

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Effect of a Real-Time Feedback Smartphone Application (TCPRLink) on the Quality of Telephone-assisted CPR Performed by trained laypeople in China: A manikin-based randomized controlled study
AUTHORS	Dong, Xuejie; Zhang, Lin; Myklebust, Helge; Birkenes, Tonje Soraas; Zheng, Zhi-Jie

VERSION 1 - REVIEW

REVIEWER	Jonathan Duff University of Alberta
REVIEW RETURNED	23-Apr-2020

GENERAL COMMENTS	<p>Review: Effect of a real time feedback smartphone application (TCPRLink) on the quality of layperson telephone-assisted CPR performance BMJ Open</p> <p>General Comments:</p> <p>Thank you for the opportunity to read your manuscript. The paper describes the use of a smartphone application that can not only provide local feedback on CPR rate but also link with a CPR dispatcher. One of the study's strengths is that the authors not only looked at performance but retention 3 months post-initial intervention.</p> <p>I have a number of general comments:</p> <ol style="list-style-type: none">1) The authors do a good job summing up the study's findings succinctly. There are a number of grammatical errors that make reading parts of the manuscript tricky. I have not identified all of these but a read-over with that lens would help improve readability.2) Can the authors provide a picture of the app in action? It was difficult to understand exactly what it was doing until I looked it up on the app store.3) I think the conclusions of the study are too strong given the results. Yes, there is a statistical difference in CC rate between the two groups but is a median of 111 vs. 108 different enough clinically to be relevant? The advantage of the app may have more to do with the offloading of cognitive load (ie, not having to count compressions).
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	<p>4) Can the authors provide more detail into what was done at the 3-month assessment? They state they were in the same randomization group – did they receive the same amount of feedback as was provided in the first intervention.</p> <p>5) In Table 1, the p-values are not necessary as the groups were randomized.</p>
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REVIEWER	Wolfgang A. Wetsch University Hospital of Cologne, Department of Anaesthesiology and Intensive Care Medicine, Cologne, Germany
REVIEW RETURNED	19-Jun-2020

GENERAL COMMENTS	<p>This is a manikin-based study to determine the effect of a free smartphone app (TCPR Link), wh on the quality of telephone-assisted CPR. 168 persons performed CPR with either the app, or t-cpr alone. Primary Outcomes were chest compression rate and % of adequate CC's during a 6-in compression only CPR in a manikin. The authors found that use of CPRLink improves resuscitation quality compared to T-CPR alone, both immediately and 3 months later.</p> <p>Ethics approval is stated in the manuscript.</p> <p>There are some aspects of the study that Need to be discussed before publication:</p> <ul style="list-style-type: none"> - you have recruited participants from individuals who have decided to take a CPR course. Even though These were not HealthCare Providers, it must be assumed that they may have more knowledge than the "standard layperson". They were used in both Groups so this does not create a direct bias, but the resulty may not be generalizable for all laypersons. - Did the partiocipants give written consent? Did they give consent to be recorded on video? (P7 L55 ff) Please give Details - I do not see a sample size calculation. Was this done a priori? Please give Details - Was the study registered at a study register prior to the beginning? Please give details <p>Specific comments: P6 L53 "the" - please check spelling, there is a special character P7 L9 please rephrase "Body movement movements" P9 L27 Coaches</p> <p>References There are several recent studies on Video-CPR (which is totally missing in the discussion) and dispatcher-assisted CPR using different apps. Please re-do your iterature search and give actual citations.</p>
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VERSION 1 – AUTHOR RESPONSE

Reviewer #1: Dr. Jonathan Duff

We appreciate Dr. Duff for his careful review and thoughtful comments. We believe that the correction and modification we have made in response to the reviewer's comments have made this a stronger manuscript. We addressed all the comments raised by the reviewer as summarized below.

1. The authors do a good job summing up the study's findings succinctly. There are a number of grammatical errors that make reading parts of the manuscript tricky. I have not identified all of these but a read-over with that lens would help improve readability.

We appreciate the positive comments and we have paid special attentions to writing in the revision to ensure the readability of the manuscript. The revised paper has been carefully revised by professional language editing service-Editage to improve the grammar and readability.

2. Can the authors provide a picture of the app in action? It was difficult to understand exactly what it was doing until I looked it up on the app store. Can the authors provide a picture of the app in action? It was difficult to understand exactly what it was doing until I looked it up on the app store. Thanks for the suggestion. We have added Figure 1 to show the app in action. And we also added one paragraph "TCPRLink application" in methods section (see Page 6, Lines 123-144) to better present how the TCPRLink app works in action.

3. I think the conclusions of the study are too strong given the results. Yes, there is a statistical difference in CC rate between the two groups but is a median of 111 vs. 108 different enough clinically to be relevant? The advantage of the app may have more to do with the offloading of cognitive load (i.e., not having to count compressions).

We have made correction and re-written the conclusions part both in abstract and conclusion sections according to the reviewer's comment (see Page 2, Lines 46-50, and Page 11, Lines 313-317).

4. Can the authors provide more detail into what was done at the 3-month assessment? They state they were in the same randomization group – did they receive the same amount of feedback as was provided in the first intervention.

At the 3-month assessment, participants take the skill retention test (Phase II test) individually. The skill retention test was conducted exactly same as in the Phase I test. We have added detailed sentences about the 3 months follow-up test (see Page 6, Lines 146-149).

5. In Table 1, the p-values are not necessary as the groups were randomized.

According to the reviewer's suggestion, we have modified the Table 1 (see Page 16, Table 1).

Reviewer #2: Dr. Wolfgang A. Wetsch

We appreciate Dr. Wetsch for the constructive criticisms that have helped us to improve our manuscript. Below is our point-by-point response to the reviewer's comments.

1. There are some aspects of the study that Need to be discussed before publication:
- you have recruited participants from individuals who have decided to take a CPR course. Even though These were not HealthCare Providers, it must be assumed that they may have more knowledge than the "standard layperson". They were used in both Groups so this does not create a direct bias, but the result may not be generalizable for all laypersons.

Thanks for the insightful comments. The participants were recruited from trainees aged 18-65 years of the "WeCan CPR" training program. The "WeCan CPR" training program was developed and validated by Peking University and Shanghai Jiao Tong University in collaboration with Laerdal Medical for the purpose of high-quality, basic CPR training.

The participants involved in the current study might have selection bias as they might positive willingness and knowledge on CPR training. Yet, according to our unpublished results of "WeCan CPR" participants' pre-training CPR knowledge assessment, their pre-training CPR knowledge (knowledge score 5.6 in 10) and skills (practice score 11.5 in 100) were poor.

We have redefined the study population as the "trained laypeople". We added more description about the population bias limitation in the limitation section (see Page 11, Lines 306-309).

2. Did the participants give written consent? Did they give consent to be recorded on video? (P7 L55 ff) Please give Details

The participants were verbally informed that their T-CPR performance would be tested and video-recorded in a simulated scenario after training and 3 months later. Participants gave their written informed consent on arrival at the first test site. We have added more detailed information about participant's consent and re-written this part according to the reviewer's comment (see Page 5, Lines 94-99).

3. I do not see a sample size calculation. Was this done a priori? Please give Details
We added a "Sample size estimation" paragraph in the methods section to describe the sample size analysis (see Page 7, Lines 185-196).

Sample size calculation was conducted in 68 participants (34 in TCPRLink group with 12 18-24 years old, 11 25-54 years old, and 11 55-65 years old, and 34 in T-CPR group with 11 18-24 years old, 12 25-54 years old, and 11 55-65 years old) who were sequentially recruited in the Phase I test. A change in the proportion of adequate CCs of >5% was considered a relevant difference. With a statistical power of 90% and two-sided alpha level of 0.05, the minimum numbers of participants in TCPRLink/ T-CPR group among age groups were 20 (18-24 years), 26 (25-54 years), and 18 (55-65 years), respectively. Considering the possibility of 20% loss to follow-up and the participants' availability, we recruited 54 participants aged 18-24, 75 aged 25-54, and 57 aged 55-65. We included those 68 participants from the pilot study into the final analysis as the study protocol maintained the same.

4. Was the study registered at a study register prior to the beginning? Please give details.
The present study was a manikin-based experimental study. The study protocol was approved by the Joint Research Ethics Board of the Shanghai Jiao Tong University Schools of Public Health and Nursing (SJUPN-201714) prior to launching. We did not register the present study in clinical trials website.

5. Specific comments:

P6 L53 "the" - please check spelling, there is a special character

P7 L9 please rephrase "Body movement movements"

P9 L27 Coaches

Thanks for the detailed comments. We have paid special attentions to writing in the revision to ensure the readability of the manuscript. We have checked the syntax throughout the whole manuscript, corrected the inappropriate expressions and polished the language.

6. References

There are several recent studies on Video-CPR (which is totally missing in the discussion) and dispatcher-assisted CPR using different apps. Please re-do your literature search and give actual citations.

Thanks for the insightful comment. Several experimental manikin studies have demonstrated potential benefits of video-assisted communication between rescuers and dispatchers compared to the conventional audio-instructed practice (Johnsen et al. 2008, Bolle et al. 2009, JS Lee et al. 2011, Stipulante et al. 2016). A recent meta-analysis study by SY Lee et al. compared the real-world effects of video-instructed T-CPR and audio-instructed T-CPR on resuscitation outcomes. Smartphone CPR feedback apps, such as PocketCPR (Plata et al. 2019), iCPR (Semeraro et al. 2011) have also shown their feasibility and capacity. We have added more related citations, and modified the Discussion part of this manuscript (see Page 9, Lines 241-247).

VERSION 2 – REVIEW

REVIEWER	Jonathan Duff University of Alberta Canada
REVIEW RETURNED	29-Aug-2020

GENERAL COMMENTS	Review: Effect of a real time feedback smartphone application
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	<p>(TCPRLink) on the quality of layperson telephone-assisted CPR performance BMJ Open</p> <p>General Comments:</p> <p>Thank you for the opportunity to read your manuscript. The paper describes the use of a smartphone application that can not only provide local feedback on CPR rate but also link with a CPR dispatcher. One of the study's strengths is that the authors not only looked at performance but retention 3 months post-initial intervention.</p> <p>I have a number of general comments:</p> <p>1) The authors do a good job summing up the study's findings succinctly. There are a number of grammatical errors that make reading parts of the manuscript tricky. I have not identified all of these but a read-over with that lens would help improve readability.</p> <p>2) Can the authors provide a picture of the app in action? It was difficult to understand exactly what it was doing until I looked it up on the app store.</p> <p>3) I think the conclusions of the study are too strong given the results. Yes, there is a statistical difference in CC rate between the two groups but is a median of 111 vs. 108 different enough clinically to be relevant? The advantage of the app may have more to do with the offloading of cognitive load (ie, not having to count compressions).</p> <p>4) Can the authors provide more detail into what was done at the 3-month assessment? They state they were in the same randomization group – did they receive the same amount of feedback as was provided in the first intervention.</p> <p>5) In Table 1, the p-values are not necessary as the groups were randomized.</p>
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VERSION 2 – AUTHOR RESPONSE

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1. The authors do a good job summing up the study's findings succinctly. There are a number of grammatical errors that make reading parts of the manuscript tricky. I have not identified all of these but a read-over with that lens would help improve readability.

We appreciate the positive comments and we have paid special attentions to writing in the revision to ensure the readability of the manuscript. The revised paper has been carefully revised by professional language editing service-Editage to improve the grammar and readability.

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