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Knowledge, Attitude and Practice of Italian Physiotherapists When Prescribing Exercise for People With Non-Specific Neck Pain: A National Survey

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ABSTRACT

Background and Objective: Exercise is a crucial component of a multimodal treatment for improving function and reducing pain in patients with non-specific neck pain. This study aims to investigate the knowledge, attitudes, practices and the influence of professional characteristics of Italian specialised musculoskeletal physiotherapists compared with non-specialised physiotherapists. The influence of professional characteristics on exercise prescription for individuals with non-specific neck pain was also investigated.

Materials and Methods: This observational study was reported according to the CHERRIES checklist. A 30-question survey was conducted from August 2023 until January 2024.

Results: A total of 446 Italian physiotherapists participated; 57.3% were Orthopaedic Manipulative Physical Therapists (OMPTs). Most (84%) reported being trained in exercise prescription for neck pain, but many were unfamiliar with certain muscular assessment tests which have been described in the literature (e.g., cervical extensor endurance test [35%], scapular holding test [41%]). 79% of the OMPTs and 56% of non-specialised physiotherapists (non-OMPTs) prescribed exercise for patients with neck pain, with 84% of the OMPTs and 68% of non-OMPTs agreeing that exercise should be part of neck pain management. 81% of the OMPTs and 63% of non-OMPTs reported being trained in the prescription of resistance training for patients with neck pain. However, OMPTs prescribed it less frequently.

Conclusions: Italian physiotherapists are trained in exercise prescription for neck pain but lack familiarity with key muscle assessment tests. There is a need for enhanced training in aerobic and resistance exercise prescription to align with international guidelines and ultimately improve patient outcomes.

1 | Introduction

Neck pain (NP) represents a complex condition which includes various physical, psychological and social factors (Blanpied et al. 2017; Côté et al. 2016). It imposes a significant burden on individuals, decreasing their health-related quality of life and work productivity, limiting daily activities and increasing healthcare utilisation (Côté et al. 2016). Pain relief is usually the primary goal of the treatment for both patients and physiotherapists, and the prevention of recurrent episodes of NP remains a real challenge (Vos et al. 2016). NP is associated with immediate movement changes and with impairments in muscle function (Amiri Arimi et al. 2017; Blomgren et al. 2018; Butera et al. 2016). The persistence of these neuromuscular alterations can lead to pain recurrence, increased disability and reduced quality of life (Amiri Arimi et al. 2017; Blomgren et al. 2018; Butera et al. 2016). Therefore, physiotherapists should consider neuromuscular control changes as a key feature of patient assessment to provide targeted exercise programs that improve sensory and motor function of the neck in addition to providing pain relief (Blanpied et al. 2017).

Physical activity and exercise are first-line recommendations for the treatment and the prevention of common musculoskeletal disorders, including NP (Ambrose and Golightly 2015; A. Gross et al. 2015). Evaluating and addressing motor control and movement dysfunction of the cervico-scapular region are beneficial components for managing NP (Chen et al. 2024; Prakash et al. 2024). Systematic reviews and meta-analyses support the efficacy of exercise for NP prevention and management (Bertozzi et al. 2013; de Campos et al. 2018; Fredin and Lorås 2017; A. R. Gross et al. 2016). Furthermore, early exposure to exercise is recommended by international clinical practice guidelines (Blanpied et al. 2017; Côté et al. 2016; Southerst et al. 2016). Assessing impairment of neck function is a crucial step to establish a baseline, identify appropriate exercises and monitor changes over time. Testing can include the assessment of active neck movements to evaluate both the quantity and quality of cervical movement (Devecchi et al. 2022), in addition to muscle testing such as the cervical extensor endurance test (CEET) (Sebastian et al. 2015), and the cranio-cervical flexion test (CCFT) (Romeo et al. 2022). Assessment of the scapular region is also often used to determine a potential contribution of lack of scapular control to the patient's NP symptoms; tests that have been described include the evaluation of the scapular position at rest and during functional activities, and tests such as the scapular holding test (Chen et al. 2024; Prakash et al. 2024). Further tests have been described to evaluate sensorimotor control and include the standard sensory organisation test for postural control (Walton and Elliott 2017); gaze stability, eye-head coordination and smooth pursuit tests to assess the oculo-motor control (Kristjansson and Treleaven 2009) and the joint position error (JPE) test to assess neck proprioception (de Vries et al. 2015).

Although the benefits of exercise for NP are well known (Bussières et al. 2016; Louw et al. 2017), the optimal type of exercise or dose of exercise is still unknown (De Zoete et al. 2020). Even though, preliminary evidence suggest that motor control exercises and segmental exercises (e.g., upper cervical or thoracic mobility) are more effective at reducing pain and disability in the short-term (Blanpied et al. 2017; Price et al. 2020), it is recommended that the exercise type and dose should be based on individual patient characteristics, the physical impairments found during the assessment, the response to the treatment, and the preferences of the patient and clinician (De Zoete et al. 2020; Wilhelm et al. 2020).

Although physiotherapists should play a key role in the prescription of exercises for NP (Kunstler et al. 2019; World Health Organization 2018), it has been observed that they often lack sufficient training in prescribing and managing exercise dosage (Barton et al. 2021). Evidence suggests that specialised physiotherapists better align their practice to guidelines and current literature (Brindisino et al. 2022; Brindisino, Ristori, et al. 2020). In Italy, the Orthopaedic Manipulative Physical Therapist (OMPT) qualification, accredited by IFOMPT—defined as 'a specialised area of physiotherapy for the management of neuromusculoskeletal conditions (IFOMPT General Meeting 2004)'—is gained by completing a 2-year University Master's programme (IFOMPT 2024). To date, no studies have specifically surveyed physiotherapists about their knowledge about exercise prescription for NP. Therefore, the objectives of this study were to: (1) descriptively analyse the knowledge and awareness of Italian OMPTs compared to non-specialised physiotherapists (non-OMPT) about the assessment of neuromuscular impairments and exercise prescription for non-specific NP and (2) understand their perceived confidence and skills in prescribing different forms of exercise (motor control, aerobic exercise and resistance training) for patients with non-specific NP. The present survey also investigated the impact of years of experience, access to physiotherapy and holding an OMPT specialisation on their knowledge and practice.

2 | Methods

An online survey was developed using the online platform Microsoft Forms (Microsoft Corporation Redmond, USA). The study is reported in line with the Checklist for Reporting Results of Internet Surveys (CHERRIES) (Eysenbach 2004) and the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Von Elm et al. 2007). This study was approved by the scientific technical committee of the University of Molise with the approval letter 'Prot. 23/2023'. The authors followed the principles outlined in the Declaration of Helsinki for this study (World Medical Association 2013).

2.1 | Survey Development

A recent international survey was used to inform our questionnaire and was adapted to the Italian context (Barton et al. 2021). The survey was piloted by four (F.Mo., G.L., A.F., L. L.) Italian musculoskeletal physiotherapists (two with > 15-years' experience) for additional feedback on wording, response logic, and the completion duration. The use of the original Australian survey and feedback from the pilot stage strengthened both the content and face validity (Barton et al. 2021; Lowe et al. 2017).

The survey was structured in five sections: the first section investigated demographic information, practice settings, and education level; the second section focused on knowledge and awareness of neuromuscular impairments, and confidence and skills in prescribing exercise for NP; the third section examined the knowledge and confidence in prescribing exercises for the deep neck muscles for NP (i.e., motor control); the fourth section assessed knowledge and confidence in prescribing aerobic exercises for NP; the final section investigated knowledge and confidence in prescribing resistance training exercises for NP. The survey consisted of a combination of multiple-choice questions, the Likert scale and one open question (to specify 'other' working settings) presented in the same order. Providing an answer to all questions was mandatory in order to complete the survey. The survey is reported in Supporting Information S1: Appendix 1.

2.2 | Setting and Recruitment

A web link to the survey was sent via a mailing list of the Italian Physiotherapy Association on the 25 August 2023, as the survey was open to all physiotherapists practicing in Italy. To maximise the response rate, invitations to participate were frequently reposted weekly on social media networks (Facebook, Twitter, LinkedIn and Instagram). The survey was open for 5 months, and the closing date was 26 January 2024. For pragmatic purposes and in line with previously published international surveys, we adopted this methodological approach to collect the maximum number of responses within a specific period, as most responses occur soon after posting (Brindisino, Matteuzzi, et al. 2020; Bury and Littlewood 2018; Kane et al. 2020; Littlewood et al. 2021; Littlewood and Bateman 2015; Pieters et al. 2019; Pribicevic et al. 2009; Smythe et al. 2020). The sample size was calculated a priori using the e-survey Dillman's formula (Dillman 2000) with a 95% confidence level and a 5% margin of error. At the time of the survey, the number of physiotherapists registered with the Italian specialised physiotherapists (OMPTs) was 648 (*GIS - Gruppo Terapia Manuale*, n.d.); therefore, the required sample size for this study was calculated as 241 participants.

The questionnaire could be completed on any electronic device with internet access; since Microsoft Forms was used without collecting respondents' IP addresses, recruitment was anonymous and voluntary. Additionally, to prevent multiple completions of the questionnaire, the same IP could not access the survey more than once. Formal informed consent was required before starting the survey, with participants agreeing to include their answers in the final report and publication. No compensation or reimbursement was offered.

2.3 | Data Processing and Analysis

Data from the survey platform were transferred to and stored on an encrypted computer for data analysis, accessible only to researchers involved in the data analysis. Incomplete surveys were not collected or analysed (Delle Fave et al. 2011). Descriptive statistics were computed to describe the collected variables.

A Chi Squared independent test was performed to examine any difference in the characteristics between responses provided by sample subgroups (i.e., OMPT, years of experience and access to physiotherapy) to categorical questions. Following this, we assessed the relationship between each questionnaire item and the independent variables of OMPT status, years of experience and physiotherapy access regimen, with all three variables included simultaneously in the model to adjust for their potentially confounding effects, using a proportional odds logistic regression model or a logistic regression model in the case of ordinal or dichotomous dependent variables, respectively.

3 | Results

3.1 | Responses

A total of 446 physiotherapists provided their consent and completed the survey. All respondents worked in Italy and were included in the final analysis of this study. Our sample size was in line with previous Italian surveys and reached the required sample size (Brindisino, Ristori, et al. 2020; Mourad et al. 2021). The average time to complete the questionnaire was 19 min and all questions were completed.

3.2 | Respondent Characteristics

Two-hundred and fifty-three (57%) respondents worked in direct patient access and 165 (37%) had worked for < 5 years. Most responders practiced in the musculoskeletal field ($n = 384$; 86%). 'Other' reported working settings were 'Hospital' ($n = 24$; 5%), 'Paediatric' ($n = 1$; 0.2%), and 'Home care physiotherapy' ($n = 12$; 3%).

Two-hundred and fifty-six (57%) possessed an OMPT qualification. The majority of OMPTs worked with musculoskeletal patients ($n = 233$; 91%) and within a direct access setting ($n = 170$; 66%). Further details are presented in Table 1.

3.3 | Knowledge and Awareness of Muscular Impairments Assessment and Exercise for NP

Most Italian physiotherapists (OMPT and non-OMPT) ($n = 350$; 78%) reported having been trained in exercise interventions for non-specific NP. However, their knowledge about neuromuscular assessment tests was poor: a large proportion of the responders did not know the CCFT ($n = 105$; 24%), the CEET ($n = 190$; 43%), the deep neck flexor endurance test ($n = 159$; 36%), the scapular holding test ($n = 215$; 48%), the gaze stability test ($n = 280$; 63%), the eye-head coordination test ($n = 185$; 41%) or the 'smooth pursuit neck torsion test' ($n = 257$; 58%).

Italian OMPTs reported being trained in prescribing exercises ($n = 214$; 84%), but a relevant proportion were unfamiliar with common assessment tests such as CEET ($n = 89$; 35%), the 'scapular holding test' ($n = 105$; 41%), the JPE ($n = 115$; 45%), the 'gaze stability test' ($n = 134$; 52%), the eye-head coordination

TABLE 1 | Demographic characteristics summarised for IFOMPT OMPT specialisation.

Variables	No IFOMPT OMPT specialisation (n = 190)	Yes, IFOMPT OMPT specialisation (n = 256)	Total (n = 446)	p-value
What main physical therapy access regimen do you practice in?				
Direct access	83 (44%)	170 (66%)	253 (57%)	< 0.001
Secondary care	71 (37%)	64 (25%)	135 (30%)	
Sport	14 (7%)	7 (3%)	21 (5%)	
Other	22 (12%)	15 (6%)	37 (8%)	
How many years have you been practicing as a licenced physical therapist?				
< 5 years of experience	63 (33%)	102 (40%)	165 (37%)	< 0.001
5–10 years of experience	42 (22%)	98 (38%)	140 (31%)	
10–15 years of experience	41 (22%)	41 (16%)	82 (18%)	
> 15 years of experience	44 (23%)	15 (6%)	59 (13%)	
Do you primarily work with musculoskeletal patients?				
Yes	151 (79%)	233 (91%)	384 (86%)	< 0.001
No	39 (21%)	23 (9%)	62 (14%)	

Abbreviations: IFOMPT, The International Federation of Orthopaedic Manipulative Physical Therapists; OMPT, orthopaedic manipulative physical therapist.

test (n = 93; 36%) and the 'smooth pursuit neck torsion test' (n = 115; 45%).

Overall, the preferred strategy by Italian OMPT and non-OMPT physiotherapists to increase patient adherence to a home exercise programme was to instruct the patient under supervision (n = 179; 40%; p < 0.001) (Table 2).

Respondents with more than 10 years of experience reported to be more trained in prescribing exercise for NP (OR 1.77; 95% CI 1.06–2.95), and they also felt more confident in managing the progression of exercises (OR 1.78; 95% CI 1.06–2.99) compared to those with < 5 years of experience (Table 3). Moreover, a significant difference was found between physiotherapists working in a sport setting compared to those working in direct access: the latter felt less confident in prescribing and progressing exercises for NP (OR 0.28; 95% CI 0.08–0.77). Interestingly, those who worked in secondary care—when compared to those working in a direct access setting—showed less confidence in using dynamometry (OR 0.33; 95% CI 0.15–0.64), the CCFT (OR 0.51; 95% CI 0.31–0.85) and oculomotor control tests such as the gaze stability test (OR 0.58; 95% CI 0.36–0.93), the eye–head coordination test (OR 0.52; 95% CI 0.34–0.81) and the smooth pursuit neck torsion test (OR 0.48; 95% CI 0.30–0.78) (Table 4).

3.4 | Knowledge and Confidence in Prescribing Motor Control Exercises for Deeper Neck Muscles

One-hundred and twenty-five (28%) of OMPT and non-OMPT respondents did not know whether training of the deeper neck muscles was more effective than resistance exercises in improving pain and function for people with chronic NP. When asked about knowledge of the functional difference between superficial and deep muscles of the neck, respondents with 5–10 years of experience reported significantly less knowledge about the difference (OR 0.28; 95% CI 0.07–0.96; p = 0.05) compared to those with < 5 years of experience, as well as those working in a secondary care setting compared to those in direct access (OR 0.16; 95% CI 0.04–0.52; p < 0.01).

OMPTs reported more knowledge about the functional difference between the superficial and deep neck muscles (OR 1.16; 95% CI 0.37–3.61; p = 0.79). They also reported using exercises for the deeper neck muscles more frequently when treating patients with NP (OR 1.56; 95% CI 0.85–2.84; p = 0.15). Sixty-two (n = 62) OMPTs (24%; p = 0.004) reported uncertainty about differences in effectiveness between exercises targeting the deeper neck muscles training versus resistance exercises in the treatment of NP (Table 5).

3.5 | Knowledge and Confidence in Prescribing Aerobic Exercises

About a third of OMPT and non-OMPT physiotherapists (n = 138; 31%) did not use aerobic exercise to treat NP and were not trained to prescribe this form of exercise (n = 146; 33%). OMPTs reported using aerobic exercise to treat NP (OR 2.84; 95% CI 1.83–4.46; p < 0.01) but lacked confidence in prescribing it (OR 0.58; 95% CI 0.40–0.84; p < 0.01) compared to non-OMPTs (Figure 1). Interestingly, respondents working in a sport setting reported that they were less confident in prescribing and progressing aerobic exercise (OR 0.36; 95% CI 0.14–0.88; p = 0.03) compared to those working in a direct access setting.

3.6 | Knowledge and Confidence in Prescribing Resistance Training Exercises

Although most OMPT and non-OMPT respondents (n = 344; 77%) regularly prescribed resistance training for patients with NP, only 58 physiotherapists (12%) reported that they were not

TABLE 2 | Prescription of therapeutic exercise in NP.

Variables	No IFOMPT OMPT specialisation ($n = 190$)	Yes, IFOMPT OMPT specialisation ($n = 256$)	Total ($n = 446$)	p-value
Quantify your agreement with the following statements regarding your skills in prescribing therapeutic exercise for NP				
'I have been trained and possess the skills in prescribing therapeutic exercise in patients with NP'				
Strongly agree	29 (15%)	84 (33%)	113 (25%)	< 0.001
Agree	107 (56%)	130 (51%)	237 (53%)	
Don't know	26 (14%)	19 (7%)	45 (10%)	
Disagree	19 (10%)	17 (7%)	36 (8%)	
Strongly disagree	9 (5%)	6 (2%)	15 (3%)	
Do you use the following tests for cervical musculature assessment?				
'CCFT'				
Yes	128 (67%)	213 (83%)	341 (76%)	< 0.001
No	62 (33%)	43 (17%)	105 (24%)	
'DNF endurance test'				
Yes	102 (54%)	185 (72%)	287 (64%)	< 0.001
No	88 (46%)	71 (28%)	159 (36%)	
'CEET'				
Yes	89 (47%)	167 (65%)	256 (57%)	< 0.001
No	101 (53%)	89 (35%)	190 (43%)	
'Scapular holding test'				
Yes	80 (42%)	151 (59%)	231 (52%)	< 0.001
No	110 (58%)	105 (41%)	215 (48%)	
Do you use the following tests for cervical motor control assessment?				
'JPE'				
Yes	77 (41%)	141 (55%)	218 (49%)	0.002
No	113 (59%)	115 (45%)	228 (51%)	
'Gaze stability test'				
Yes	44 (23%)	122 (48%)	166 (37%)	< 0.001
No	146 (77%)	134 (52%)	280 (63%)	
'Eye-head coordination test'				
Yes	98 (52%)	163 (64%)	261 (59%)	0.01
No	92 (48%)	93 (36%)	185 (41%)	
'Smooth pursuit neck torsion test'				
Yes	47 (25%)	141 (55%)	189 (42%)	< 0.001
No	143 (75%)	115 (45%)	257 (58%)	
Which strategy do you prefer to increase home exercises' adherence for patients with NP?				
The patient performs the exercise under my supervision during the session	92 (48%)	87 (34%)	179 (40%)	< 0.001
Variability of the exercise over time	17 (9%)	15 (6%)	32 (7%)	
Consideration of the patient's preferences	33 (17%)	81 (32%)	114 (26%)	
Pre-set informational material (pre-set sheets and/or video/photos)	7 (4%)	11 (4%)	18 (4%)	
Informational material (sheets and/or video/photos)	41 (22%)	62 (24%)	103 (23%)	

Abbreviations: CCFT, cranio cervical flexion test; CEET, cervical extensors endurance test; DNF, deep neck flexors; IFOMPT, The International Federation of Orthopaedic Manipulative Physical Therapists; JPE, joint position error test; NP, neck pain; OMPT, orthopaedic manipulative physical therapist.

TABLE 3 | Results stratified for years of experience compared to physiotherapists with < 5 years of experience.

	5–10 years of experience		10–15 years of experience		> 15 years of experience	
Variables	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**	**OR (95% CI)**	***p*-value**
Quantify your agreement with the following statements regarding your skills in prescribing therapeutic exercise for NP						
I have been trained and I possess the skills in prescribing therapeutic exercise in patients with NP	1.24 (0.80–1.92)	0.34	1.77 (1.06–2.95)	0.03	1.86 (1.03–3.36)	0.04
I am able to prescribe and manage the progression of therapeutic exercise in patients with NP	1.37 (0.86–2.17)	0.18	1.78 (1.06–2.99)	0.03	2.06 (1.15–3.69)	0.01
I'm confident in prescribing therapeutic exercise in patients with NP	0.93 (0.60–1.44)	0.74	0.91 (0.54–1.51)	0.72	1.25 (0.70–2.22)	0.45
Prescribing therapeutic exercise programs for NP is part of my job as a physiotherapist	1.01 (0.65–1.59)	0.95	1.17 (0.68–2.01)	0.56	1.09 (0.59–2.03)	0.78
Do you use the following tests for cervical musculature assessment?						
CCFT	2.11 (1.18–3.91)	0.01	1.33 (0.71–2.54)	0.37	1.13 (0.56–2.30)	0.74
DNF endurance test/Harris test	1.56 (0.94–2.60)	0.08	1.06 (0.61–1.88)	0.83	0.75 (0.39–1.41)	0.37
CEET	1.26 (0.79–2.03)	0.33	1.27 (0.73–2.22)	0.39	1.18 (0.63–2.24)	0.60
Scapular holding test	1.48 (0.93–2.37)	0.10	1.90 (1.10–3.33)	0.02	2.27 (1.20–4.37)	0.01
Manual muscle testing	0.61 (0.35–1.05)	0.08	1.00 (0.50–2.00)	0.99	0.67 (0.32–1.46)	0.31
Dynamometer resistance testing	0.77 (0.41–1.46)	0.43	0.90 (0.42–1.86)	0.78	0.98 (0.41–2.24)	0.98
Do you use the following tests for cervical motor control assessment?						
JPE	1.39 (0.87–2.22)	0.17	2.50 (1.44–4.41)	< 0.01	1.84 (0.97–3.50)	0.06
Standard sensory organisation	1.89 (1.04–3.51)	0.04	1.70 (0.83–3.45)	0.14	3.41 (1.60–7.28)	< 0.01
Gaze stability	1.85 (1.14–3.01)	0.01	1.37 (0.76–2.45)	0.29	1.11 (0.53–2.24)	0.77
Eye head coordination	1.55 (0.97–2.51)	0.07	1.55 (0.89–2.73)	0.12	1.88 (0.98–3.65)	0.06
Smooth pursuit neck torsion	1.95 (1.20–3.20)	0.01	1.54 (0.85–2.78)	0.15	1.68 (0.83–3.38)	0.14
Do you know the difference between superficial and deep muscles of the neck?	0.28 (0.07–0.96)	0.05	1.83 (0.26–36.74)	0.59	0.37 (0.07–2.10)	0.23
Do you use exercises to recruit deep flexors/extensors of the neck for treating patients with NP?	0.95 (0.48–1.89)	0.87	1.06 (0.49–2.42)	0.87	1.97 (0.73–6.30)	0.21
Quantify your agreement with the following statements:						
It is important to restore deep neck muscles' recruitment (e.g., CCFT) in patients with NP before introducing other exercises	1.14 (0.74–1.76)	0.53	0.98 (0.58–1.64)	0.94	0.90 (0.49–1.62)	0.72
In patients with NP, resolution of pain is an indicator of 'normalisation' of deep neck muscles' recruitment (e.g., stabilisers)	0.70 (0.46–1.05)	0.08	0.55 (0.33–0.91)	0.02	0.64 (0.35–1.14)	0.13
Deep neck muscles' training is more effective than other resistance exercises in improving pain and function of chronic NP	0.94 (0.62–1.41)	0.76	0.94 (0.57–1.53)	0.80	0.75 (0.42–1.34)	0.33
Quantify your agreement with the following statements related to your ability to prescribe aerobic exercise						
Do you use aerobic exercise to treat patients with NP?	0.95 (0.56–1.61)	0.84	0.76 (0.42–1.36)	0.35	0.82 (0.42–1.61)	0.57
I have been trained and possess the skills in prescribing aerobic exercise in patients with NP	0.91 (0.60–1.38)	0.65	0.97 (0.60–1.56)	0.89	0.93 (0.53–1.61)	0.79

(Continues)

TABLE 3 | (Continued)

Variables	5–10 years of experience		10–15 years of experience		> 15 years of experience	
	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value
I'm able to prescribe and manage the aerobic exercise's progression in patients with NP	1.15 (0.76–1.75)	0.50	0.65 (0.40–1.06)	0.08	0.81 (0.46–1.41)	0.46
I'm confident in prescribing aerobic exercise in patients with NP	1.25 (0.82–1.90)	0.30	0.94 (0.58–1.92)	0.81	0.93 (0.53–1.62)	0.79
Prescribing aerobic exercise programs for NP is part of my job as a physiotherapist	1.04 (0.68–1.60)	0.85	1.30 (0.79–2.13)	0.30	1.17 (0.65–2.08)	0.60
Quantify your agreement with the following statements regarding the use and beliefs of aerobic exercises in your patients with NP						
I regularly prescribe aerobic exercise to patients with NP	0.98 (0.64–1.49)	0.92	1.15 (0.71–1.87)	0.57	1.13 (0.64–1.99)	0.68
Aerobic exercise is required only for patients who need to return to sport competitions	1.17 (0.77–1.79)	0.46	1.17 (0.70–1.95)	0.53	0.77 (0.42–1.42)	0.41
Elderly patients (> 65 years) have limited capacity to improve their cardiovascular fitness	1.15 (0.75–1.78)	0.52	1.37 (0.82–2.27)	0.23	0.86 (0.47–1.56)	0.62
Quantify your agreement with the following statements regarding your ability to prescribe resistance exercise						
I have been trained and I possess the skills in prescribing resistance exercise in patients with NP	0.83 (0.53–1.29)	0.41	0.89 (0.53–1.47)	0.64	1.03 (0.57–1.86)	0.91
I'm able to prescribe and manage the progression of resistance exercises in patients with NP	1.04 (0.66–1.63)	0.86	0.83 (0.48–1.41)	0.49	1.06 (0.58–1.91)	0.84
I'm confident in prescribing resistance exercises in patients with NP	0.98 (0.63–1.52)	0.93	0.99 (0.59–1.65)	0.97	0.90 (0.50–1.61)	0.72
Prescribing resistance exercise programs for NP is part of my job as a physiotherapist	0.84 (0.54–1.30)	0.44	0.88 (0.52–1.47)	0.63	0.68 (0.37–1.25)	0.22
Quantify your agreement with the following statements regarding the use and beliefs of resistance exercises in your patients with NP						
I regularly prescribe resistance exercise to patients with NP	1.05 (0.66–1.66)	0.84	1.30 (0.78–2.15)	0.31	1.35 (0.75–2.41)	0.31
Resistance exercise is required only for patients who need to return to sport competitions	0.95 (0.62–1.48)	0.83	0.89 (0.54–1.47)	0.65	0.62 (0.34–1.14)	0.13
Elderly patients (> 65 years) have limited capacity to improve their muscle strength	0.93 (0.60–1.43)	0.64	0.89 (0.53–1.48)	0.75	0.61 (0.33–1.09)	0.10

Abbreviations: CCFT, cranio cervical flexion test; CEET, cervical extensors endurance test; C.I., confidence interval; DNF, deep neck flexors; JPE, joint position error test; NP, neck pain; OR, odds ratio.

trained on the prescription of resistance training for patients with NP. Although the percentage of OMPTs (n = 154; 60%; $p < 0.001$) and non-OMPTs (n = 94; 49%; $p < 0.001$) trained in resistance exercise was similar, OMPTs prescribed resistance exercise for NP less frequently than non-OMPTs (OR 0.65; 95% CI 0.44–0.97; $p = 0.03$) (Figure 2). Additionally, uncertainty was reported in identifying the appropriate exercise intensity to develop neck strength: 95 (37%) OMPTs and 75 (39%) non-OMPTs reported that the appropriate intensity should be between 60% and 79% of 1RM, whereas 112 (44%) OMPTs and 50 (26%) non-OMPTs reported that the intensity should be equal to or > 80% of 1RM ($p < 0.001$).

4 | Discussion

Our results highlight that Italian OMPTs are trained and possess the skills needed to prescribe exercises for non-specific NP as part of management. However, we observed a consistent difference between OMPTs and non-OMPTs, which may reflect the importance of continuing education to influence clinical practice with recommendations from the literature (Lowe, Gee, et al. 2018; Lowe, Littlewood, et al. 2018; Zadro et al. 2019). This is aligned with the concept that specialised neuro-musculoskeletal physiotherapists possess higher levels of knowledge and that those with working experience in complex settings (e.g., direct access) are

TABLE 4 | Results stratified for type of work setting compared to physiotherapists who work in direct access.

Variables	Secondary care		Sport		Other	
	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value
Quantify your agreement with the following statements regarding your skills in prescribing therapeutic exercise for NP						
I have been trained and I possess the skills in prescribing therapeutic exercise in patients with NP	1.29 (0.85–1.93)	0.23	0.68 (0.23–1.80)	0.45	0.79 (0.39–1.54)	0.50
I am able to prescribe and manage the progression of therapeutic exercise in patients with NP	1.06 (0.69–1.61)	0.78	0.28 (0.08–0.77)	0.02	0.84 (0.41–1.66)	0.63
I'm confident in prescribing therapeutic exercise in patients with NP	1.24 (0.82–1.86)	0.31	0.38 (0.12–1.00)	0.06	0.96 (0.47–1.89)	0.90
Prescribing therapeutic exercise programs for NP is part of my job as a physiotherapist	1.15 (0.75–1.78)	0.51	0.61 (0.25–1.51)	0.28	0.77 (0.39–1.52)	0.44
Do you use the following tests for cervical musculature assessment?						
CCFT	0.51 (0.31–0.85)	0.01	0.94 (0.33–3.11)	0.91	0.60 (0.27–1.38)	0.21
DNF endurance test/Harris test	0.78 (0.50–1.24)	0.30	1.98 (0.72–6.39)	0.21	0.68 (0.33–1.42)	0.30
CEET	0.85 (0.55–1.33)	0.48	0.76 (0.30–1.94)	0.57	0.80 (0.39–1.64)	0.53
Scapular holding test	0.79 (0.51–1.22)	0.28	0.70 (0.26–1.80)	0.47	1.06 (0.52–2.21)	0.86
Manual muscle testing	1.16 (0.60–1.98)	0.58	2.61 (0.71–16.90)	0.21	1.34 (0.58–3.50)	0.51
Dynamometer resistance testing	0.33 (0.15–0.64)	< 0.01	0.62 (0.14–1.98)	0.47	0.46 (0.13–1.24)	0.16
Do you use the following tests for cervical motor control assessment?						
JPE	0.80 (0.51–1.22)	0.29	1.41 (0.55–3.64)	0.47	0.69 (0.33–1.41)	0.31
Standard sensory organisation	0.83 (0.48–1.43)	0.51	0.69 (0.15–2.21)	0.57	0.26 (0.06–0.77)	0.03
Gaze stability	0.58 (0.36–0.93)	0.02	0.73 (0.24–1.96)	0.55	0.57 (0.25–1.24)	0.17
Eye head coordination	0.52 (0.34–0.81)	< 0.01	0.73 (0.29–1.86)	0.50	0.51 (0.25–1.04)	0.06
Smooth pursuit neck torsion	0.48 (0.30–0.78)	< 0.01	1.58 (0.60–4.17)	0.36	0.51 (0.22–1.11)	0.10
Do you know the difference between superficial and deep muscles of the neck?	0.16 (0.04–0.52)	< 0.01	0.26 (0.03–5.46)	0.26	0.63 (0.09–12.75)	0.69
Do you use exercises to recruit deep flexors/extensors of the neck for treating patients with NP?	0.48 (0.25–0.90)	0.02	0.73 (0.22–3.35)	0.64	0.54 (0.21–1.59)	0.23
Quantify your agreement with the following statements						
It is important to restore deep neck muscles' recruitment (e.g., CCFT) in patients with NP before introducing other exercises	1.28 (0.85–1.92)	0.24	1.33 (0.58–2.93)	0.48	1.81 (0.93–3.51)	0.08
In patients with NP, resolution of pain is an indicator of 'normalisation' of deep neck muscles' recruitment (e.g., stabilisers)	0.70 (0.47–1.04)	0.08	0.73 (0.31–1.70)	0.47	1.47 (0.76–2.87)	0.25
Deep neck muscles' training is more effective than other resistance exercises in improving pain and function of chronic NP	1.26 (0.84–1.87)	0.26	0.80 (0.34–1.83)	0.60	0.74 (0.37–1.44)	0.38
Quantify your agreement with the following statements related to your ability to prescribe aerobic exercise						
Do you use aerobic exercise to treat patients with NP?	0.85 (0.53–1.38)	0.52	1.74 (0.62–5.67)	0.32	0.84 (0.40–1.82)	0.65

(Continues)

TABLE 4 | (Continued)

Variables	Secondary care		Sport		Other	
	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value
I have been trained and possess the skills in prescribing aerobic exercise in patients with NP	1.26 (0.86–1.85)	0.24	0.81 (0.35–1.84)	0.62	0.84 (0.44–1.60)	0.61
I'm able to prescribe and manage the aerobic exercise's progression in patients with NP	1.12 (0.76–1.66)	0.55	0.36 (0.14–0.88)	0.03	1.36 (0.73–2.55)	0.33
I'm confident in prescribing aerobic exercise in patients with NP	0.93 (0.63–1.37)	0.70	0.71 (0.29–1.64)	0.43	0.81 (0.42–1.55)	0.53
Prescribing aerobic exercise programs for NP is part of my job as a physiotherapist	0.96 (0.65–1.43)	0.86	0.87 (0.37–2.03)	0.76	1.00 (0.51–1.92)	0.99
Quantify your agreement with the following statements regarding the use and beliefs of aerobic exercises in your patients with NP						
I regularly prescribe aerobic exercise to patients with NP	1.05 (0.70–1.56)	0.81	0.74 (0.31–1.69)	0.48	1.02 (0.54–1.89)	0.95
Aerobic exercise is required only for patients who need to return to sport competitions	0.78 (0.51–1.71)	0.23	1.06 (0.45–2.45)	0.89	1.50 (0.78–2.87)	0.22
Elderly patients (> 65 years) have limited capacity to improve their cardiovascular fitness	0.90 (0.59–1.36)	0.62	0.52 (0.21–1.22)	0.14	0.92 (0.47–1.74)	0.79
Quantify your agreement with the following statements regarding your ability to prescribe resistance exercise						
I have been trained and I possess the skills in prescribing resistance exercise in patients with NP	1.27 (0.84–1.91)	0.25	0.88 (0.36–2.06)	0.78	1.71 (0.87–3.31)	0.11
I'm able to prescribe and manage the progression of resistance exercises in patients with NP	1.38 (0.91–2.09)	0.13	0.54 (0.19–1.35)	0.21	1.60 (0.79–3.16)	0.18
I'm confident in prescribing resistance exercises in patients with NP	1.16 (0.77–1.74)	0.46	0.43 (0.15–1.08)	0.09	1.02 (0.51–2.00)	0.94
Prescribing resistance exercise programs for NP is part of my job as a physiotherapist	0.92 (0.61–1.39)	0.70	0.67 (0.27–1.61)	0.38	0.88 (0.43–1.75)	0.72
Quantify your agreement with the following statements regarding the use and beliefs of resistance exercises in your patients with NP						
I regularly prescribe resistance exercise to patients with NP	0.87 (0.57–1.32)	0.52	1.24 (0.48–3.03)	0.64	1.04 (0.52–2.02)	0.92
Resistance exercise is required only for patients who need to return to sport competitions	0.66 (0.44–1.00)	0.05	0.65 (0.26–1.56)	0.34	0.72 (0.36–1.42)	0.35
Elderly patients (> 65 years) have limited capacity to improve their muscle strength	0.85 (0.56–1.28)	0.43	0.39 (0.16–0.96)	0.04	1.34 (0.69–2.59)	0.38

Abbreviations: CCFT, cranio cervical flexion test; CEET, cervical extensors endurance test; C.I., confidence interval; DNF, deep neck flexors; JPE, joint position error test; NP, neck pain; OR, odds ratio.

capable of providing effective care that aligns to clinical practice guidelines (Lowe, Gee, et al. 2018; Lowe, Littlewood, et al. 2018; Zadro et al. 2019). As part of recommended multimodal care, exercise (e.g., aerobic) was shown to provide positive effects on pain sensitisation in patients with musculoskeletal disorders (Tan et al. 2022). Accordingly, most Italian physiotherapists who completed the survey (68% of non-OMPTs and 84% of OMPTs) strongly agreed that prescribing aerobic exercise for the treatment of NP is part of the physiotherapist's role. However, approximately only half (41% non-OMPTs and 56% OMPTs) reported

TABLE 5 | Deep neck muscle exercise in NP.

Variables	No IFOMPT OMPT specialisation (n = 190)	Yes, IFOMPT OMPT specialisation (n = 256)	Total (n = 446)	p-value
Quantify your agreement with the following statements				
'In patients with neck pain, resolution of pain is an indicator of "normalisation" of deep neck muscles' recruitment (e.g., stabilisers)'				
Strongly agree	10 (5%)	6 (2%)	16 (4%)	< 0.001
Agree	68 (36%)	57 (22%)	125 (28%)	
Don't know	50 (26%)	55 (21%)	105 (24%)	
Disagree	55 (29%)	115 (45%)	170 (38%)	
Strongly disagree	7 (4%)	23 (9%)	30 (7%)	
Deep neck muscles' training is more effective than other resistance exercises in improving pain and function of chronic neck pain				
Strongly agree	22 (12%)	15 (6%)	37 (8%)	0.004
Agree	72 (38%)	100 (39%)	172 (39%)	
Don't know	63 (33%)	62 (24%)	125 (28%)	
Disagree	28 (15%)	66 (26%)	94 (21%)	
Strongly disagree	5 (3%)	13 (5%)	18 (4%)	

Abbreviations: IFOMPT, The International Federation of Orthopaedic Manipulative Physical Therapists; NP, neck pain; OMPT, orthopaedic manipulative physical therapist.

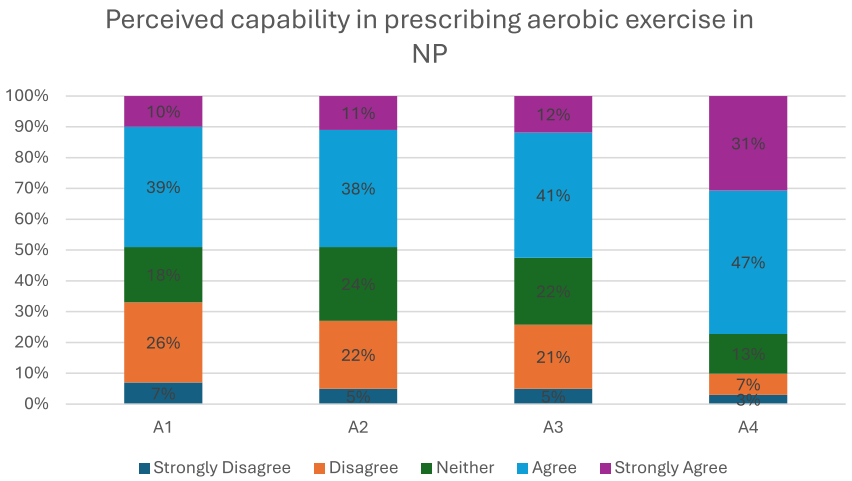

FIGURE 1 | Physiotherapist's perceived knowledge, competency and role in providing aerobic exercise people with neck pain. A1, I have been trained and possess the skills in prescribing aerobic exercise in patients with neck pain; A2, I'm able to prescribe and manage the aerobic exercise's progression in patients with neck pain; A3, I'm confident in prescribing aerobic exercise in patients with neck pain and A4, prescribing aerobic exercise programs for neck pain is part of my job as a physiotherapist.

having been trained on the use of aerobic exercise. A recent multinational survey reported similar results although it focused on musculoskeletal pain in a broad sense. Barton et al. found that most respondents agreed on their role in prescribing aerobic exercise (75%), while fewer reported having the training and confidence in prescribing this form of exercise (38%) (Barton et al. 2021). In addition, Barton et al. reported that 70% of physiotherapists knew how to deliver resistance training, 50% reported to be trained, and the 67% of the respondents reported to be skilled (67%) and confident (58%) in delivering resistance training (Barton et al. 2021). Similarly, we found that Italian OMPTs (81%) and non-OMPTs (63%) reported having been trained, possessing the skills and regularly prescribing resistance exercises for NP (82% and 61%, respectively).

In the current survey, respondents with more than 10 years of experience reported to be more trained in prescribing exercise for non-specific NP compared to those with < 5 years of experience (OR 1.77; 95% CI 1.06–2.95). Additionally, when asked about knowledge of the functional difference between superficial and deep muscles of the neck, less experienced physiotherapists (< 5 years of experience) reported to know less about the difference compared to their colleagues with 5–10 years of experience (OR 0.28; 95% CI 0.07–0.96). Although Italian physiotherapists reported being trained in the prescription of exercise for NP, they showed little knowledge in the use of tests to assess neuromuscular function: only 76% reported using the CCFT, 67% the deep neck flexor endurance test, 57% the CEET and 52% the scapular holding test. Dynamometry for muscle

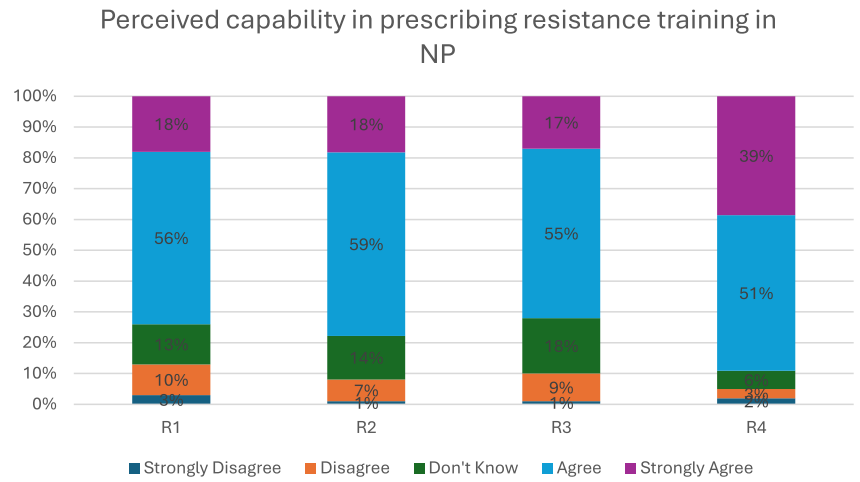

FIGURE 2 | Physiotherapist's perceived knowledge, competency and role in providing resistance training to people with neck pain. R1, I have been trained and I possess the skills in prescribing resistance exercise in patients with neck pain; R2, I'm able to prescribe and manage the progression of resistance exercises in patients with neck pain; R3, I'm confident in prescribing resistance exercises in patients with neck pain and R4, prescribing resistance exercise programs for neck pain is part of my job as a physiotherapist.

strength testing is a recommended tool although many respondents (39%) reported using traditional manual tests to measure strength, with only 15% of the OMPTs using a dynamometer (Selistre et al. 2021; Tudini et al. 2019). Compared to those working in direct access, respondents working in secondary care also reported limited use of dynamometry ($p < 0.01$), CCFT ($p = 0.01$) and oculomotor control such as the gaze stability test ($p = 0.02$), eye head coordination test ($p < 0.01$) and smooth pursuit neck torsion test ($p < 0.01$). Interestingly, a statistically significant difference was also found between OMPTs and non-OMPTs in the use of tests for neuromuscular assessment. Specifically, OMPTs reported more frequent use of the CCFT, the deep neck flexor endurance test and the CEET for the assessment of neck muscle function compared with non-OMPTs ($p < 0.01$). Similarly, although significantly different between OMPTs and non-OMPTs ($p < 0.001$), we found a general lack of use of oculomotor control tests (Table 2). Except for the eye-head coordination test, less than half of the total respondents use the JPE (49%), gaze stability test (37%), eye-head coordination test (59%), or smooth pursuit test (42%), potentially influencing the prescription of tailored exercises to address oculomotor control impairments in people suffering from NP (Jull et al. 2018; Villanueva-Ruiz et al. 2022).

Exercise is recommended as a first-line intervention for the management of NP with the goal of reducing pain and disability (Blanpied et al. 2017; Côté et al. 2016) as well as to promote changes in motor behaviour, and improve physical function (Dirito et al. 2024; Mueller et al. 2023). Notably, the main obstacle to exercise prescription for NP—for both physiotherapists with < 5 years (68%) and with > 15 years of experience (52%)—is the limited access (e.g., funds) for professional development. Professional development represents a way to facilitate up-to-date knowledge and influence physiotherapists' implementation of evidence-based interventions in practice, particularly when based on the learning needs and preferences of the learners (Stander et al. 2019). Therefore, there is an apparent need to introduce appropriate theoretical and practical competencies regarding exercise prescription for NP into the Italian physiotherapy core curriculum and invite other research groups to collaborate to further generalise the current results in other countries.

4.1 | Strengths and Limitations

This survey was developed and adapted from an existing survey with the goal of exploring differences with prior studies (Barton et al. 2021). The survey was developed with a rigorous process according to previous published surveys (Brindisino, Ristori, et al. 2020; Faletra et al. 2022; Mourad et al. 2021, 2022; Rossettini et al. 2018). However, the questionnaire was not translated forward and backward, and the face and content validity could have been enhanced by statistical testing. In line with previous studies, several reminders were posted that helped to achieve the required sample size (Brindisino, Ristori, et al. 2020; Faletra et al. 2022; Mourad et al. 2021, 2022; Rossettini et al. 2018). This also confirms the willingness of Italian physiotherapists to participate in this topic.

Our results could be challenged in terms of generalisability. The survey was initially distributed by email to the members of the Italian Physiotherapists Association; the web link to participate, used as an invitation method, is potentially subject to selection bias. Also, reminders were sent via social media posts and mailing lists, and therefore it is not possible to track the number of people who have seen the reminders. Our study could also be subject to responder bias because of the specific questions. Lastly, it should be considered that we only included Italian physiotherapists with potential differences in educational standards on the topic.

5 | Conclusion

A high number of Italian physiotherapists (both OMPT and non-OMPT) were reported to be trained on the fundamentals of

exercise prescription for NP. However, we observed a discrepancy in the level of confidence and knowledge about using neuromuscular tests and the prescription of aerobic exercise for NP. Responders who use aerobic exercises were reported to not be trained on the prescription and the progression of this form of exercise. Interestingly, OMPTs reported prescribing resistance exercise for NP less frequently than non-OMPTs. We strongly encourage institutions to use the findings of our study as a starting point to introduce appropriate theoretical and practical competencies into the Italian physiotherapy core curriculum.

Author Contributions

F.Mo. and G.L. conceived the study and were responsible for the project administration. F.Mo. and G.L. designed the study. F.Mo., G.L., A.F. and L.L. developed the survey. F.Mo., D.Fe., G.L. and L.L. analysed the data. All authors overviewed data analysis and interpretation. F.Mo., G.L. and L.L. wrote the first draft of the paper. F.Mo. and G.L. were major contributors in writing (original draft). F.B., G.G., A.F., F.Ma., I.Y., J.D., D. Fa. and D.Fe. contributed to the investigation and to the writing (review and editing). D.F. contributed to data curation and formal analysis. F. Mo. is the guarantor. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Raw data are available upon request.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.