22], with lower medians indicating greater clinical relevance.

3. Results

Twenty-nine international experts agreed to participate in the study and completed the Round 1 questionnaire; 24 and 25 participated in Rounds 2 and 3, respectively. The characteristics of the panel of experts

Table 1. Round 1 questionnaire.

The clinical findings that guide musculoskeletal physiotherapists' decision-making in the treatment of patients with neck pain. An international e-Delphi study.
e-Delphi Round 1
Please answer to the following questions.
What are that clinical features in history taking that suggest to you that a patient with NSNP may benefit from manual therapy?
What are that clinical features in physical examination that suggest to you that a patient with NSNP may benefit from manual therapy?
What are that clinical features in history taking that suggest to you that a patient with NSNP may benefit from exercise?
What are that clinical features in physical examination that suggest to you that a patient with NSNP may benefit from exercise?
Do you have any other comments on decision-making process of musculoskeletal physiotherapists treating patients with NSNP?

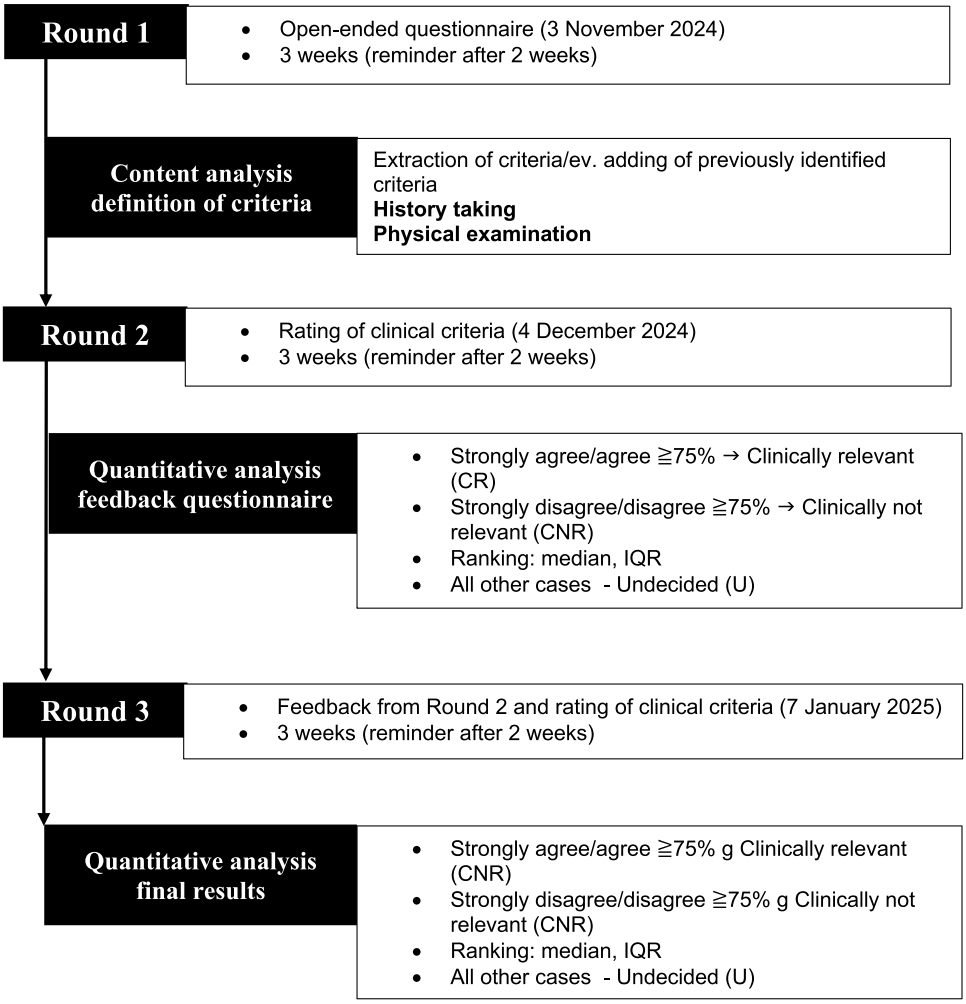

Figure 1. Stages of the Delphi study.

Table 2. Characteristics of international expert consensus panel.

Age, years (±SD)	44 (±15.5)
Country	Australia (6), Belgium (3), Canada (1), Germany (1), Italy (4), Japan (1), Luxembourg (1), Netherlands (1), United Kingdom (2), USA (5)
Male/Female	19/10
Years of practice: mean (±SD)	21.5 (±14.8)
Method taught	Multimodal/OMPT based (14), Maitland (9), Kaltenborn (1), N/A (5)
NSNP patients as a proportion of workload: mean (±SD)	50% (±28.3)

NSNP Nonspecific Neck Pain: **OMPT** Orthopedic Manipulative Physical Therapist; **SD** Standard deviation

are shown in Table 2. To ensure completeness of the item pool, the criteria generated in Round 1 were compared with findings from a previous qualitative study involving Italian OMPT physiotherapists (Appendix 1). All criteria identified in the qualitative study were already represented within the Round 1 responses and therefore did not result in the addition of any new items to the Round 2 questionnaire.

A total of 27 features reached consensus as indicators for manual therapy (16) or exercise (11), with 13 related to history and 14 to physical examination. Consensus was achieved on 22 of those features in Round 2, and 5 additional features were agreed upon in Round 3. Fifteen features did not reach consensus, of which 9 were related to manual therapy and 6 to exercise (see Table 3). Additionally, the experts agreed that combining these approaches is superior to a single modality and emphasized the need for a patient-tailored approach (see Table 4).

3.1. Common clinical features

Several clinical features identified during history taking were common to both manual therapy and exercise interventions: absence of red flags, attitude, and positive previous experience toward the proposed treatment, mechanical pain behavior, and report of stiffness. From the physical examination, shared indicators were as follows: improvement or centralization of symptoms with repeated

Table 3. Percent agreement on clinical indications for manual therapy and exercise.

	Round 1			Round 2		
Indications for manual therapy – history taking	CR	U	CNR	CR	U	CNR
Patients report stiffness and loss of range of movement (ROM)	100%	–	–	–	–	–
Symptoms must not be too intense	29%	46%	25%	20%	64%	16%
Unilateral neck pain	63%	29%	8%	71%	21%	8%
Bilateral neck pain	33%	50%	17%	20%	68%	12%
Absence of radicular pain with/without neurological signs (loss of sensation or strength)	50%	25%	25%	48%	24%	28%
Mechanical pain behavior (on/off)	96%	4%	–	–	–	–
Specific movements toward the symptomatic side	84%	16%	–	–	–	–
Specific movements toward the asymptomatic side	62%	33%	5%	64%	32%	4%
Acute/subacute NSNP	35%	57%	8%	20%	72%	8%
Previous manual therapy helped	92%	8%	–	–	–	–
The patient has good expectations with manual therapy	92%	8%	–	–	–	–
Absence of red flags	92%	8%	–	–	–	–
Minimal yellow flags	75%	17%	13%	–	–	–
No comorbidity	42%	33%	25%	48%	36%	16%
Absence of nociplastic pain	67%	20%	13%	84%	8%	8%
Indications for manual therapy – physical examination	CR	U	CNR	CR	U	CNR
Ability to find positions that relieve symptoms	88%	8%	4%	–	–	–
Active and passive movement restriction	100%	–	–	–	–	–
Movement painful and restricted in rotation, toward the more painful side	87%	13%	–	–	–	–
Movement painful and restricted in rotation, toward the less/non-painful side	67%	33%	–	76%	20%	4%
Improvement of symptoms with repeated movements and sustained movements (directional preference)	75%	21%	4%	–	–	–
Neurological screen is negative	63%	33%	4%	72%	28%	–
Restricted passive physiological movements (PPIVM's)	84%	8%	8%	–	–	–
Muscle tightness and/or tenderness	50%	42%	8%	72%	20%	8%
Symptoms and movement restriction with manual examination (i.e. postero-anterior glides)	87%	13%	–	–	–	–
Consistency between reported and found signs and symptoms and active and passive movements	100%	–	–	–	–	–
Indications for exercise – history taking	CR	U	CNR	CR	U	CNR
Indications of weakness or stiffness in the complaints	83%	13%	4%	–	–	–
Pain localized in the neck (not referred)	54%	25%	21%	60%	32%	8%
Mechanical behavior (on-off)	87%	13%	–	–	–	–
Previous exercises helped	92%	8%	–	–	–	–
Positive attitude to exercise and strong motivation	96%	4%	–	–	–	–
Absence of red flags	67%	21%	12%	84%	16%	–
Minimal yellow flags, i.e. fear avoidance	54%	21%	25%	56%	40%	4%
Global exercises in presence of nociplastic pain/ specific neck/upper limb exercises in absence of nociplastic pain	67%	29%	4%	64%	36%	–
Indications for exercise – physical examination	CR	U	CNR	CR	U	CNR
Forward head position	46%	38%	16%	44%	44%	12%
Active movement restriction	83%	13%	4%	–	–	–
Poor neuromotor control or decreased strength/endurance of neck-scapular muscles	92%	8%	–	–	–	–
Improvement of symptoms with repeated movements and sustained movements (directional preference)	75%	21%	4%	–	–	–
Patient open to explore movement possibilities	88%	8%	4%	–	–	–
Altered joint position sense, poor performance in balance test and in eye movement control	66%	29%	4%	88%	12%	–
Negative passive movement testing (PPIVM's)	13%	50%	37%	16%	80%	4%
Poor performance of deep neck muscles and/or tightness of superficial muscles	88%	4%	8%	–	–	–
Inconsistency between movement and pain	17%	54%	29%	4%	80%	16%
Other comments	CR	U	CNR	CR	U	CNR
Combining manual therapy and exercise is better than either used as a single modality	100%	–	–	–	–	–
The amount and type of the two interventions will vary according to their clinical presentation	100%	–	–	–	–	–

Bold font denotes consensus reached: CR = recommended; U = undecided CNR = not recommended; normal font = no consensus.

movements or changes in posture. The experts also agreed on the superiority of combining manual therapy and exercise and on the necessity of tailoring the amount and type of these interventions to each individual.

3.2. Manual therapy

Independent indicators for manual therapy were as follows: (history) painful movement toward the symptomatic side, absence of nociplastic pain, and minimal yellow flags; (physical examination): consistency between signs and symptoms during active and passive movements, and movement restrictions elicited through manual examination.

3.3. Exercise

Independent indicators for exercise were as follows: (history) complaints of weakness and localised pain without referred symptoms; (physical examination): active movement restriction, poor neuromuscular control or deficits in the neck-scapular muscles, openness to explore movement possibilities, altered neck-eye sensorimotor control, and poor performance of the deep neck flexors.

4. Discussion

In this Delphi study, international experts agreed on clinical features from the history and physical examination that were indications for manual therapy and

Table 4. Comparison of clinical indications for manual therapy and exercise therapy for NSNP from international expert consensus panel.

Median (IQR)†	Common/similar indicators Indications for manual therapy	Indications for exercise therapy	Median (IQR) †
1 (1)	Absence of red flags [H] 92%	Absence of red flags [H] 84%	1 (1)
1 (1)	The patient has good expectations with manual therapy [H] 92%	Positive attitude to exercise and strong motivation [H] 96%	1 (1)
1 (1)	Previous manual therapy helped [H] 92%	Previous exercises helped [H] 92%	2 (1)
1 (1)	Mechanical pain behavior (on/off) [H] 96%	Mechanical pain behavior (on/off) [H] 87%	2 (1)
1 (1)	Patients report stiffness and loss of range of movement (ROM) [H] 100%	Indications of weakness or stiffness in the complaints [H] 83%	2 (1)
2 (2)	Improvement of symptoms with repeated movements and sustained movements (directional preference) [PE] 75%	Improvement of symptoms with repeated movements and sustained movements (directional preference) [PE] 75%	2 (1)
Median (IQR)†	Different indicators Indications for manual therapy	Indications for exercise therapy	Median (IQR) †
2 (1)	Specific movements toward the symptomatic side [H] 84%		
2 (0)	Absence of nociplastic pain [H] 84%		
2 (2)	Minimal yellow flags [H] 75%	Minimal yellow flags, i.e. fear avoidance [H] 56%	2 (2)
1 (1)	Consistency between symptoms, active and passive movements [PE] 100%	Inconsistency between movement and pain [PE] 4%	3 (0)
2 (1)	Active and passive movement restriction [PE] 100%	Active movement restriction [PE] 83%	2 (0)
2 (1)	Ability to find positions that relieve symptoms [PE] 88%	Patient open to explore movement possibilities [PE] 88%	2 (1)
2 (1)	Movement painful and restricted in rotation, toward the more painful side [PE] 87%	Poor performance of deep neck muscles and/or tightness of superficial muscles [PE] 88%	2 (1)
2 (1)	Movement painful and restricted in rotation, toward the less/non-painful side [PE] 76%	Poor neuromotor control or decreased strength/endurance of neck-scapular muscles [PE] 82%	2 (1)
2 (1)	Symptoms and movement restriction with manual examination (i.e. postero-anterior glides) [PE] 87%	Altered joint position sense, poor performance in balance test and in eye movement control [PE] 88%	2 (1)
2 (1)	Restricted passive physiological movements (PPIVM) [PE] 84%	Unrestricted passive movement testing (PPIVM) [PE] 16%	3 (0)
2 (1)	Specific movements toward the asymptomatic side [H] 64%	Global exercises in presence of nociplastic pain/ specific neck/upper limb exercises in absence of nociplastic pain [PE] 64%	2 (1)
2 (1)	Unilateral neck pain [H] 71%	Pain localized in the neck (not referred) [H] 60%	2 (1)
2 (1)	Neurological screen is negative [PE] 72%	Forward head position [PE] 44%	3 (1)
2 (1)	Muscle tightness and/or tenderness [PE] 72%		
2 (2)	Absence of radicular pain with/without neurological signs (loss of sensation or strength) [H] 48%		
3 (0)	Symptoms must not be too intense [H] 20%		
3 (0)	Bilateral neck pain [H] 20%		
3 (0)	Acute/subacute NSNP [H] 20%		
3 (1)	No comorbidity [H] 48%		
Further comments			Median (IQR) †
Combining manual therapy and exercise is better than either used as a single modality 100%			1 (0)
The amount and type of the two interventions will vary according to their clinical presentation 100%			1 (0)

Bold font denotes consensus reached – recommended; normal font = no consensus – undecided (U).
†Likert rating (1–5 where 1 = Strongly agree, 5 = Strongly disagree).
H History; NSNP Nonspecific neck pain; PE Physical Examination; PPIVM Passive physiological intervertebral movements.

exercise therapy for nonspecific neck pain. One striking finding is that five of these features were the same for both interventions, namely absence of red flags, positive patient attitudes, and expectations or experience of the intervention, mechanical pain behaviors, and directional preference on testing. Furthermore, the experts agreed that combining manual therapy and exercise is superior to using a single modality and emphasized the importance of tailoring the interventions to each patient's clinical presentation. Features most indicative of manual therapy were the presence of active and passive movement limitations, minimal yellow flags, and absence of nociplastic pain. Independent indicators for exercise were active, but not passive, movement limitations, impaired muscle performance, and deficits in sensorimotor control. Movement limitations, mechanical pain behavior, consistency between movement and symptoms, previous favorable experience, good expectations, and a positive attitude toward exercise had the strongest consensus.

4.1. Clinical reasoning process

As with previous work in this area, with clinical prediction rules (CPRs) for manual therapy [22–25] or exercise [26], a constellation of criteria was found. But these could be grouped around two key areas: (1) confirmation of the nonspecific, mechanical nature of the patients' problem, and (2) the patients' attitude and previous experience. Confirmation of the first was contained in exclusion of red flags, radicular and nociplastic pain and then in confirmation of the mechanical nature of the patients' problem, which was embraced by multiple items from the history and physical examination. These items provided signs and symptoms to

direct management, namely deficits to address (primarily loss of range of movement or muscle performance) or directional preference but also included preference or attitude of the patients.

Therefore, the findings of this study suggest that expert physiotherapists consider multiple clinical reasoning strategies, including diagnostic reasoning which involves hypothetical-deductive reasoning and pattern recognition, as well as narrative reasoning that encompasses patients' preference and attitudes [27,28].

4.2. Mechanical pain behaviour

Mechanical pain behavior was one of the clinical findings with the strongest consensus and was considered relevant for both manual therapy and exercise. Previous authors have also highlighted the prognostic significance of this mechanical presentation [29]. Mechanical symptoms are provoked by mechanical stimuli capable of activating nociceptors, and the cessation of such stimuli typically leads to the resolution of these symptoms [30]. This clinical presentation is characteristic of a nociceptive pain mechanism, and patients with NSNP rarely exhibit signs of central sensitization, which are more commonly associated with nociplastic pain mechanisms [30].

A recent framework proposed that manual therapy techniques should be targeted toward specific impairments when nociceptive pain is present [8]. Furthermore, specific motor control and strengthening exercises are recommended for patients presenting these pain features [29].

4.3. Previous experience/preference

Patient expectations, preferences, and previous positive treatment experiences were among the most consistently supported criteria in this Delphi. Previous studies have highlighted the role of the patients' attitudes, with positive expectations being linked to better outcomes, while negative expectations can lead to poorer results [31]. Patients who believed joint manipulations would help had better short-term success and reduced disability compared to those who did not believe in or receive manipulations [32]. Although this evidence derives from individuals with nonspecific low back pain, Kleinert et al. [33] reported that positive attitude and motivation may be relevant factors in both exercise adherence and the effectiveness of treatment outcomes. This may suggest that these factors are relevant across musculoskeletal pain conditions, including NSNP.

Whilst the exact degree to which patient's expectations, preferences, and attitudes may affect the outcome is unclear, it is difficult to conceive of success with manual therapy, and especially exercise if the patient does not view them positively or their perspective is not considered [34].

4.4. Combination of manual therapy and exercise

The expert panel agreed that combining manual therapy and exercise is the preferred management for most patients with NSNP. This multimodal strategy is supported by most guidelines and some systematic reviews [35–37]. This finding aligns with the results of another Delphi study, which acknowledged that physiotherapists often use complex, multimodal interventions rather than single, isolated interventions [14]. Despite a recent meta-analysis indicated that both treatments provide similar benefits to manual therapy alone, but manual therapy is more effective than exercise alone [38]; and a previous review concluded that manual therapy and exercise therapy did not appear to be more effective than exercise alone [17], and overall evidence supports the combined use of exercise and manual therapy, rather than as single entities.

4.5. Personalized intervention

The importance of personalized interventions was highlighted by the participants in this Delphi, and this aligns with the recommendation to customize treatment according to individual clinical features of patients with heterogeneous conditions such as NSNP [9]. Patients with NSNP exhibit a variety of signs and symptoms, such as reduced range of motion, impaired deep muscle performance, and altered sensorimotor control [39,40–42]. In particular, the experts suggested that active and passive movement limitation, absence of nociplastic pain, and minimal yellow flags were specific indicators for manual therapy, while muscle weakness and poor sensorimotor control were specific indicators for exercise. Active and passive movement limitations have been shown to be associated with a good response to manual therapy [23–25]. Localized manual therapy or stretching exercises have been shown to enhance mobility at targeted symptomatic and hypomobile segments [43–47]. Painful postero-anterior glides and no worsening with cervical extension were some of the criteria from existing prescriptive CPRs indicating a benefit from manual therapy [22–24]. Furthermore, a previous Delphi study found it challenging to achieve consensus on unimodal clinical reasoning in areas such as the direct goal of the intervention, evaluation tests, signs/symptoms, and diagnostic tests [14]. This makes sense due to the multiple deficits that might be identified during assessment in different patients, and varying expert preferences and challenges of translating scientific evidence into everyday clinical practice [48]. However, strong expert agreement was found on motor control and coordination exercises for patients with weakness,

dizziness, unsteadiness, and motor control deficits [33]. This aligns with our results, which suggest that deep neck muscle weakness and altered sensorimotor control are important indicators for exercise therapy. The latter included deficits in joint position sense, eye movement control, and standing balance, although these items did not achieve the strongest level of consensus.

Importantly, consensus was not achieved for several proposed indicators, including symptom intensity, symptom duration, comorbidities, and forward head posture. This lack of agreement may reflect uncertainty regarding their clinical relevance for treatment selection, variability in expert interpretation, or the heterogeneous nature of NSNP.

4.6. Strengths and limitations

One of the main strengths of this investigation was the high number of participants, especially when compared to a similar Delphi study investigating clinical decision-making in NSNP [33]. Furthermore, participants were from 10 different countries and had different backgrounds enhancing the generalizability of results. The recruitment of researchers and clinicians involved in teaching post-graduate programs increases the likelihood that results represent a valid picture of the decision-making process of a potentially wider number of clinicians.

While the diverse educational backgrounds and professional experiences of the experts may have posed a limitation by making consensus more difficult to achieve, the substantial level of agreement ultimately reached mitigated this concern. Furthermore, a relevant limitation concerns the composition of the expert panel. Although participants had extensive clinical experience, many were also educators, researchers, or authors, and current clinical practice was not an inclusion criterion. Therefore, the findings should be interpreted as expert consensus on clinically relevant decision-making factors rather than a direct description of routine clinical practice. A limitation of this study was the attrition rate (15%) of participants between Rounds 1 and 2, which may have weakened the validity of results. However, the high level of consensus reached on the majority of the items might have mitigated the impact of this loss. Another limitation was the dichotomous separation between manual therapy and exercise in the Round 1 questionnaire. The experts noted that in real clinical practice, these two modalities are often used in combination, making it difficult to identify clinical criteria for a single treatment used in isolation. Indeed, the results demonstrated several similar criteria for the two interventions. Another limitation is that items reaching consensus in Round 2 were not re-rated in Round 3. Consequently, consensus stability could not be assessed for these items, and agreement reflects a single rating round rather than repeated confirmation across rounds. The final limitation of results is that not all indicators needed to be present, and many lacked clear operational definitions, such as mechanical pain presentation and passive movement restriction. Some of these, such as active range of motion and sensorimotor tests, have sufficient reliability, while passive physiological movement tests and the craniocervical flexion, commonly used for deep neck muscles, require more investigation to determine validity, reliability, and responsiveness [49–52].

4.7. Future implications

This Delphi study revealed a wide range of indicators in the history and physical examination for manual therapy and exercises that therapists use in their clinical reasoning process. However, many clinical features lacked clear operational definitions, and some tests require further validation. Furthermore, the individualization of management, according to different clinical presentations, and the use of combined therapies were also emphasized. This suggests that therapists use a complex array of factors when making treatment decisions, which defy simple conceptualization. Therefore, it will be challenging to evaluate the effectiveness of the identified criteria in improving NSNP management with randomized clinical trials comparing manual therapy and exercise in patients with these clinical characteristics versus those without.

5. Conclusion

A three-round e-Delphi study involving 29 experienced clinicians and educators in musculoskeletal physiotherapy identified clinical criteria for prioritizing manual therapy or exercise in managing patients with NSNP. Experts agreed that movement limitations, mechanical pain behavior, and consistency between movement and symptoms, previous favorable experience, and good expectations were criteria likely to identify patients who may benefit from manual therapy. Additionally, a positive attitude toward exercise, mechanical pain behavior, and neuromuscular deficits potentially indicated usefulness of exercise. Nevertheless, they considered the combination of both approaches to be superior to a single intervention in isolation. The decision-making process considered a wide range of clinical aspects, as previously described within the clinical reasoning literature. To determine whether the identified criteria can improve the management of patients with NSNP, randomized controlled trials comparing manual therapy and exercise across different patient subgroups are needed. Additionally, the inter- and intra-rater reliability of some assessment tests must be established before

these criteria can be recommended for routine clinical use. It is important to note that the findings reflect expert opinion regarding clinically relevant decision-making factors and should not be interpreted as a direct description of routine clinical practice.

Author contributions

CRediT: **Paolo Mastromarchi:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Writing – original draft; **Stephen May:** Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing; **Sionnadh McLean:** Conceptualization, Methodology, Supervision, Writing – review & editing; **George M. Peat:** Conceptualization, Supervision, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Study details

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