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Review article

The importance of differentiating the three modalities of Tai Chi Chuan practice in clinical trials – A critical review

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ABSTRACT

Introduction: Three different modalities have emerged in the historic evolution of Tai Chi Chuan (martial, sports and therapeutic) with clearly differentiated objectives and methods. The purpose of this article is to identify whether the research that is being carried out in relation to this activity bears these three modalities in mind when delimiting and interpreting its effects on the health of its practitioners.
Method: Eight electronic data bases were searched for publications up to January 2017. Ninety-six systematic reviews and meta-analyses exclusively dedicated to this activity were used. In the analysis we differentiated between the reviews which offered information on the TCC style, the form used in the studies and those which made no mention of them.
Results: The most common forms used in the research design associated with TCC correspond to those linked to the sports modality of this activity, while the forms associated with the therapeutic modality are scarcely present. Moreover, a large number of reviews include in their analyses studies which do not mention the TCC form or styled used.
Conclusion: The current reviews being written on the subject of TCC indiscriminately mix in their analyses the effects of the forms associated with the different modalities and thus contribute to maintaining a partial and confused vision of the scope and potential benefits offered by this activity.

1. Introduction

Tai Chi Chuan (TCC) currently represents a research field which occupies a relatively important place in scientific publications witnessed by the large number of original studies and systematic reviews published to determine the general benefits of TCC as well as its effects on a wide variety of pathologies [1,2].

However, some researchers [3–6] indicate that this activity represents a complex research problem and that it is necessary to improve research designs, as well as identify the variables pertaining to TCC which could condition the interpretation of the study results.

One of these key variables when researching into this activity, which was indicated recently by the authors of the present article [7], is the different "modalities" of practice which have arisen in TCC during its historical evolution, as each one springs from very different objectives and methods.

1.1. Historical evolution of the modalities associated with TCC

The first modality to be created was *"martial"* and it was devised by the founders of TCC in the 16th and 17th centuries [8]. These masters created a system with martial aims where each movement and each turn had an application for combat, and the sensations which were sought had this same aim. The objective of this modality was victory in combat and technical efficacy [7].

As we see it, the individuals involved in this dimension had to master some bases or principles which were common to any style of TCC practised. Bases which not only refer to knowing the technical applications of each movement and the eight forces associated with this martial art, but also to being able to access the "secrets" or "discoveries" and "investigations" carried out by the masters that teach which elements had to be mastered at the internal or external level so that these techniques and forces were real.

From the 1950s and 60 s on, a new practice modality developed in TCC geared towards sports practice and competition under the auspices of the National Physical Culture and Sports Commission [9]. This is

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when the standardised forms of TCC: 24-form, 48-form, 88-form and 32-form (with sword) were created under the title of "Jung Dong" (sports practice) [10], and later on in the year 1989, the competition regulations for the styles of Chen, Yang, Wu and Sun were standardised [11] together with the 42-form competition in the Beijing Sports Institute [9].

This line of development in TCC currently presents two faces: the gentle and healthy sports version and the branch of sports performance associated with the championships which is at present trying to convert this activity into an Olympic discipline [9,12,13].

As we understand it, the evolution of TCC towards a "gentle sports" form signified an important step forward in the field of health, as by transforming itself into a "sport or physical activity" it could be associated "at the very least" with the same benefits that a multitude of physical and sports activities offer for health [7].

Regarding the competitive branch, we will just highlight the fact that the preparation of the competitors is the same as that followed by elite athletes in any other sports discipline geared towards performance, and that in future it will certainly have to face up to the same types of problems that beset top performance (doping, injuries, overtraining, etc.).

The final modality of practice which has developed within TCC is the one characterised as "therapeutic" or "traditional and complementary medicine". This was made possible thanks to the association of this practice with Chikung (CK), which started in the 1950s and with it a tradition belonging to traditional Chinese medicine [14,15].

CK is a term which was officially adopted in the year 1949 by the Chinese government to designate a set of physical and meditative practices aimed at caring for one's health. However, this term quickly evolved to become, in the middle of the "chikung boom" in the 1980s, a "generic label" to designate a multitude of heterogeneous practices (esoteric, martial art, sporting) with very different aims from those at the root of this word, creating a certain amount of confusion among practitioners [14–16].

Ancient practices associated with caring for one's health (yangsheng) and which formerly were recognised by their original name (daoyin, yinshu, wuqinxi, yijinjing, baduanjin, etc.), began to be identified under the generic term of CK, and thus to mix with a multitude of other activities giving rise to new definitions like soft, hard, external, internal, martial, dynamic, static CK, etc. [14–16]. We consider that this is a reality which clearly demands an in-depth investigation to be able to differentiate which systems included under the heading CK are really focussed on therapeutic intervention.

However, this also made it possible for TCC to be included under the umbrella of CK and thus open up the possibility of the appearance of a new therapeutic model within this activity. This was a new "virgin" research field which could be called "Chikung Tai Chi" would be included under the heading of "traditional and complementary medicine" as defined by the WHO [7].

The aim of this article is to identify if the research which is being carried out in relation to Tai Chi Chuan differentiates its three practice modalities: martial, sports and therapeutic, when delimiting and interpreting their effects on the health of the practitioners. It is important to determine this information because if not, it would be confirmed that still today there is a partial and confused vision on the scope and potential benefits which this activity offers; and would reveal the need for a new framework to guide research on this practice, the categorisation of its effects and the establishment of comparisons within TCC itself and with other activities.

2. Methods

2.1. Eligibility criteria

The researchers came across two problems when making the selection of studies: 1) the great number of articles which have been written about Tai Chi Chuan, and 2) the terminological confusion in the titles. Most of the published research uses the word chuan/quan which means "fist" and refers to the martial aspect and the original name which the first masters of this art gave to this activity, when afterwards in their contents, the practice is used with a sporting or therapeutic aim.

To solve this problem it was decided to use the systematic reviews and *meta*-analyses exclusively dedicated to this activity. The justification was that these reviews assemble a large number of studies focussed on one topic; constitute a very attractive framework of reference for the researchers; and usually present the TCC style and form used in the research designs.

In the present article "style" refers to the four main schools of TCC: Chen, Yang, Sun and Wu, and "form" refers to the number of movements which make up the "choreography" of the intervention.

2.2. Search strategy

Eight electronic data bases were searched for this article: Medline-Pubmed, Scirus, Cochrane, Pascal, ScienceDirect, SportDiscuss, Science Citation Index, Google Scholar and BIOSIS. The key words used were "Tai Chi Chuan"; "Taijiquan"; "Tai Chi Chuan"; "Tai Chi Chikung"; "Chikung Tai Chi"; "Taiji Qigong"; "Qigong Taiji"; "Tai Chi"; "Tai Chi"; "Tai Ji"; "Systematic Review" or "Meta-analysis". The search was carried out until January 2017.

2.3. Study selection

Two researchers independently analysed the studies identified in order to determine their inclusion and any disagreement was resolved by discussion. When first reading the contents of the reviews selected for this article, the authors realised the need to differentiate between the reviews which offered information on the TCC style and form used in the studies and those which made no mention of them. If the latter were included because they also offered important information, they were omitted from the data presented in the tables identifying practice style and form.

With regard to the reviews which presented data on the TCC style and form used in the selected studies, the main problem was the lack of reference to the "modality" of the practice used in the intervention (martial, sports or therapeutic), and the duplication of the studies. Thus three measures were used to work with these reviews:

a) To record the great diversity of TCC forms which are used in the studies included in the reviews according to three dimensions:

- *"Official sports forms",* that is the forms created by the Chinese National Commission for Sports [10] and The National Research Institute of Wushu [11]: simplified 24 and 48 forms, 88-form and simplified 32-form with sword; and the four official standardised forms for competition: 40-form Yang Style, 56-form Chen Style, 54-form Wu Style and 73-form Sun Style.
- *"Simplified and traditional forms",* the forms which arose based on the official sports and competition forms, or the complete forms belonging to the different TCC styles and the traditional complete forms.
- *"Therapeutic forms",* the forms purposely created for treating different pathologies using Tai Chi and which have their own name. In particular this group includes "Tai Chi Chih" 10 and 20 form, created by Steven L. Wolf; "Tai Chi: Moving for Better Balance" 8 form, by Li Fuzhong; "Tai Chi for Arthritis" 12 form and "Tai Chi for Diabetes" 9 form, by Paul Lam; and "Tai Chi Qigong" 18 form, by Li Hounsheng.

To identify how many studies belonged to this last dimension we looked in the method section for 1) any article by authors who were co-authors in research published by the people who created these forms; 2) all the studies where the number of movements in their intervention

Table 1
Studies associated with therapeutic forms of TCC.

Therapeutic Forms	Studies	Total
Tai Chi Chih	Audette 2006; Campo 2013; Carminiti 2011; Faber 2006; Greenspan 2007; Hall 2009; Hass 2004; Irwin 2003, 2007, 2008; Kutner 1997; Lavretsky 2011; McGibbon 2005; Sattin 2005; Schaller 1996; Wolf 1996, 1997, 2003, 2006	19
Tai Chi for Arthritis	AuYeung 2009; Chen 2008; Cheon 2013; Choi 2005; Fransen 2007; Jung 2012; Lee 2004; Leung 2012; Park 2010; Seoung 2008; Song 2003, 2007, 2009, 2010; Tsai 2012, 2013, 2015; Voukelatos 2007	18
Tai Chi Qigong	Blake 2009; Chan 2010, 2011; Chao 2002; Lee 2009; Shen 2000; Youngwanichsetta 2013; Zhang 1988	8
Tai Chi for Better Balance	Jones 2012; Li 2004, 2005, 2008, 2012	5
Tai Chi for Diabetes	Lam 2008; Orr 2006; Tsang 2007, 2008	4

form coincided with that of these therapeutic forms; and 3) all the studies in which the intervention was with the TCC Sun style or the mixed formula of the Sun and Yang styles. Results are shown in Table 1.

b) To avoid the confusion which could arise from the duplication of studies both in the systematic reviews which deal with the same topic and in the whole set of reviews selected, and to be able to determine the actual position that each TCC style and form occupies in the context of the researcher, it was decided to cross reference the bibliography of the reviews for the studies whose "author" and "year of publication" coincided and thus classify only one study and avoid duplications.

c) To identify the style and form of TCC used in the studies included in some reviews where this information had been omitted but was identified by another review, a bibliographic cross reference was performed by "author" and "year of publication" to determine if it was the same study and thus classify it according to the review which did offer these data.

2.4. Inclusion/exclusion criteria

Systematic reviews and meta-analyses which were not published in English, together with theses, abstracts, posters, and summaries from conferences were excluded. It was also decided to exclude all the reviews and meta-analyses where the effects of TCC were evaluated together with another type of activity (yoga, qigong, dance, etc.). Within the systematic reviews and meta-analyses the studies using forms that did not belong to the traditional styles associated with TCC were also excluded (Fig. 1).

3. Results

The total number of systematic reviews and meta-analyses found which satisfied the inclusion criteria was 96 and they deal with such varied topics as: general benefits of TCC practice, balance and falls; musculoskeletal disease (chronic conditions, osteoarthritis, osteoporosis, rheumatic disease, chronic pain, lumbar myodynamia); cardiovascular disease (cardiovascular fitness, blood pressure, hypertension, coronary artery disease) and diabetes; obstructive pulmonary disease; mental health (well being, depression, anxiety, self-efficacy, sleep quality) and cognition; Parkinson's disease, cancer care (breast cancer), and immunology; and safety practice (Table 2).

Table 2
Topics of the studies included in systematic reviews and meta-analyses related to TCC.

Topics	N° Reviews
General Benefits of Tai Chi Chuan	9
Balance and Falls Prevention	21
Musculoskeletal disease	13
Heart Disease	15
Chronic Disease	3
Aerobic Capacity	4
Mental Functions and Cognition	20
Parkinson's Disease	5
Cancer Care	5
Others	1
Total	**96**

Of these 96 reviews, 46 provide information on the TCC style and forms which were used in the studies selected, while 50 give no information on either aspect.

None of the reviews either distinguish or compare the effects of TCC according to its three practice modalities in their interpretation of the results of the studies. All the studies are grouped together for analysis.

a) Reviews which specify the styles and forms used in the studies

The total number of non-duplicated studies considered by these

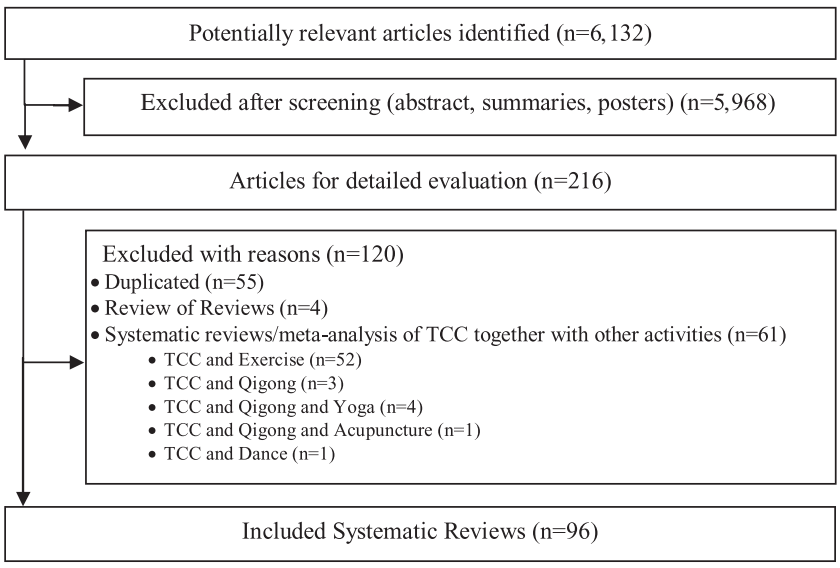

Fig. 1. Flowchart of publication selection process.

Table 3
Number of studies per topic presented in the selected systematic reviews and *meta*-analyses.

		Number of Studies	
		Specifies style/ form	Does not specify style/form
Total number of non-duplicated studies		215	154
Reviews	Topic		
[17,18]	General Benefits of Tai Chi Chuan	15	5
[19–28]	Balance and Falls Prevention	56	25
[29–32]	Musculoskeletal disease	13	1
[33–41]	Heart Disease	65	38
[42]	Chronic Disease	12	9
[43,44]	Aerobic Capacity	8	3
[45–53]	Mental Functions and Cognition	57	46
[54–57]	Parkinson's Disease	24	12
[58–60]	Cancer Care	19	3
[61]	Others	41	12

reviews is 369 (215 that specified the TCC style and form used in the intervention plus 154 that did not). The number of non-duplicated studies for each research topic selected by the chosen reviews is shown in Table 3.

Distinguishing between the studies which used an official sports form, a simplified or traditional form or a therapeutic form we found that:

- The simplified 24 form, associated with the gentle sports modality, is the one most commonly used in the studies while the rest of the forms in this modality, including the official competition form are barely present (Table 4).
- The simplified forms associated with the Yang style and the Complete Form of 108 movements, are more commonly used in studies than the simplified or complete forms of the Wu, Sun and Chen styles (Table 5).

Except in 10 studies which indicate that the simplified form used was created from the simplified 24-form, 3 studies which cite the source as the 108-form and 1 study where the form was derived from the 48-form Chen style, the rest do not mention if the simplified form was created from the official sports forms or the complete forms of the four styles.

Table 4
Total number of non-duplicated studies and total number of non-duplicated studies according to the topic chosen in the systematic reviews which use official sports forms in their intervention.

		N° of studies that use official sports forms							
		Gentle sport				Competition			
Form		24	48	88	32	40	56	45	73
Non-duplicated total		74	3	4		1			
Reviews	Topic								
[17,18]	General Benefits	3		1					
[19–28]	Balance/Falls	14							
[29–32]	Osteoarthritis	2							
[33–41]	Cardiovascular Disease/Diabetes	25	3			1			
[42]	Chronic Disease	1							
[43,44]	Obstructive Pulmonary Disease	5							
[45–53]	Mental Health/Cognition	22							
[54–57]	Parkinson's Disease	5							
[58–60]	Cancer Care/Immunology	2		3					
[61]	Others	11							

Table 5
Total number of non-duplicated studies according to topic selected by the systematic reviews that use simplified and traditional forms in their intervention.

		N° of studies that use the simplified and traditional forms																			
TCC Style		Yang													Sun		Wu		Chen		
Form		4	5	8	9	10	12	13	15	17	18	37	38	108	10	46	16	7	13	37	119
Non-duplicated total		1	9	10	1	6	7	1	8	1	4	5	1	15	2	1	1	1	1	1	1
Reviews	Topic																				
[17,18]	General Benefits				1			1						4							
[19–28]	Balance/Falls		2	1	1	1	2					3		6	1		1	1	1		
[29–32]	Osteoarthritis				1	1	1														
[33–41]	Cardiovasc. Dis./Diab.		3	1		1	1	1		1	1	1		7						1	2
[42]	Chronic Disease		3			2															
[43,44]	Obstruct. Pulmon. Dis.																				
[45–53]	Mental Health/Cognition		4	1	1	5			3	1	2			4							
[54–57]	Parkinson's Disease	1		5			2					3									
[58–60]	CancerCare/Immunology			3					6				1								
[61]	Others		4	1		2					1	1		1	1	1					

Table 6
Total number of non-duplicated studies and total number of non-duplicated studies according to topic chosen in the systematic reviews which use forms created with therapeutic aims in their intervention.

		N° of studies which use forms with therapeutic aims				
Form		TCChih	TCDiabetes	TCArthritis	TCBalance	TCQigong
Non-duplicated total		19	4	18	7	8
Reviews	Topic					
[17,18]	General Benefits	5				
[19–28]	Balance/Falls	12	1	5	4	
[29–32]	Osteoarthritis			7		1
[33–41]	Cardiovascular Disease/Diabetes	4	4	3		5
[42]	Chronic Disease	2	1	1		2
[43,44]	Obstructive Pulmonary Disease			1		2
[45–53]	Mental Health/Cognition	9		3	2	2
[54–57]	Parkinson's Disease			2	5	
[58–60]	Cancer	3		1		
[61]	Others	5	2	5	5	1

Table 7
Number of studies used in the TCC reviews in which the TCC style and form used in the intervention is not specified classified by topic.

			N° Studies		
Reviews	Year	Topic	Total	Style-Form unknown	
		General Benefits			
Kleim y Adams [17]	2004	General Benefits	17	5	(29.4%)
Verhagen et al. [18]	2004	General Benefits	9	3	(33.3%)
		Balance/Falls			
Wu [19]	2002	Improve Balance/Falls Prevention	16	8	(50.0%)
Wayne et al. [20]	2004	Improve Vestibulopathic Control	24	11	(45.8%)
Harling y Simp [21]	2008	Reduce Falls/Fear of Falls	7	4	(57.1%)
Low et al. [22]	2009	Reduce Falls	7	3	(28.5%)
Liu y Frank [23]	2010	Improve Balance	20	5	(25.0%)
Wooton [24]	2010	Improve balance/Falls Prevention	22	8	(36.3%)
Leung et al. [25]	2011	Falls Reduction/Fear of Falls	13	3	(23.0%)
Schleicher et al. [26]	2012	Falls Prevention	24	9	(37.5%)
Jiménez et al. [27]	2013	Balance	27	11	(40.7%)
		Musculoskeletal diseases			
Lauche et al. [30]	2013	Knee Osteoarthritis	5	2	(40.0%)
		Cardiovascular Disease/Diabetes			
Yeh et al. [33]	2008	Blood Pressure	26	14	(53.8%)
Yeh et al. [34]	2008	Cardiovascular/Risk Factors	29	10	(34.4%)
Lee et al. [36]	2011	Diabetes II	10	7	(70.0%)
Ng et al. [37]	2012	Heart Disease	9	8	(88.8%)
Lan et al. [38]	2013	Cardiovascular disease	11	10	(90.9%)
Wang et al. [39]	2013	Hypertension (General)	18	7	(38.8%)
Taylor Piliae [40]	2014	Prevent/Manage Cardiovascular disease	20	6	(30.0%)
Lee et al. [41]	2015	Diabetes II	15	7	(46.6%)
		Chronic Disease			
Li et al. [42]	2014	Heart/Respirat/Musculoskel/Immune/Cancer	21	18	(85.7%)
		Obstructive Pulmonary Disease			
Yan et al. [43]	2013	Obstructive Pulmonary Disease	8	3	(37.5%)
Wu et al. [44]	2014	Obstructive Pulmonary Disease	11	6	(54.5%)
		Mental Health/Cognition			
Dechamps et al. [45]	2007	Self-efficacy and well being	14	7	(50.0%)
Wang et al. [46]	2009	Well Being	15	11	(73.3%)
Chang et al. [47]	2010	Cognition	6	4	(66.6%)
Wang et al. [48]	2010	Well Being	40	27	(67.5%)
Jiménez et al. [49]	2012	Psychological Effects	35	10	(28.5%)
Raman et al. [50]	2013	Sleep Quality	11	6	(54.5%)
Wang et al. [51]	2014	Depression, Anxiety, Well Being	42	27	(64.2%)
Zheng et al. [52]	2015	Protection of Cognitive Ability	9	6	(66.6%)
Du et al. [53]	2015	Sleep Quality	5	2	(40.0%)
		Parkinson's Disease			
Toh [54]	2013	Parkinson's	8	1	(12.5%)
Ni et al. [55]	2014	Parkinson's	9	4	(44.4%)
Yang et al. [56]	2014	Parkinson's (Motor Function, balance, gait)	8	5	(62.5%)
Cwiekała et al. [57]	2016	Parkinson's (Well Being)	12	2	(16.6%)
		Cancer Care			
Lee et al. [58]	2010	Breast Cancer	7	4	(57.1%)
Ho et al. [59]	2013	Immunology and Infections	16	11	(68.7%)
		Other			
Wayne et al. [61]	2014	Safety of TCC	50	15	(30.0%)

Table 8
Reviews which do not identify the TCC style or form used in the studies which have been selected for analysis.

Topic	Reviews (Authors − Year of publication)
General Benefits	Kuramoto [62], Field [63], Burschka et al. [3], Lan et al. [64], Huston&McFarlane [65], Solloway et al. [1], Webster et al. [66].
Balance and Falls Prevention	Komagata&Newton [67], Gregory&Watson [68], Logghe et al. [69], Maciaszek&Osinsky [70], Hackney&Wolf [71], Stevens et al. [72], Zhao&Wang [73], Chen et al. [74], Hu et al. [75], Huang et al. [76], Gu&Denis [77].
Musculoskeletal Disease	Wayne et al. [78], Lee et al. [79], Lee et al. [80], Liu et al. [81], Wang [82], Peng [83], Yan et al. [84], Ling et al. [85], Hall et al. [86].
Heart Disease	Dalusung-Angosta [87], Neri et al. [88], Zhang et al. [89], Zheng et al. [90], Zheng et al. [91], Zou et al. [92].
Chronic Disease	Fetherston&Wei [93], Chen et al. [94].
Aerobic Capacity	Taylor-Piliae&Froelicher [95], Wieland&Santesso [96].
Mental Functions and Health	Sandlund&Norlander [97], Dechamps et al. [98], Zhang et al. [99], Sharma&Haider [100], Chi et al. [101], Wu et al. [102], Pan et al. [103], Wayne et al. [104], Yin&Dishman [105], Sharma&Haider [106].
Parkinson's Disease	Zhou et al. [107].
Cancer Care	Lee et al. [108], Mustian et al. [109].

– There are at least 5 purposely created forms to intervene with TCC at the therapeutic level found in the studies and "Tai Chi Chih" by Steven L. Wolf and "Tai Chi for Arthritis" by Paul Lam are the most common (Table 6).

In general it can be seen that: 1) the sports modality of TCC, in its gentle sports form represented by the simplified 24-form is by far the most commonly used modality in the studies, followed by the simplified forms derived from the Yang style as a whole; 2) the therapeutic modality is hardly present in the studies, with Tai Chi Chih by Steven L. Wolf and Tai Chi for Arthritis by Paul Lam being the most cited forms; and 3) there is a lack of information in the reviews on the "intention" of the practice with the TCC intervention, which makes it impossible to evaluate the position which the martial modality occupies in this context.

Lastly, we should highlight the large number of studies included in the reviews and associated to different topics, where neither the TCC style nor the form used in the intervention is mentioned, but that even so were included in the reviews to make their inferences (Table 7).

b) Reviews that do not give information on the styles and forms used in the studies

Of the 96 reviews selected 50 offer no information on the style and form used in the studies when making their analysis (Table 8). Of these, 17 reviews were published between 2015 and 2017 and so are very recent.

4. Discussion

The 96 reviews selected for this paper represent a large number when they are compared with the 107 systematic reviews used by Solloway et al. [1] to establish an evidence map of the effects of Tai Chi on health outcomes; the 43 systematic reviews used by Yang et al. [2] to perform a bibliometric analysis, or the 120 reviews included in the work by Huston and McFarlane [65] to describe the health benefits of Tai Chi, given that 51 of their reviews are not exclusive to this activity.

It is interesting to note that a large number of systematic reviews and meta-analyses to date have not taken into account the modalities of practice embraced by TCC, but it is still more important to observe that in almost all of them it was not considered important to know the TCC style and form used in the studies when including and analysing them.

We consider that the distinction made in the present work, with regard to the studies included in the reviews between those that do or do not identify the TCC styles and forms used in the interventions, and their reclassification according to the three dimensions of official sports forms, simplified and traditional forms and therapeutic forms, represents a step forward in the clarification of what the limitations are to date in the present research framework associated with this activity.

Although Yang et al. [2] present a table in which they identify the TCC style and forms used in the studies and even mention a large number of studies which neither specify the style nor the form used in the intervention, we consider that the way the data are presented in this paper is a step forward. Here the TCC forms are distinguished according to the modalities belonging to this activity; differentiating which styles and forms are more commonly used in the studies selected for the reviews and their topics, and how many of them have not taken this aspect into account. It also clarifies the item of "modified form" in their work, by showing that a large number of these forms actually respond to the simplified forms format with their number, and therapeutic forms.

Before developing the discussion it should be pointed out that due to the lack of information found in the reviews as to what degree the TCC practice in the studies was of the martial variety, the following discussion will essentially be centred on the sports and therapeutic modalities of this activity.

4.1. Sports Modality

We consider within this modality both the official sports forms created by the Chinese government and the simplified forms, given that the latter, having been used in studies linked to the health context, cannot have been used with a martial reference and similarly, as there is no justification that they respond to forms purposely created to treat a determined pathology, do not belong to the therapeutic modality either.

Two important problems were identified within this modality:

a) The diversity of forms used in the intervention: The problem of the great diversity of styles and forms used in the research carried out on TCC has been identified by Burschka et al. [3], Larkey et col. [4], Wayne and Kaptchuk [5,6], and Yang et al. [2], as an important variable which conditions the interpretation of the results and leaves unclear the potential advantages and disadvantages of TCC.

According to Zhang [9] the modification of the exercises and number of movements in TCC is a reality which goes back to the very founders of the different styles. For example, Yang Luchang clearly modified the Chen style to create the Yang style, in the same way that Sun Lutang modified the Yang style to create the Sun style. This tendency became even stronger in the era of the Republic of China and the People's Republic of China under the pressure exerted by the western sports pedagogical model, the competition from the sports modality of Tai Chi Chuan, and the increase in the number of students of this discipline. It has been since this time that a multitude of variants (simplified or extended), combinations among them and even the creation of new modalities of practice, have arisen within each style.

Although we could somewhat agree that the variety in the TCC forms and styles can be a key variable when adopting the martial reference, given that each movement is important because it was intended with a martial application, and this was the starting point which differentiated the TCC styles; and even in the sports reference, given that it conditions the way the competition is scored and the physical demand it places on the practitioners, we consider that this vision is not suitable when the reference is the therapeutic modality or traditional and complementary medicine.

The problem of the TCC styles and forms loses its meaning regarding this latter reference for the simple reason that this distinction arose as we have said for martial, sports or pedagogical reasons and not for health purposes [9]. When the therapeutic dimension of TCC is considered, these variables are not important but rather the selection and sequencing of the exercises, the modifications and adaptations, the ease with which they can be learned and performed, the dose and progression to be followed as a function of the pathology, and the limitations of the person approaching the activity [7].

When this is the reference, the differences which could exist among the styles and forms with regard to the height of the postures, the pace, the amplitude of the movements or the sequencing of the exercises disappear, as these variables should be adapted in all of the above. From the therapeutic point of view it would be a mistake to want to associate the TCC styles and forms used with therapeutic benefits, as some authors appear to suggest, perhaps because of adopting a general vision of TCC without distinguishing among its practice modalities [2,4–6]. It is "*the pathologies which condition the TCC format to be used*".

b) The existing limitations when the challenge is intervention in the presence of disease: If it is taken into account that the topic chosen by many reviews is centred on analysing the possible benefits that TCC can bring to certain complex clinical pathologies like diabetes, multiple sclerosis, coronary heart disease, Parkinson's, schizophrenia, cancer, etc. [1–3]; that perhaps because of this the WHO [110,111] has identified TCC under the heading of "traditional complementary medicine"; and we add that a large number of elderly people are attracted to this activity, people who suffer or will suffer from certain pathologies even simply as a consequence of the natural physiological degeneration of aging, it could be thought that the simple use of TCC in its sports modality may be somewhat limited for satisfying this objective.

With the present investigation it has been possible to ascertain that most of the research on TCC uses the simplified 24-form, associated with the sports modality of the activity. A fact which coincides with the results of the work of Yang et al. [2], which they justify in the amount of promotion this form has been given by the Chinese government.

Although this modality makes perfect sense from the point of view of a sports modality and a gentle sport, and is able to generate healthy effects in its practitioners, its potential changes when it adopts the reference of a therapeutic modality for several reasons. This form includes exercises ("snake creeps through the grass" and "heel kicks") and transitions with rather unsuitable movements for elderly people or people with certain pathologies, if the pertinent modifications are not made or certain movements eliminated [112]. Furthermore, as it is a simplified form, it represents a reduced repertoire with regard to the number and variety of movements which the complete traditional form offers when it comes to purposely creating forms for intervening in different pathologies.

In a previous article, the authors of the present paper [7] defended the idea that TCC as a traditional and complementary medicine implies a step beyond simple wellness to adopt a new format for intervention, capable of treating disease with specific protocols and therefore going beyond the health benefits which any other physical sports activity can offer.

The limitations of the sports modality in therapeutic intervention derive in the first place from its objective. Sport usually aims to improve physical fitness (flexibility, strength, coordination, balance, endurance, etc.) and performance, or is for leisure and recreation, movement aesthetics, and even educational aspects, but not the treatment of disease.

In therapeutic intervention, practice should be accessible and beneficial not only for all ages, but also for any person whatever their disease. This demands individual treatment instead of the group class, and individualised intervention even when dealing with the same disease. Furthermore, if the practice of TCC in its sports modality was not designed to treat disease, it would be logical that with regard to providing health benefits, in many diseases it would only work with a percentage of subjects and not all of them. In therapeutic intervention every body, every individual subject, should get the benefits of this practice, so that the adaptation and personalisation of the form should be imperative.

4.2. Therapeutic modality or traditional and complementary medicine

The number of forms identified in the studies which can be associated with the therapeutic modality of this activity is limited perhaps due to the fact that this context represents a new research field. It should be remembered that the association of TCC with CK, the true tradition associated since long ago with traditional Chinese medicine, arose in the middle of the 1980s at the height of the CK boom [7,14].

This study has only found five forms which seem to have been purposely created to prevent or treat certain pathologies, and the two forms which are most commonly used are Tai Chi Chih and Tai Chi for Arthritis. However, the doubt remains whether some of the other forms included in the table of simplified forms correspond to other purposely created forms like 12 form "Tai Chi STEP" [113,114], or 5-form Tai Chi Easy [115,116].

If we evaluate the therapeutic potential of these forms, the main common drawback that can be observed is that in practice, in the table of exercises that they propose, at the end they repeat "in a group and at the same pace" the same movements originally created by Yang Luchan; movements which we know were created for fighting and not for "curing". With the exception of Li Fuzhong [117] little information is offered about the reason for the selection of the exercises and their sequencing, adaptations, modifications and teaching progressions and difficulties in the movements and sequences performed to tackle the diseases targeted and the limitations of the practitioners.

Moreover, in the case of some of these forms, important weaknesses can be observed that were pointed out by Li [117] in the year 2003 in his criticism of "Tai Chi Chih": they include movements (like kicks) which are not recommended for elderly people given the degenerative limitations and pathologies which they usually present, nor for people with certain illnesses; or somewhat unnatural transitions between the movements. Added to this are the doubts about being able to associate the health benefits or "improvements in an internal organ" with one single exercise more than the whole sequence of movements, or to what extent the continued repetition of the same exercise with controlled breathing can be harmful or counterindicated for some types of practitioners who suffer from for example, tendonitis, osteoarthritis of the knee or heart problems.

When TC is used with medicinal or therapeutic aims, more than selecting movements or performing parts of complete TCC forms in a group at the same pace (movements which it must be remembered had originally been designed with a martial and not a therapeutic objective), it would be more appropriate to:

- Justify which exercises are the most appropriate for the respective pathology and which should be avoided, modified or adapted, as well as detailing a minimum number of movements which should be performed if it is necessary to ensure a minimum of practice time to achieve the desired effects and not to expect effects to be produced through simple memorisation and repetition.
- Determine what the dose should be like in terms of intensity, speed, number of sessions and practice time and how it should be progressively adapted and modified depending on the evolution of the practitioner in their illness and their mastery of the motor actions in order to avoid risks and work with a minimum of safety.
- Give guidance as to how much practice is necessary or with what minimum quality of execution the benefits that this activity can offer could begin to be felt, or really work on the personal problems of the practitioner; for example, the minimum quality of relaxation (calm heart rate and natural breathing in the movement), balance or harmony that should be achieved.
- Take into account that the way the activity is performed is not the

same at all ages or even at the same age. For example, in an intervention with older people it is normal that in the same group there are individuals with different pathologies or who suffer from more than one illness and thus, practice should be absolutely tailored to the particular situation.
– Add in the introduction of the principles of CK into TCC the selective reference which should be adopted is the notion of the real therapeutic value or benefits which the different methods of breathing, imagination, visualization, relaxation etc. bring to every person according to their age, physical fitness or pathology, and describe how the principles of internal and external harmony and the notions of yin and yang have been incorporated in the form, i.e. what, how and where relaxation should occur in each movement.

In this last line of thought, it should be underlined that CK is a serious topic which can negatively affect the internal physiology of the person when it is not performed correctly [14,16,118,119]. As we see it this practice modality requires professionals who have mastered both the practice of medical CK, and the "original" TCC format, to be able to make the necessary adaptations for each individual.

Although these forms may seem new formulas for intervention in the end they are also simplified forms that hardly differ in their performance from the format used in the sports or traditional forms and in their working objectives respond to pathologies that have already been seen to improve with physical exercise (balance-prevention of falls) [120–124]; diabetes [125–129]; and osteoarthritis [130–134].

Even though these forms represent important efforts to approach the therapeutic potential of this activity, and each form is reinforced with research that shows the positive effects it produces, we consider that the true challenge resides in having available practice formats which are more efficient than other physical-sports activities, capable of facing complex diseases and going beyond simple prevention or maintenance of health, to benefit any person suffering from a disease.

4.3. Studies which omit information on the TCC style and form used

A final aspect which should give rise to serious reflection is the high number of reviews which use the data from studies which have not identified the TCC style and/or form used for the intervention.

Although the review by Yang et al. [2] had already indicated this problem the present article goes a step forward by identifying two realities: the percentage of studies which omit this information but which are used for analysis, together with studies which do provide these data, and the reviews which offer no information whatsoever on this aspect from the studies selected.

This problem becomes even more striking when it is also observed that the topic of study is focussed on the effects of TCC on certain important pathologies.

Although this decision may be due to the complexity and diversity of forms and styles which make up TCC and the lack of information to tackle this aspect, the idea is also transmitted that it seems to be more important to show evidence of the positive effects of this practice than to research and delimit the conditions of practice which make them possible or not.

To simply decide or consider that "TCC favours…" after having explained the different practice modalities and conditions inherent in each one, implies omitting the information which can really contribute to clarifying the health and therapeutic potential of this activity. As indicated, the selection of the exercises, their modification and adaptations, etc. are the key variables of therapeutic intervention which the researcher needs to know to be able to interpret the results, offer advice and even make comparisons within the activity and also with other healthy physical and sports practices.

For this limitation to be overcome, it is important for the studies to take into account and indicate when selecting and describing the forms used in the interventions:

– The intention of the practice, i.e. martial (efficiency in combat, mastery of the eight internal forces), sports (carrying out a healthy physical-sports activity, improving performance or physical fitness or participating in a competition), or related to traditional and complementary medicine (preventing or treating a determined pathology).
– If the form has some type of official recognition or not, i.e. it is a form supported by the Chinese Government through the National Sports Commission or the National Research Institute of Wushu; by public entities like the Universities or Faculties of Sport and Physical Education; by sports federations like the International Wushu Federation; by respected masters within TCC; or by researchers who have created these forms with their respective justification.

If this is not the case, it would be important to know who created this form, on what date, with what intention and how it is better than the former ones. This aspect will clarify that it should not be considered a new form when it is merely a simplification of an earlier form or the order of the movements has been changed. To be able to say that a form is new it should show variations in comparison with existing forms and justify the advantages of introducing this type of changes.

− If it is a complete form or simply extracts or movements of a complete form that have been strung together. In the latter case it is very important to identify the name of the movements chosen, describe with what criteria these movements and not others have been selected from the complete forms and their sequencing, illustrate the sequence to be able to assess if the form of joining the movements together is correct, and if adaptations have been introduced to treat certain pathologies or adapt to different population profiles (elderly, people with disabilities, people suffering from disease…).

− If the number of movements which are included in the form refers to each of the movements made by the practitioner or a movement is made up of a set of movements as in the traditional form. When the masters created their TCC forms they identified each movement with a more or less extended set of motor actions, but later on, the way of counting the movements varied so that, for example, today the complete form of the yang style is identified by three different numbers: 108, 88 and 85 movements.

Given that in the end all TCC forms used in the interventions represent a simplification or a selection of movements chosen from the traditional complete forms, we consider that the best way to refer to the movements is to use the name given by each master when creating his style of practice.

− It would be useful if some indication were given to whether the therapeutic forms used are evidence based, i.e. needing a minimum length of practice and therefore a minimum number of exercises, and a selection of movements which have shown their benefits for a certain pathology; or whether they are being tried out.

5. Conclusion

The reviews currently being written about TCC do not differentiate the three practice modalities (martial, sports and therapeutic) which this activity embraces when delimiting and interpreting its effects on the health of the practitioners. Furthermore, the analyses indiscriminately mix the effects of forms associated with the different modalities and thus contribute to maintaining a partial and confused view of the scope and potential benefits offered by this activity.

A large number of reviews on TCC use studies in their analysis which have not correctly identified the TCC style and form used in the intervention. The current research context in the field of TCC should go beyond indicating the positive effects associated with this activity to begin to investigate and delimit the conditions and variables which make these benefit possible or not.

When the styles and forms used in the research studies on TCC are distinguished, it can be seen than the forms associated with the sports

modality, and particularly the simplified 24-form, are the most commonly used in the investigations, while the forms linked to the therapeutic modality are very limited in number. Thus the health benefits currently associated with TCC are more related to the use of TCC as a gentle sport than as an activity purposely designed to intervene in certain pathologies.

Each practice modality associated with Tai Chi Chuan demands a specific and differentiated research frame-work to be able to understand its true benefits and potential. The implanting of a research frame-work for developing the therapeutic modality of TCC will be one of the conditions which will permit this activity to progress from the field of wellness to that of health care.

Conflicts of interest

The authors declare they have no conflicts of interest.

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