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Intervention fidelity in Qigong randomized controlled trials: A method review



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ABSTRACT

Intervention fidelity has important implications for the reliability and validity of a study. Despite the widely reported health benefits of Qigong exercise interventions, the quality of intervention fidelity is less clear. The purpose of this paper is to use a valid intervention fidelity assessment tool to evaluate how intervention fidelity has been addressed in five areas—design, training, delivery, receipt, and enactment—in Qigong randomized controlled studies. A total of 86 articles were drawn from CINAHL, PubMed, AMED, and Scopus, and 32 were selected for the review. The adherence to intervention fidelity strategies within the intervention design, training, delivery, receipt, and enactment was 0.66, 0.32, 0.22, 0.12, and 0.21, respectively. The findings suggest that intervention fidelity is inadequately implemented or reported in published Qigong studies. Developing a consistent intervention fidelity plan for Qigong interventions is needed. To this aim, we propose a treatment fidelity plan specific to Qigong research.

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Introduction

Qigong exercise, a Chinese traditional medicine exercise, has been practiced widely in Asia to promote wellness of the human mind, body, and spirit. It is a gentle, low-impact exercise that is particularly suitable for older adults.¹ Qigong exercise consists of a series of movements that flow in a continuous sequence and integrate mental concentration.² The function of the movements is to guide breathing patterns and to circulate vital energy flow, called “Qi,” throughout the body to achieve harmony of the body.³ The theoretical underpinnings of Qigong exercise claim that the body is a small universe which possesses Qi, a vital energy. This energy can be disturbed by illness or injury. Qigong exercise is believed to be a method of bringing vital energy circulation into balance through meditation, breathing exercises, and bodily movements.^{4,5} The beneficial effects of Qigong exercise on physical function, psychological health, and the quality of life of older adults have been

reported.^{6–8} Despite well-reported benefits of Qigong exercise, methodological issues have been noted in systematic reviews and meta-analyses of randomized controlled trials using Qigong exercise. A major methodological issue is the quality of intervention fidelity.^{1,2,9–11}

Intervention fidelity is the ongoing assessment and monitoring in a study that helps to enhance reliability and internal validity.¹² The process helps to ensure that an intervention or a treatment has been implemented as intended and that the interventions have been accurately tested.¹³ Intervention fidelity plays a critical role in research, as it affects the internal and external validity of study findings, as well as the effect size of a tested intervention and statistical power.¹⁴ Intervention fidelity also helps to increase confidence that the changes in the outcome of interest have resulted from manipulation of the independent variables rather than effects of potential confounds.¹⁵ A set of recommendations and guidelines for intervention fidelity was established to assess health behavior interventions in five areas: intervention design, training providers, intervention delivery, receipt, and enactment (Table 1).^{13,16} The definitions, specific strategies, and examples of each intervention fidelity area were described in published papers.^{15,16}

Despite the importance of intervention fidelity, few reviews and a meta-analysis suggest that the methodological issues related to intervention fidelity in Qigong studies need to be addressed.^{1,2,9–11} The issues include inadequate information on design and details of Qigong intervention (intervention design); lack of reported training for

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Table 1
Percentage of articles reporting intervention fidelity strategies.

| Intervention fidelity strategies | % including | N of articles included |
|--|-------------|------------------------|
| Intervention Design | | |
| 1. Treatment dose of the intervention condition | | |
| Length of contact | 97 | 32 |
| Number of contacts | 91 | 32 |
| Content of treatment | 100 | 32 |
| Duration of contact over time | 91 | 32 |
| 2. Treatment dose of the comparison condition | | |
| Length of contact | 35 | 31 |
| Number of contacts | 35 | 31 |
| Content of treatment | 42 | 31 |
| Duration of contact over time | 84 | 32 |
| 3. Mention of providers' credentials | 81 | 32 |
| 4. Mention of theoretical models | | |
| Active ingredients are specified & incorporated into the intervention | 77 | 31 |
| Use of experts or protocol review group to determine whether the intervention protocol reflects the underlying theoretical model | 23 | 30 |
| 5. Potential confounders are identified | 65 | 31 |
| 6. Possible setbacks in implementation | 6 | 32 |
| 7. If more than one intervention is described, all described equally well | 100 | 10 ^a |
| Providers' Training | | |
| 1. Description of how providers are trained | 4 | 13 ^b |
| 2. Standardization of providers' training | 0 | 13 ^b |
| 3. Assessment of provider skill acquisition | 8 | 13 ^b |
| 4. Assessment & monitoring of providers' skill maintenance over time | 8 | 24 |
| 5. Characteristics being sought in a treatment provider are articulated | 72 | 32 |
| 6. At the hiring stage, assessment of whether or not there is a good fit between the provider and intervention | 8 | 13 ^b |
| 7. A training plan takes into account trainees' differences in terms of education, experience, and learning style | 0 | 7 ^c |
| Intervention Delivery | | |
| 1. Ensure the intervention content is delivered as specified | 66 | 32 |
| 2. Ensure the dose of the intervention is delivered as specified | 9 | 32 |
| 3. Assess if providers actually adhere to the intervention plan | 9 | 32 |
| 4. Assessment of non-specific treatment effects | 6 | 31 |
| 5. Use of treatment manual | 84 | 32 |
| 6. Assess whether or not the active ingredients are delivered | 7 | 30 |
| 7. Assess whether or not proscribed components are delivered | 6 | 31 |
| 8. There is a plan of how contamination between conditions are prevented | 7 | 30 |
| 9. There is an a priori specification of treatment fidelity | 0 | 32 |
| Intervention Receipt | | |
| 1. Assess the degree to which participants understood the intervention | 13 | 32 |
| 2. A strategy used to improve participants' comprehension of the intervention | 25 | 31 |
| 3. Assess participants' ability to perform the intervention skills | 9 | 32 |
| 4. A strategy used to improve participants' performance of intervention skills | 9 | 32 |
| 5. Multicultural factors are considered in the development & delivery of the intervention | 0 | 24 ^d |
| Enactment | | |
| 1. Assess participant performance of the intervention skills in the setting in which the intervention might be applied | 0 | 32 |
| 2. A strategy used to assess performance of the intervention skills in the setting in which the intervention might be applied | 34 | 32 |

^a Only 10 studies have more than 1 intervention.

^b 13 studies used instructors other than Qigong masters to deliver the interventions.

^c 7 studies using instructors other than Qigong masters were conducted in countries other than Asia.

^d Studies conducted in countries in Asia were excluded.

interventionists who deliver Qigong interventions (training providers); lack of sufficient instruction and supervision to ensure success and compliance in Qigong practice (intervention delivery and receipt); and lack of clear frequency of practicing Qigong at home (enactment).^{1,2,9–11} Therefore, a systematic examination of intervention fidelity in Qigong randomized controlled studies is needed. The purpose of this paper was to evaluate how all five areas of intervention fidelity have been addressed across Qigong randomized controlled studies using a structured and valid intervention fidelity assessment tool.¹⁵

Methods

Search methods

All randomized controlled Qigong trials (RCTs) were included initially. A search with the words 'Qigong' and 'randomized controlled

trial' as subject headings or keywords yielded 86 articles from the CINAHL, PubMed, AMED, and Scopus databases. No date restrictions were used to filter the searches. After removing 27 duplicate articles, 59 articles remained for further screening. A set of inclusion criteria was established prior to filter the articles. To be selected for inclusion, a study was required to: (1) be published in English; (2) be a RCT; and (3) use Qigong exercise as an intervention. We excluded articles that were: (1) commentary, reviews, meta-analyses, Qigong protocol, and qualitative research; and (2) using Tai Chi Qigong, Qigong massage and external Qigong as an intervention. Because the combination of these exercises could result in a different study design and intervention development and articles that assessed Tai Chi Qigong were excluded. Furthermore, Qigong massage and external Qigong rely on a trained Qigong master to emit and circulate Qi, the vital energy, on participants for treatment. Their underlying mechanisms are different than Qigong and studies that included these interventions were

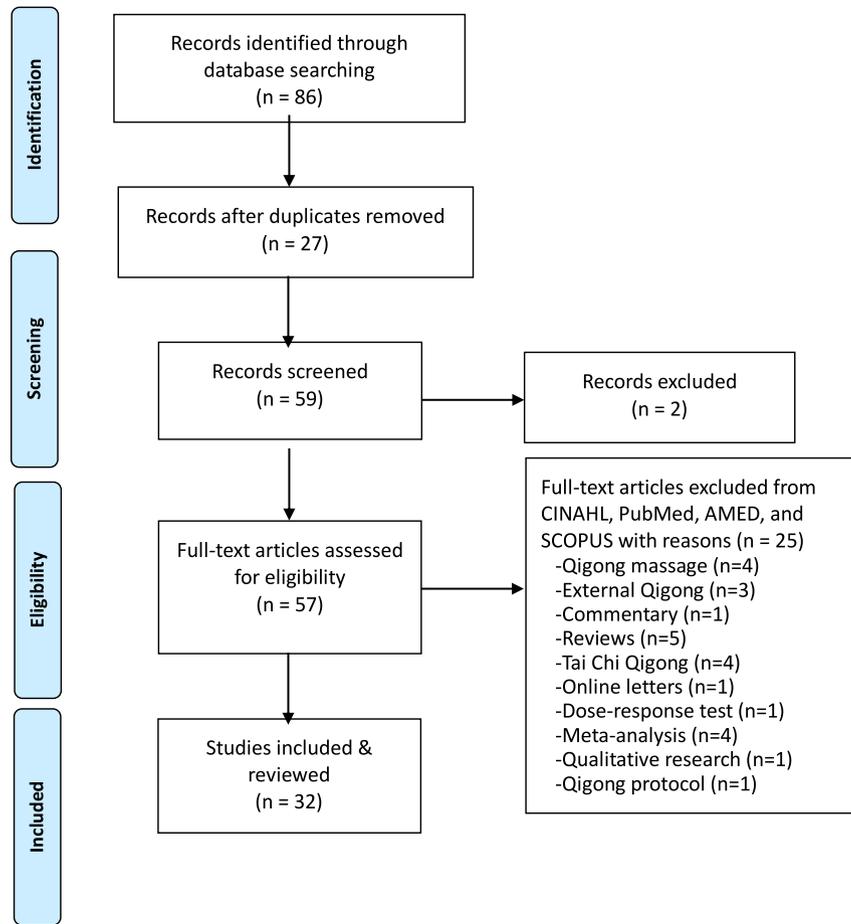


Fig. 1. Flow chart of paper selection.

excluded.¹ Of 59 articles, 57 full-text articles were located and reviewed for inclusion. A total of 25 articles were excluded due to these reasons: Qigong massage (n=4); external Qigong (n=3); commentary (n=1); reviews (n=5); Tai Chi Qigong (n=4); online letter (n=1); dose-response test (n=1); meta-analyses (n=4); qualitative research (n=1); Qigong intervention protocol (n=1). A final number of 32 studies were selected for review (Fig. 1).

Intervention fidelity checklist and coding process

A total of 32 articles were reviewed by the three authors (PC, AC, MJ) independently. Information regarding intervention fidelity in all articles was extracted using an intervention fidelity assessment tool, the Treatment Fidelity Assessment and Implementation Plan Checklist (Table 1) developed by Borrelli and colleagues.¹⁵ This checklist contains a total of 29 strategies used to enhance or preserve intervention fidelity in 5 areas (design, training, delivery, receipt, and enactment), with 7 strategies for treatment design, 7 for training providers, 9 for delivery of treatment, 5 for receipt of treatment, and 2 for enactment of treatment skills.

The coding of articles began in March 2013 and ended in July 2013. A coding checklist, including definitions of the intervention fidelity areas and examples,¹⁶ was used to extract information from each article. The authors used the checklist to determine the presence or absence of strategies identified within each of the five areas. Articles were reviewed using a series of examples to decide whether the article met the criteria for the particular component under each area of intervention fidelity.¹⁶ For example, the criteria of assessing intervention delivery included: 1) direct observation of randomly selected sessions,

2) corrections of problems observed in delivery of interventions, or 3) documentation of classes and hours taught. For intervention receipt, documentation of participants' performance of Qigong exercise or exit interviews with participants were searched.¹⁶ Intervention fidelity information was judged and coded as either 'present', 'absent but should be present', or 'not applicable'. For example, if videos were used to deliver the intervention, this study would be coded as 'not applicable' in the providers' training category because there were no human intervention instructors to be trained. Such studies would not be included in the denominator when computing the analysis. Moreover, the majority of Qigong studies using Qigong masters with years of teaching experience to deliver the interventions were coded as 'not applicable' for components 1, 2, 3, 6 and 7 in the area of providers' training (Table 1), as the authors agreed that the movements of Qigong exercises are unique and it requires years of training to become a Qigong master. In the area of intervention receipt, component 5 would be considered 'not applicable' when the studies were conducted in Hong Kong, South Korea, or China, as Qigong exercise is well recognized in Asian culture. Articles were coded independently by the authors, who met together to discuss and resolve any discrepancies.

Analytic plan

First, the proportion of studies reporting intervention fidelity in each area was calculated by dividing the number of articles that reported the particular strategy by the total number of articles for which the strategy was considered reportable:

$$\left(\frac{\text{\# of articles that report the particular strategy}}{\text{Total \# of articles that report the particular strategy that was considered applicable}} \right).$$

For example, if training providers was not applicable to a particular study,

this study was not included in the denominator. Next, the articles with the greatest adherence to fidelity strategies (>70%) were identified by the total number of strategies that were presented in each article, divided by the sum of applicable fidelity strategies (coded as present and absent) in each article. The third analytic plan was to determine the adherence rate to intervention fidelity strategies of the five areas. The mean proportion of adherence to intervention fidelity across 5 areas was calculated by dividing the sum number of present fidelity areas (intervention design, training providers, intervention delivery, receipt, and enactment) by a total number of present and absent areas in all articles

$$\left(\frac{\text{Sum \# of 'present' strategies of all articles in each fidelity area}}{\text{\# of 'present' \& 'absent' strategies of all articles in each fidelity area}} \right).$$

Results

Study characteristics

Qigong interventions have been studied in various populations with hypertension, type 2 diabetes, muscular dystrophy, fibromyalgia, Parkinson's disease, chronic fatigue, chronic neck pain, COPD, psychological distress, and knee arthritis. The studies included participants with a mean age range from 22.4 to 82 years. The length of Qigong interventions ranged from 4 days to 12 months. The control interventions included newspaper reading, cognitively oriented behavior rehabilitation, usual care, wait list, conventional exercise, progressive resistance training, walking exercise, and stretching exercises.

Intervention fidelity

Table 1 presents the percentage of articles that reported each intervention fidelity strategy across the 5 areas. The variation of the use of intervention fidelity strategies was wide. Items within the intervention design category ranged from 6% to 100%, among which only 23% of Qigong studies reported the underlying theoretical model of the intervention protocols. Items within the providers' training category ranged from 0% to 72%, within the intervention delivery category from 0% to 84%, within the receipt category from 0% to 25%, and within the enactment category from 0% to 34%.

Intervention fidelity strategies that were reported in greater than 80% of Qigong studies were mostly in the intervention design domain: 1) equal descriptions of the interventions when more than one was used (100%); 2) the treatment dose of the intervention condition (91–100%); 3) the duration of contact over time in the comparison condition (84%); and 4) mention of providers' credentials (81%). One item from another domain was the use of an intervention manual (84%) in the intervention delivery domain. The lowest percentages of intervention fidelity strategies reported were within the areas of providers' training, intervention delivery, and intervention receipt, with less than 10% of fidelity strategies reported or used. These items included: ensuring that the dose of the intervention is delivered as intended (9%); the assessment of providers' adherence to the intervention plan (9%); assessment of providers' skills acquisition (8%); assessment and monitoring of providers' skills maintenance over time (8%); the assessment of a good fit between the provider and intervention at the hiring stage (8%); the assessment of whether the active ingredients are delivered (7%); the plans for contamination prevention (7%); the assessment of non-specific treatment effects (6%); the assessment of whether proscribed components are delivered (6%); and the description of providers' training (4%). Fidelity strategies that were not reported include 1) standardization of providers' training; 2) a training plan that takes into account trainees' differences; 3) a prior specification of treatment fidelity; 4) consideration of multicultural factors; and 5) assessments of participants' intervention skills performance.

Table 2

Proportion of adherence to intervention fidelity strategies in all articles.

| Category | Mean proportion |
|----------------|-----------------|
| Design | 0.66 |
| Training | 0.32 |
| Delivery | 0.22 |
| Receipt | 0.12 |
| Enactment | 0.21 |
| Mean adherence | 0.31 |

The mean proportion of Qigong studies that adhered to fidelity strategies in the five areas is presented in Table 2. The average proportion of adherence to the fidelity strategies within the design area was 0.66 with the maximum value of 1. The lowest mean adherence was found in the receipt area, where only 0.12 of strategies were reported. The mean proportion of intervention fidelity adherence in the training, delivery, and enactment areas was 0.32, 0.22, and 0.21, respectively. The overall mean adherence to strategies in the five areas of intervention fidelity was 0.31. Of the total 32 Qigong studies included, only one study had 70% or greater adherence.¹⁷ In this article, the percentage of adherence to the design, training, delivery, receipt, and enactment was 79%, 100%, 78%, 40%, and 50%, respectively.

Discussion

Intervention fidelity strategies are key elements to ensure that an intervention has been implemented as intended and been accurately tested, which results in the reliability and internal validity of a study's findings. The purpose of this paper was to evaluate how the intervention fidelity was reported in RCTs using Qigong. To date, this is the first review that systematically assessed how intervention fidelity has been reported and addressed in Qigong RCTs. The findings of this review indicate that the reporting or implementation of intervention fidelity in Qigong intervention research is insufficient and needs to be improved.

The intervention fidelity strategies within the intervention design area are poorly reported, where 0.66 of strategies were reported (Table 2). Mean proportions for another four fidelity areas are less than 0.35, which means that less than 35% of strategies identified in the intervention fidelity checklist within the training, delivery, receipt, and enactment areas are addressed or reported. The most commonly seen omissions of intervention fidelity strategies include training of providers, intervention delivery and receipt, and enactment of intervention skills. Similar omissions were also found in a systematic review of yoga interventions.¹⁸

The theoretical model is essential for interpreting the study's outcomes, understanding the findings, and leading to the meaningful relationship between the interventions and the findings.¹⁹ Despite its importance, we found that the theoretical underpinnings of Qigong exercise were often missing. No included studies stated that they used theoretical models or theories to guide the study design or outcome measures. Such omissions could be due to little existing literature that provides a comprehensive theoretical background of Qigong exercise. Lack of a theoretical model could result in missing the important finding relevant with the intervention effect. Chang et al.²⁰ used the Layers Model²¹ to guide the outcome measurement in a Qigong exercise study and the findings revealed a positive relationship between meditation and spiritual well-being, as well as mental health, of older adults. Their study highlighted the crucial role of a theory in interpreting study outcomes and providing meaningful links between the interventions and findings.

The standardization of providers' training and use of a training plan were underreported as well. Thirteen studies used physical therapists or teaching assistants of a Qigong master to deliver the

intervention. Less than 9% of the articles described how providers were trained and how their skills were monitored and maintained across the course of the interventions. Likewise, in studies with Qigong masters as instructors, researchers provided the masters' credentials but often did not describe the Qigong masters' previous or current training, the assessment of their skill acquisition, and skill maintenance during the study. Intervention instructors' previous training and knowledge with Qigong exercise may be important to clarify and answer participants' questions regarding the critical components of Qigong exercise – breathing exercise, body movements, and meditation. This may also be important for participants' retention, attendance, and satisfaction with Qigong interventions.²² The importance of instructors' selection was also indicated in studies with yoga interventions, where studies have shown that instructors play a critical role in mediating the study results and participants' motivation to complete the intervention sessions.¹⁸

Intervention delivery and receipt were least likely to be reported. The majority of Qigong RCTs lacked direct observation of intervention sessions, assessment of participants' Qigong performance, and use of an exercise log; hence, an accurate amount of content and doses delivered and the degree of providers' adherence to the planned intervention were unclear. This resulted in difficulties assessing the delivery of active intervention ingredients. While the majority of Qigong RCTs encouraged the participants to practice outside the class, most did not include assessment of the participants' performance. Because Qigong exercise has unique movements, it is critical for participants to receive feedback or corrections from the Qigong instructors to improve their comprehension and performance.²² Participants' comprehension and performance were found to potentially impact adherence to home practice.²² Other than body movements, breathing exercise and meditation are active and critical components of Qigong interventions, and should be included in assessments of intervention delivery and receipt.²³

Additionally, the enactment was not properly assessed in most studies. Only 34% of studies reported using an exercise log to record participants' Qigong practice outside the study. Most studies either

did not report participants' home practice or how participants' home practice was tracked. Exercise logs were often not used to assess participants' actual exercise at home. No studies included in this review incorporated the use of a technological activity log (e.g., mHealth). Without using an exercise log, the correct doses of Qigong practice at home cannot be recorded and incorporated into the interpretation of research outcomes, which may result in bias in a study's findings.

Quality intervention implementation is vital to maximize the intervention effects and health outcomes of target populations.²⁴ For example, Cheung et al.¹⁷ had an intervention fidelity adherence rate of 70% and reported significant blood pressure reductions. Yet, due to the overall low adherence rate of intervention fidelity across studies reviewed in this paper, we cannot determine the relationship between research outcomes and fidelity adherence rates. However, it was reported previously that interventions implemented with fidelity resulted in 2 to 3 times higher mean effect sizes, which indicated that the treatment fidelity was highly associated with intervention outcomes.²⁵ Similar positive impacts of high quality of treatment fidelity were reported elsewhere.²⁶ Furthermore, the unclear implementation of treatment fidelity could compromise study outcomes, leading to the heterogeneity outcomes when synthesizing data from individual RCTs.²⁷

Suggestions for future research

Monitoring and assessing intervention fidelity in efficacy trials plays an important role in interpreting the validity of relationships between the interventions and study outcomes, and ruling out alternative explanations that could influence the study outcomes. Our review indicates the immediate need to develop treatment fidelity plans for future studies with Qigong exercise interventions. The body of literature on complementary and alternative exercise would benefit from a consistent treatment fidelity plan. We suggest the model of treatment fidelity created by the Behavior Change Consortium Treatment Fidelity Workgroup to develop treatment plans tailored to Qigong interventions.¹⁶ A summary of the recommended treatment

Table 3
Intervention Fidelity Plan for Qigong Interventions.

| Treatment fidelity focus | Recommendation |
|--------------------------|--|
| Design | The Qigong interventions development is based on the theory and the content validity of Qigong intervention need to be evaluated by experts in Qigong exercise practice or research. Assessors/evaluators are blinded from the Qigong intervention. |
| Training | The comparison interventions are designed for participants to receive the equal attention. The development of training plans takes trainees' education, culture, and experience with Qigong exercise into account. The training plans for physical therapists or lay persons have considered their previous experiences with Qigong exercise. Standardized plans are developed to evaluate instructors' skills acquisition and maintenance across the course of the interventions. Instructors have regular month meeting (either in-person, telephone call, or zoom meeting) with the PI to discuss intervention sessions, any observed problems to prevent intervention drift. |
| Delivery | When instructors (Qigong masters) are employed, their previous trainings should be included based on a training protocol. Direct class observation and active comparison groups are used to minimize and assess potential non-specific treatment effects that may influence participants' behavior or expectations of study outcomes. Instructors take field notes (including any observed problems regarding intervention delivery and adverse events) during sessions and reports to the PI. The actual Qigong sessions and hours taught are documented. |
| Receipt | Direct observation of randomly selected session is conducted to document participants' performance of Qigong exercise in class and to assess if the active components (body movements, breathing exercise, and meditation) are delivered. The Qigong session protocol is created to ensure the intervention and the dose is delivered as specified. Informal weekly discussion is performed with an individual participant to understand their Qigong practice at home. |
| Enactment | Educational materials, Qigong movement video, and instructors' feedback are used to facilitate participants' comprehension. Each participant is required to sign in for each Qigong session. Weekly phone call with participants is conducted to understand their ability, challenges or barriers to practice breathing exercise, body movements and meditation. Participants are required to complete daily exercise logs to track the frequency of home practice. Weekly phone call with participants is conducted to understand their home practice. |

Note. PI=principle investigator.

fidelity plans with regard to design, training, delivery, receipt, and enactment based on the findings of the current review is presented in Table 3. We suggest that the development of training plans take trainees' education, culture, and experience with Qigong exercise into account when studies are conducted in countries outside of Asia.²² Furthermore, developing a tool similar to the Dartmouth Assertive Community Treatment Scale²⁴ is needed to guide the implementation of Qigong treatment fidelity plans and ensure implementation quality.

To preserve the validity of findings in future published Qigong studies, we recommend that researchers provide clear descriptions in relation to the components of treatment fidelity, including intervention design, training of instructors, intervention delivery and receipt, and enactment.¹⁶ First, the rationale for the inclusion of active intervention components should be included if they are not derived from a theory (intervention design).¹⁹ Second, providers' professional credentials, training specific to the intervention, and characteristics relevant (instructors training) to successful intervention implementation should be provided, as they are necessary to determine confounders or threats to validity of the findings. Third, the details of procedures, techniques, and materials used to facilitate participants' comprehension and practice at home (intervention receipt and enactment) should be included in the published Qigong studies, because the majority did not report the assessment of participants' performance of the Qigong movements at home. Information concerning the actual amount, intensity, frequency, and duration of an intervention that participants received (intervention receipt) should be reported, as these factors potentially have critical influences on the validity of study outcomes. Finally, the quantity and methods of intervention delivery, such as by telephone, Internet, or group discussion (intervention delivery), should be included in a study's report to ensure the accurate interpretation of its outcomes.

Suggestions for addressing treatment fidelity in older adults

We recommend several strategies that can be used to enhance intervention delivery, receipt, and enactment in older adults. The Qigong instructors' role is important for participants' retention, attendance, and satisfaction with Qigong interventions.^{18,22} To address intervention delivery and receipt, we suggest that instructors be aware of older adults' physical limitations resulting from aging or chronic conditions and give feedback on their performance of Qigong exercise movements accordingly. The instructors should ask older participants for questions regarding the Qigong exercise movements, breathing exercise, and meditation, as well as any barriers to performing the exercise in sessions or at home. A checklist for intervention receipt that includes the components of eight Qigong body movements, breathing exercise, and meditation can be developed to understand older participants' ability to perform. Any questions and barriers should be answered and solved immediately. The real-time feedback may improve older adults' adherence to home practice, resulting in better intervention enactment.²² The environment selection for exercise sessions is also critical for improving the intervention delivery and receipt in older adults. We suggest conducting the Qigong exercise sessions in a room that is quiet and equipped with mirrors. Chang et al.²² reported that American older participants in their Qigong exercise study indicated that mirrors greatly facilitated their learning and performance of Qigong exercise, as they could compare their movements with those of the instructors. The quiet environment helps them to hear the instructions clearly and to perform meditation easily.²² For studies that enroll older adults and which want to enhance the intervention enactment, weekly phone interviews using a 7-Day Physical Activity Record can more accurately track the frequency and amount of Qigong home practice and

further minimize the possibility of low return rates or omissions in exercise logs.²⁸

Limitations

Although several intervention fidelity issues are identified, there are limitations to this review. The strategy for the literature search might not be inclusive. Another limitation to this review is that the reasons for the poor quality of intervention fidelity cannot be ascertained; they could include intentional or unintentional inadequate intervention fidelity implementation by the researchers, lack of reporting intervention fidelity despite satisfactory implementation, or journals' policies such as page limits. Although this review cannot infer the reasons for the poor quality of intervention fidelity, the findings highlight the great variation in reporting or implementing intervention fidelity among Qigong studies.

Conclusion

Assessment of intervention fidelity is important for the validity of Qigong studies, as low intervention fidelity can influence interpretation of the effects of Qigong interventions. The findings of this review reveal that intervention fidelity is inadequately assessed and/or reported in most published Qigong RCTs. The intervention delivery, receipt, and enactment of intervention skills are less likely to be found in the included Qigong studies; hence, developing an intervention fidelity plan tailored to the needs of Qigong interventions is indicated. The strategies, including using a quiet room with mirrors, checklists for Qigong exercise components, 7-Day Physical Activity Record, and real-time feedback on the challenges and barriers, should be employed in the treatment fidelity plan of Qigong studies that enroll older adults. Improved conduct and reports of intervention fidelity would result in more accurate interpretation of the efficacy of Qigong interventions.

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Supplementary materials

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