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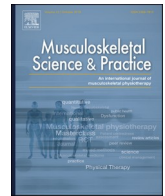
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Review article

Completeness of the description of manipulation and mobilisation techniques in randomized controlled trials in neck pain; A review using the TiDieR checklist

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ABSTRACT

Study design: A secondary analysis of a systematic review.

Background: Manipulations or mobilizations are commonly used interventions in patients with mechanical neck pain. The treatment effects have often been studied in randomized controlled trials (RCT) which are generally considered the gold standard in evaluating the treatment effects, mainly due to its high internal validity. External validity is defined as the extent to which the effects can be generalised to clinical practice. An important prerequisite for this is that interventions used in clinical trials can be replicated in clinical practice. It can be questioned if interventions utilized in randomized controlled trials can be translated into clinical practice.

Objectives: The overall aim of this study is to examine whether the quality of the description of manipulation and mobilization interventions is sufficient for to replication of these interventions in clinical practice.

Methods: A comprehensive literature search was performed. Two independent researchers used the Template for Intervention Description and Replication (TiDieR) which is a 12-item checklist for describing the completeness of the interventions.

Results: Sixty-seven articles were included that used manipulation and/or mobilization interventions for patients with mechanical neck pain. None of the articles describe the intervention e.g. all the items on the TiDieR list. Considering item 8 (a-f) of the TiDieR checklist only one article described the used techniques completely.

Conclusion: Manipulation or a mobilization interventions are poorly reported in RCTs, which jeopardize the external validity of RCTs, making it difficult for clinicians and researchers to replicate these interventions.

1. Introduction

The randomized controlled trial (RCT) is generally considered the gold standard in evaluating the effects of treatment (Akobeng, 2005). Internal validity of these studies is of importance as this determines the level of confidence for making treatment recommendations because the conclusions of a specific trial are then valid for the population of interest. Furthermore, studies must also be of sufficient external validity to allow for generalizability and replication of the interventions in clinical practice (Nasser et al., 2012). External validity has been defined in many different ways in the literature (Nasser et al., 2012), (Rothwell, 2010), (Dekkers et al., 2010). Rothwell defined it as the extent to which the results of a trial are relevant to clinical practice, among other things, the

extent to which the intervention is likely to be replicated when applied to patients in a particular clinical setting (Rothwell, 2010).

One of the challenges identified in the reporting of clinical trials is the quality of the description of the intervention (Hoffmann et al., 2014). Providing sufficient details about interventions is fundamental in the scientific process and is critical for the development of evidence informed practice (Conn, 2012). As Hoffman et al. stated; "Without a complete published description of interventions, clinicians cannot reliably implement interventions that are shown to be useful, and other researchers cannot replicate or build on research findings".

The CONSORT statement for RCTs recommends precise specification of trial processes including details of the intervention being studied or components of that intervention (Schulz et al., 2010). Despite this

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recommendation, health care providers in daily practice are not provided with a complete description of the intervention in most RCTs. Glasziou et al. demonstrated that in back pain trials, only 13% of the interventions could be replicated (Glasziou et al., 2010). Given the importance of adequate reporting of interventions in clinical trials, the Template for Intervention Description and Replication (TIDieR) was developed by Hoffman et al. (Hoffmann et al., 2014). This template was developed to guide the complete reporting of an intervention and is an extension to the CONSORT 2010 statement. The TIDieR checklist was published in 2014 as an official extension of the Consolidated Standards of Reporting Trials (CONSORT) 2010 statement. The CONSORT statement suggests that authors should report on “The interventions with sufficient details to allow replication”.

In this article we consider interventions used in patients with non-specific neck pain. Neck pain is the fourth major cause of disability worldwide. In 2015, more than a third of a billion people worldwide had neck pain of more than 3 months duration (Hurwitz et al., 2018), which makes neck pain a serious health threat.

The interventions that are used for the treatment of neck pain are exercises, manipulative therapies, mobilization, massage, physical methods, and multidisciplinary biopsychosocial rehabilitation, or a combination of these modalities. The most frequently used physiotherapeutic interventions in patients with non-specific neck pain are manipulations or mobilizations (Maissan et al., 2018a).

The TIDieR checklist assesses all the relevant issues related to an intervention, such as for example why the intervention was performed, by whom and where. Item 8 of the TIDieR checklist focuses specifically on the used techniques, such as the ‘segmental level’, ‘frequency’, ‘direction’, ‘intensity’, ‘dosage’. In this article we focused on both, that is, all the relevant issues related to the intervention, as well as the specific manipulation and mobilization techniques and the replication of these techniques.

A manipulation technique is defined as: A passive, high velocity, low amplitude thrust applied to a joint complex within its anatomical limit with the intent to restore optimal motion, function, and/or to reduce pain. A mobilization technique is defined as: A technique comprising a continuum of skilled passive movements that are applied at varying speeds and amplitudes to joints, muscles or nerves with the intent to restore optimal motion, function, and/or to reduce pain (www.IFOMPT.org). The description of these techniques can be found in textbooks (Maitland et al., 2005) and videos on the Internet. This article examines whether the quality of the description of manipulation and mobilization interventions as well as the techniques is sufficient for replication in clinical practice.

This has led to the following research questions;

1. Are interventions which include manipulation and or mobilization techniques, used in clinical trials on patients with non-specific neck pain described complete according to all items on the TIDieR checklist ?
2. Are the manipulation or mobilisation techniques described in a reproducible manner?

This review was performed as a secondary analysis alongside a review on the clinical reasoning process in randomized clinical trials with patients with non-specific neck pain (Maissan et al., 2018a).

2. Methods

A comprehensive literature search was performed in MEDLINE, CINAHL and PEDro from inception to September 2018. We used a sensitive search strategy that we used in a previous review (Maissan et al., 2018). To collect all potentially eligible RCTs, the search strategy combined two primary pathways. The first combined neck pain with physical therapy and the second concerned the combination neck pain with the subheadings “rehabilitation”, “therapy” and “prevention and

control” because these subheadings included most likely also physical therapy. The first and second pathways were combined with the Boolean term “OR”. Subsequently, the outcome was limited for RCTs with the “Cochrane Highly Sensitive Search Strategy” for identifying randomized trials”. In CINAHL the same strategy was used as in MEDLINE with an adapted Cochrane search strategy. In PEDro the Abstract and Title box was filled with “neck”, the problem box with “pain” and the method box with “clinical trial”.

2.1. Study selection

A study was included if it met the following criteria: full-text original article, published in English, adult patients (>18 years) with non-specific neck pain as their main complaint, the intervention consisting of mobilisation or manipulation techniques and randomized controlled trial (RCT) as the study design. Non-specific neck pain was defined as pain (with or without radiation) located in the cervical spine and/or occiput region and/or cervico thoracic junction and muscles originating from the cervical region acting on the head and shoulders. The selection process was performed by two independent researchers (FM,xJP). After independently selecting the studies, the differences were discussed until consensus was reached. If no consensus was reached, a third researcher (HW) was consulted and consensus was reached based on discussion between them.

Two reviewers (FM and NW) independently selected the RCTs with manipulation or mobilization interventions. If a manipulation or mobilization intervention was combined with other interventions, only the manipulation or mobilization intervention part was assessed.

2.2. Data-extraction

To determine whether the reporting manipulation and/or mobilization intervention performed on patients with non-specific mechanical neck pain was complete we used the 12-item TIDieR checklist to determine the replicability of these interventions (Hoffmann et al., 2014).

Each item was scored with no (0) or yes (Akobeng, 2005), except for items 1, 5 and 8 which are scored with a description or actual scores. A score of “0” for item 1, 5 or 8 (a-f) means that it is not described. A score of “0” for item 8g means that the manipulations or mobilizations were not used in combination with other interventions. Again, if no consensus was reached, a third researcher (HW) was consulted and consensus was reached based on discussion between them.

To answer research question 1, all items from the TIDieR list were used and to answer research question 2, item 8 (a-f).

2.3. Risk of bias assessment

The TIDieR checklist was published in 2014 as an additional exploration. Therefore, we compared the articles published before 2015 with articles published after 2015 to get an impression if the description of interventions was improved and to explore publication bias.

2.4. Analysis

A descriptive analysis was performed using the software package of IBM SPSS Statistics 23.0 (SPSS Inc., Chicago, IL).

3. Results

We found 67 articles using manipulation or mobilization techniques as the intervention under study. See Fig. 1.

(Akhter et al., 2014; Ali et al., 2014; Beltran-Alacreu et al., 2015; Casanova-Mendez et al., 2014; Celenay et al., 2016a, 2016b; Cho et al., 2017; Cleland et al., 2005, 2007a, 2007b; de Camargo et al., 2011; Deepa et al., 2014; Duymaz and Nesrin, 2018; Dunning et al., 2012;

Table 1
 Score of the TIDieR checklist (n = 671) 1 = manipulation 2 = mobilization 3 = both: (5)0 = not known, 1 = PT, 2 = MT, 3 = chiropractor, 4 = other profession (7) 0 = not known, 1 = private practice, 2 = institutional (8a) no of sessions (8b) no of sessions per week (8c) duration of a session (8d) description of intensity, 0 = no, 1 = yes (8e) 1 = manip Cx, 2 = manip Tx, 3 = combination Cx Tx, 4 = maitland mob, 5 = Snags, 6 = diversity (8f) level of manipulation/mobilization, 0 = no, 1 = yes (8g) combination with other modality, 0 = no, 1 = yes.

	1.	2.	3.	4.	5.	6.	7.	8a.	8b.	8c.	8d.	8 e.	8f.	8g.	9.	10.	11.	12.
	Intervention	rationale	materials	procedure	person	modes	location	sessions	frequency	duration	intensity	Type	level	combination	tailoring	modification	adherence	delivered
Akhter et al., 2014	1	0	0	1	0	1	2	6	2	0	0	1	0	1	1	1	1	0
Ali et al., 2014	2	0	0	1	2	1	1	24	4	0	0	5	0	0	0	1	1	1
Aquino et al., 2009	2	1	0	1	1	1	0	1	0	0	0	4	0	0	1	0	0	0
Beltran-Alacreu et al., 2015	3	0	0	0	1	1	0	8	2	0	0	6	0	0	0	0	0	1
Casanova-Mendez et al., 2014	1	1	0	1	1	1	0	1	0	0	0	2	0	0	0	0	0	0
Celenay et al., 2016	2	1	0	1	1	1	0	12	3	20	0	6	0	1	1	0	0	0
Cleland et al., 2007a	1	1	0	1	1	1	1	2	2	0	0	2	0	1	0	0	0	1
Cleland et al., 2007b	3	0	0	1	1	1	1	1	0	3	0	4	0	1	0	0	0	0
Cleland et al., 2005	1	1	0	1	1	1	1	1	0	0	0	2	0	0	1	0	0	0
de Camargo et al., 2011	1	1	0	1	2	1	0	1	0	0	0	1	1	0	0	0	0	0
Deepa et al., 2014	2	1	0	1	1	1	0	0	0	0	1	6	0	0	1	0	0	0
Dunning et al., 2012	1	1	0	1	1	1	1	1	0	1	1	1	1	0	0	0	0	0
Dziedzic et al., 2005	2	0	0	0	4	1	1	8	0	20	0	6	0	1	1	0	0	0
Evans et al., 2012	1	0	0	0	3	1	1	20	2	20	0	3	0	1	1	1	1	1
Ganesh et al., 2014	2	1	0	0	2	1	2	10	5	10	1	6	0	1	1	1	1	1
Gonzalez-Iglesias et al., 2009b	1	1	0	1	0	1	1	3	1	0	0	2	0	1	0	0	0	0
Gonzalez-Iglesias et al., 2009a	1	0	0	1	1	1	1	3	1	0	0	2	1	1	0	0	0	0
Griswold et al., 2015	2	0	0	0	4	1	0	3	0	0	1	4	0	1	1	0	0	0
Haas et al., 2003	1	1	0	1	3	1	1	1	0	0	0	1	0	0	1	0	0	0
Hakkinen et al., 2007	2	1	0	1	0	1	2	8	2	10	0	6	0	1	0	0	0	0
Hoving et al., 2002b	2	0	0	1	2	1	1	6	1	45	0	6	0	0	1	0	0	1
Izquierdo Perez et al., 2014	3	0	0	1	1	1	0	4	2	0	0	3	0	0	1	1	1	1
Kanlayanaphotporn et al., 2009	2	0	0	1	2	1	1	1	1	2	1	4	0	0	1	0	0	0
Kanlayanaphotporn et al., 2010	2	0	0	1	2	1	1	1	0	2	1	4	0	0	1	0	0	0
Ko et al., 2010	2	1	0	1	0	1	2	18	6	3	1	6	1	1	0	0	0	0
Krauss et al., 2008	1	1	0	1	2	1	1	1	0	0	0	2	0	0	1	0	0	0
Lau et al., 2011	1	1	0	1	2	1	0	8	2	0	0	2	0	1	1	0	0	1
Leaver et al., 2010	3	0	0	0	1	1	0	4	2	0	0	3	0	1	1	0	0	1
Lee et al., 2013	2	1	0	0	1	1	2	12	3	15	0	6	0	0	1	0	0	0
Lee and Kim, 2016	1	1	0	1	1	1	0	30	3	10	0	2	0	1	1	0	0	1
Lluch et al., 2014	2	1	0	1	1	1	0	1	0	3	0	6	0	1	1	0	0	1
Lopez-Lopez et al., 2015	3	0	0	1	0	1	1	1	0	0	1	3	0	0	1	0	0	0
Madson et al., 2010	2	0	0	1	1	1	1	12	3	30	1	6	0	1	1	0	0	1
Mansilla-Ferragut et al., 2009	1	1	0	1	2	1	0	1	0	0	1	1	0	0	0	0	0	0
Martel et al., 2011	1	0	0	1	3	1	0	15	2	10	1	1	0	1	0	0	0	1
Martinez-Segura et al., 2006	1	0	0	1	2	1	0	1	0	0	0	3	0	0	1	0	0	1
Martinez -Segura et al., 2012	3	1	0	1	1	1	0	1	0	0	0	3	0	0	1	0	0	0
Masaracchio et al., 2013	3	0	0	1	1	1	0	2	0	0	1	3	1	1	1	0	0	1
Pillastrini et al., 2016	2	1	0	1	0	1	0	0	0	30	1	6	0	1	0	0	0	1
Pires et al., 2015	1	1	0	1	2	1	2	1	0	0	0	2	1	0	0	0	0	1
Puentedura et al., 2011	1	1	0	1	2	1	0	0	2	0	0	3	0	1	0	0	0	1

(continued on next page)

Table 1 (continued)

	1.	2.	3.	4.	5.	6.	7.	8a.	8b.	8c.	8d.	8 e.	8f.	8g.	9.	10.	11.	12.
	Intervention	rationale	materials	procedure	person	modes	location	sessions	frequency	duration	intensity	Type	level	combination	tailoring	modification	adherence	delivered
Puntumetakul et al., 2015	1	1	0	1	1	1	0	1	0	0	0	2	0	0	0	0	0	1
Saavedra-Hernandez et al., 2012	1	0	0	1	0	1	1	1	0	0	0	1	0	0	0	0	0	1
Saavedra-Hernandez et al., 2013	1	0	0	1	2	1	1	1	0	0	0	3	0	0	1	0	0	1
Saayman et al., 2011	1	1	0	1	0	1	1	6	2	30	0	1	0	1	1	0	0	1
Salom-Moreno et al., 2014	1	0	0	1	1	1	0	1	0	0	1	2	0	0	0	0	0	1
Schomacher, 2009	2	0	0	1	1	1	0	1	0	4	1	6	0	0	1	0	0	0
Sillevis et al., 2010	1	1	0	1	2	1	0	1	0	0	0	2	1	0	0	0	0	0
Snodgrass et al., 2014	2	0	0	1	1	1	1	1	0	3	1	6	0	0	1	0	0	1
Sterling et al., 2001	2	1	0	1	2	1	2	1	0	0	1	6	1	0	1	0	0	0
Walker et al., 2008	3	0	0	1	1	1	2	6	2	0	0	1	0	1	1	0	0	0
Yang et al., 2015	1	1	0	1	0	1	0	18	3	0	0	3	0	1	0	0	0	0
Ylinen et al., 2007	2	0	0	1	1	1	2	8	2	30	0	6	0	1	0	0	0	1
Bautista et al., 2017	1	1	0	1	2	1	1	1	1	0	0	3	3	0	1	0	0	0
Buyukturan et al., 2018	2	1	0	1	1	1	2	10	5	0	1	5	2	1	1	0	1	1
Cho et al., 2017	2	1	0	1	1	1	2	10	2	5	0	6	2	1	0	0	0	1
Duymaz and Nesrin, 2018	2	1	0	1	0	1	0	10	5	5	0	5	0	1	0	0	0	1
Farooq et al. 2018	2	0	0	1	1	1	2	10	2	0	1	4	0	1	1	0	0	1
Galindez et al., 2018	1	1	0	1	2	1	1	1	1	0	0	3	0	1	0	0	0	1
Gorrel et al., 2016	1	1	0	1	0	1	2	1	1	0	0	1	0	1	1	0	0	1
Griswold et al., 2018	3	1	0	1	2	1	1	2	0	0	0	3	0	1	1	0	0	1
Groeneweg et al., 2017	2	0	0	1	2	1	1	6	1	30	0	6	0	1	1	0	0	1
Karas et al., 2014	1	1	0	1	2	1	1	1	1	0	0	2	0	0	1	1	0	1
Lee et al., 2017	2	0	0	1	1	1	0	6	3	60	1	4	0	1	1	0	0	1
Maiers et al., 2014	1	0	0	1	3	1	1	20	2	0	0	1	0	1	1	0	1	0
Win et al., 2015	1	0	0	0	3	1	1	2	1	0	0	1	1	0	1	0	0	0
Petersen et al., 2015	3	1	0	1	2	1	0	1	1	0	0	1	0	1	1	0	0	1

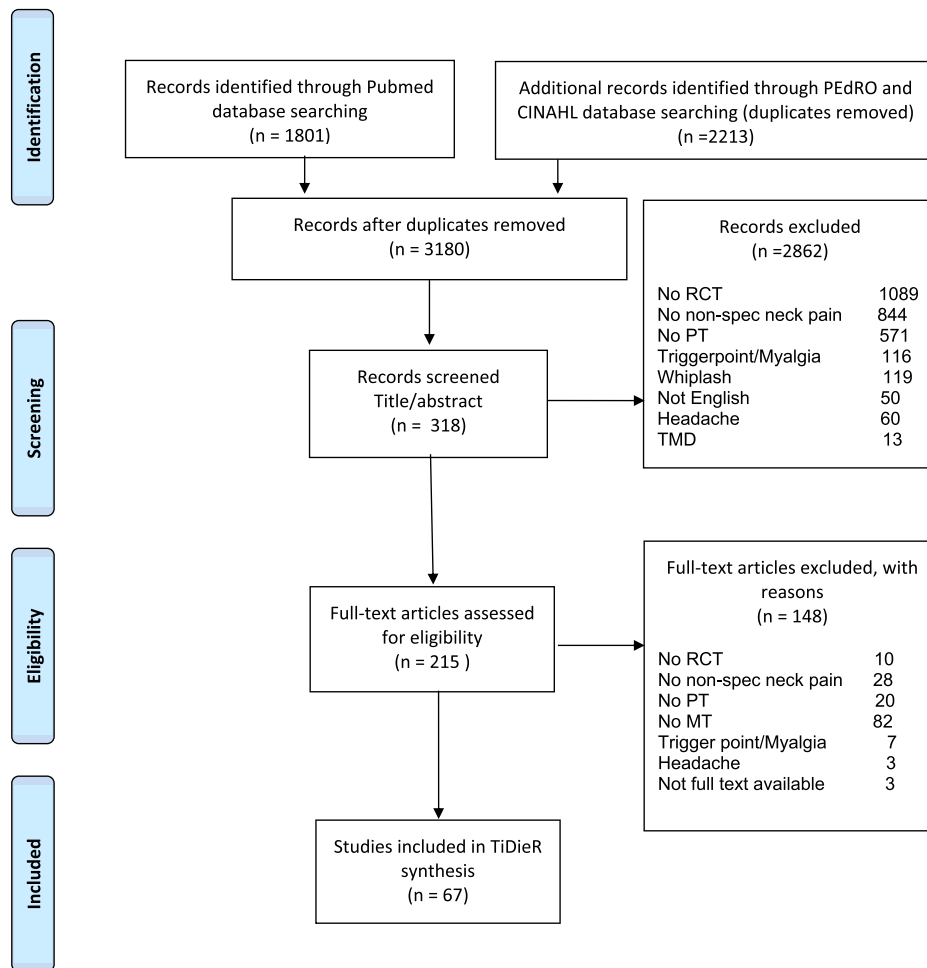


Fig. 1. Flowchart of articles reviewed.

Dziedzic et al., 2005; Raney et al., 2009; Evans et al., 1976; Galindez et al., 2018; Ganesh et al., 2014; Gonzalez-Iglesias et al., 2009a, 2009b; Griswold et al., 2015; Haas et al., 2003; Hakkinen et al., 2007; Hoving et al., 2002; Izquierdo Perez et al., 2014; Kanlayanaphotporn et al., 2009, 2010; Krauss et al., 2008; Karas, 2014; Lau et al., 2011; Leaver et al., 2010), (Lee et al., 2013; Lee and Kim, 2016; Lluch et al., 2014; Lopez-Lopez et al., 2015; Madson et al., 2010; Mansilla-Ferragut et al., 2009; Martel et al., 2011; Martinez-Segura et al., 2006; Martinez-Segura et al., 2012; Masaracchio et al., 2013; Pillastrini et al., 2016; Pires et al., 2015; Puentedura et al., 2011; Puntumetakul et al., 2015; Saavedra-Hernandez et al., 2012, 2013; Saayman et al., 2011; Salom-Moreno et al., 2014; Schomacher, 2009; Sillevs et al., 2010; Snodgrass et al., 2014; Sterling et al., 2001; Walker et al., 2008; Yang et al., 2015; Griswold et al., 2018; Bautista-Aguirre et al., 2017; Buyukturan et al., 2018; Farooq et al., 2018; Groeneweg et al., 2017; Gorrell et al., 2016; Maiers et al., 2014; Petersen et al., 2015; Ylinen et al., 2007; Win et al., 2015)

None of the articles described all the items on the TiDieR list. See Table 1. For example, in only 55,2% of the RCTs a rationale for the intervention was described. For a complete overview of the scored percentages on the TiDieR items we refer to Table 2.

In 17% of the studies manipulation of the cervical spine was used and in 22% manipulation was applied to the thoracic spine (22.6%); in 18.9% both manipulation and mobilization techniques were used and in 41.5% only mobilization was used.

Several mobilization techniques were used; in 9.4% specific Maitland mobilization techniques (Maitland et al., 2005), in 1.9% Snags techniques by Mulligan and in 30.2% all other modalities of

Table 2
Summary of scores TiDieR checklist (n = 67).

TiDieR items	
1. Description of the name of the intervention	100%
2. Description of the intervention rationale, theory or goal of the elements essential to the intervention	55,2%
3. Description of materials used in the intervention	46%
4. Detailed description of procedures used in the intervention	88,0%
5. Description of the person who provided the intervention	83,6%
6. Description of the modes of delivery (such as face to face)	100%
7. Description of the location where the intervention occurred	60,7%
8. Description of the parameters regarding the intervention	
8a. No of sessions	95,5%
8b. Frequency	56,7%
8c. Duration (min)	37,3%
8d. Intensity or dose	32,8%
8e. Type of intervention	91,0%
8f. Level of intervention	20,9%
8g. Combination of intervention	53,7%
9. Was the intervention tailored i.e. personalized?	42,0%
10. Was the intervention modified during the treatment?	18,0%
11. Was the adherence of the intervention assessed	7,5%
12. If so: was the intervention delivered as planned?	55,2%

na = not applicable.

mobilization techniques. In 47.2% of all treatment sessions a combination of modalities was used, for example the addition of exercises.

Considering item 8 (a-f) of the TiDieR checklist only one article described the technique completely (Ko et al., 2010). In 94.3% of the articles the number of treatment sessions was described, with a range of

1–30 treatment sessions; in 45.3% of the treatment sessions only 1 technique was the topic of research. The duration of the treatment sessions varied from 1 min to 45 min but in most cases (60.4%) it was not described. In this review the intensity or dose of the techniques was described in 32.1% of the included articles. In half of these trials, grades of movement were used according to Maitland (Maitland et al., 2005). The vertebral level at which the technique was applied was described in 15.1%. The majority of authors (51%) used the results of the physical examination as reference for the level of intervention but did not report what the results were.

After the studies were stratified according to publication date (before or after 2015) the scores of items 2, description of the intervention rationale, 8b frequency and 8f level of the intervention increased slightly (see Table 3).

4. Discussion

4.1. Main findings

None of the articles fully described the manipulation or mobilization interventions used in clinical trials on non-specific neck pain, considering all items of the checklist. Only one article completely described the manipulation or mobilisation technique, considering item 8 of the checklist (Akhter et al., 2014). The TIDieR checklist intends to check the intervention as a whole. Within the checklist (more specifically, using item 8) we considered the used manipulation and or mobilisation techniques.

We consider the most relevant items in the checklist for replication of these techniques, the rationale (the why), the expertise, the background or level of training of the therapist (the who) and the parameters of the intervention (the what) such as the amount of time, number of sessions, the duration, the intensity and level. Less relevant items are the name of the intervention, “materials” because for these interventions no materials were needed. Tailoring and modifications are expected because each treatment is tailored to the individual patient, although these items were not always reported as such (n = 37,3%). As Tuttle et al. stated (Tuttle and Hazle, 2019) that applying parameters of techniques are no longer predetermined but are continuously adjusted due to the feedback of the patients and the adjustment of the therapist to the responses of the individual patient. Furthermore, the perception of the patient as well of the therapist on the performed intervention is of influence on the

Table 3
Differences of scores TIDieR checklist articles published before 2015 versus published after 2015.

TIDieR items	48 <2015	19> 2015
1. Description of the name of the intervention	100%	100%
2. Description of the intervention rationale, theory or goal of the elements essential to the intervention	52.8%	73,7%
3. Description of materials used in the intervention	na	
4. Detailed description of procedures used in the intervention	86.8%	89,5%
5. Description of the person who provided the intervention	100%	100%
6. Description of the modes of delivery (such as face tot face)	100%	100%
7. Description of the location where the intervention occurred	54.7%	52,6%
8. Description of the parameters regarding the intervention		
8a. No. of sessions	94.3%	94,7%
8b. Frequency	47.2%	68,4%
8c. Duration (min)	39.6%	36,8%
8d. Intensity or dose	32.1%	42,1%
8e. Type of intervention	88.7%	100%
8f. Level of intervention	15.1%	36,8%
8g. Combination of intervention	47.2%	73,7%
9. Was the intervention tailored i.e. personalized?	58.5%	11%
10. Was the intervention modified during the treatment?	30.2%	21%
11. Was the adherence of the intervention assessed	7.7%	5,3%
12. If so: was the intervention delivered as planned?	48.1%	68,4%

tailoring of the intervention.

Finally, intervention adherence assessment is a less relevant item because adherence does not provide information about how the intervention is performed.

Although a rationale is not necessary to replicate an intervention, we consider it a relevant item because there must be a hypothesis present on why the intervention could be effective. The rationale for the use of the techniques was described in only 55.2% of the included studies. Two main rationales for the use of manipulation and/or mobilization were described. First, the biomechanical rationale; the therapist identified a hypo mobile segment or articular dysfunction and used a manipulation or mobilization technique to restore mobility.

The second rationale is neuro-physiological, with the aim to influence the patient’s pain by applying an input on the neuro-musculo skeletal system. Another issue was the rationale for the selection of a manipulation or mobilization technique. In the context of safety, it seems important whether and, if so, when one prefers manipulation over mobilization (Kranenburg et al., 2017), (Haynes et al., 2012). From this current review it was impossible to determine why a manipulation or a mobilization was chosen.

Because the checklist was published in 2014, we also compared the articles published before 2015 with articles published after 2015 to get an impression if the description of interventions had improved. The description improved slightly after the publication of the TIDieR checklist. See Table 3.

A diagnostic clinical reasoning process for determining the segmental level at which the intervention would be applied to was used in 55% of the trials, however the specific levels were not always reported. Although the specific segmental level is potentially relevant, its relevance can also be questioned because several studies showed that the validity and reliability of determining a segment to be treated is low (Celenay et al., 2016a). In addition, Slaven et al. (2013) stated in a recently published review, that it is still unclear whether it is necessary to determine a specific level with cervical mobilization. In this review we found that in 20,9% the level was described as “high cervical spine”, “mid cervical spine” or “thoracal spine”.

The dose or the intensity of the manipulation or mobilisation technique seems important (Gross et al., 2010), however, enormous variations in research exist (Snodgrass et al., 2006). In this survey the intensity or dose of the techniques was described in 32.1% of include articles, half of these trials, grades of movement were used according to Maitland (Maitland et al., 2005). Furthermore, inter-reliability of assessing the grade of movement was poor (ICC = 0.23) and intra-reliability was moderate to good (ICC 0.83–0.94) (Snodgrass et al., 2006) (Snodgrass et al., 2010). Further research must demonstrate whether the dosage or intensity matters.

4.2. Comparison with existing literature

Overall, the interventions were poorly reported, the used manipulation and or mobilisation techniques somewhat better. One reason for this may be the result of the word limits imposed on authors by journals (Yamato et al., 2016). Conn et al. reported that only 7% of the space in an article was used for description of the intervention in 141 studies in Nursing Research Journals (Conn, 2012). A possible solution could be attaching an appendix describing the details of the intervention or a design article with the complete description of the intervention (Pool et al., 2006). Also, specific register forms can be used to describe every used technique during the treatments sessions (Holtorp et al., 2008). However, it remain problematic to describe an optimal dose, level and frequency. Another option was suggested by Glasziou et al. (2010), these authors suggested to video three interventions in advance of conducting the clinical trial with, for example, a mild, moderate or intense intervention which is an option to consider. However, this is a time consuming and potentially costly method, although the use of a smart-phone can make it more accessible.

4.3. Weaknesses

The results of this study should be interpreted in the light of some limitations. As far as we know, nothing is known about the methodological properties of the TiDieR list. The use of a dichotomous response options on most items on the checklist restrict full information about topics concerning the intervention, a more qualitative description could be more informative.

Furthermore, does the description of intervention or the description of a specific techniques fully resembles what happens in daily practice? This is also related to the heterogeneity of patient's problems, patient's reaction and patient's perception. Also, the beliefs of the patients and of the therapist plays a role in the application of techniques and or the intervention as a whole (Bialosky et al., 2018)

Finally, we only included English-language research. There is a chance that this has affected the results, although given the amount of included articles, this chance seems small.

4.4. Strengths

A strength of this study is the use of a sensitive search strategies in multiple databases, developed in collaboration with a medical information specialist.

Another strength is the use of the TiDieR checklist as this includes all relevant aspect that should be described.

4.5. Implication

What can be expected of a description of the intervention within the methodology of a RCT? A manipulation or mobilization technique is in most cases tailored to the individual patient as the dosage, velocity and segmental level for example. Also, the inconsistency of the applied manual forces during spinal mobilization has to be taken into account (Snodgrass et al., 2006) (Snodgrass et al., 2009) which makes it very difficult to describe the amount of force and the replication of it, which can be a topic for future research. In our opinion, the TiDieR checklist covers the most important items to give an impression of the completeness of the description of an manipulation or mobilisation intervention, although the specific description of the technique should be considered for addition to the TiDieR checklist.

5. Conclusion

In conclusion, interventions with manipulation or mobilization techniques are poorly reported in RCTs. Poor reporting and incomplete descriptions of the techniques jeopardize the external validity of RCTs, making it difficult for clinicians and researchers to replicate the techniques. It is also important to investigate which aspects matter with regard to the effectiveness of manipulations and mobilizations.

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