PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	A scoping review assessing the evidence used to support the adoption of mobile health (mHealth) technologies for the education and training of community health workers (CHWs) in low- and middle-income countries
AUTHORS	Winters, Niall; Langer, Laurenz; Geniets, Anne

VERSION 1 – REVIEW

REVIEWER	Kunal D Patel Kingston and St Georges University, UK
REVIEW RETURNED	16-Oct-2017

GENERAL COMMENTS	Overall an excellent and much needed review. Almost overdue due to the saturation of 'mhealth' solutions out there. Shame so few solid studies found, but a positive as clearly shows work needs to be done. P3, line 10 : Advise defining a chw in the context of LMICs, as v different to lets say the USA (definition seen on p5, but would be good for a general one in the introduction) P3, line 31: Completely agree re: mhealth framework, almost all 'education theory' was ignored, I would almost suggest the authors make such a bold statement, as this very positive review must highlight the massive flaws in mhealth education P13, line 37: Can the authors breakdown any further, whether this statement 'findings from this scoping review suggest the mHealth literature is in danger of overclaiming regarding its ability to promote CHWs'education and training within a work context' – what the context is? Commonly this is 'community practice', primary care and not secondary care. This will provide further clarity and justs need to be mentioned earlier in the paper. Overall, excellent summing up first sentence. P13 : Can the discussion be broken down into some simple implications? I.e a table be formed. Provides the authors opportunity to clearly define points made Any limitations? Good to see these acknowledged e.g time window of review? Pre 2000? Is this not a limitation?

REVIEWER	Zelee Hill University College London, UK
REVIEW RETURNED	15-Nov-2017

GENERAL COMMENTS	This is an interesting and clearly written paper, that highlights a lack of clarity about what constitutes education and training in relation to

	m-health. A clearer justification for why the two theories of learning were selected would be helpful, as would a description of the criteria used to determine if the interventions supported learning- a tick in any part of the coding tool? The authors were critical of the interventions and how they supported learning. This critique needs to be placed within the context of the reality of using m-health in some low income settings. For example the intervention designers could be constrained by language issues, phones may only support basic text messages and battery life and connectivity issues may limit what the phones can be used for. It is also important to add in the limitations that the m-health interventions may be part of a wider system to support learning and development - CHW support and learning systems need to be examined as a whole to get a realistic picture of how well CHW learning and development is being supported.

REVIEWER	Karin Källander Malaria Consortium, London, United Kingdom
REVIEW RETURNED	16-Nov-2017

GENERAL COMMENTS	Overall, a very well written paper with a few minor revisions required. Namely: • Abstract should mention that only English reviews were included in the scoping review under “Strengths and limitations of this study”. • Sentence on page 5/34 does not read correctly: “Lastly, reference lists of includes reviews were used as an additional source for snowball….” • Need more explanation regarding how the categories used for inclusion of systematic reviews could be framed as supporting CHW education and training, namely “provider work planning and scheduling” and “data collection and reporting”. Explanation of how the categories of “decision-support” and “provider-provider communication” are given but not for these categories, which are less obvious as to how they may support CHW training and education. • Figure 2, add a description to the title giving an explanation of how these categories were established. • Supplementary Material 5: Unclear what “Agreement in allocation” means here, would rephrase to “Agreement in allocation between systematic reviews” and provide more explanation at the end of the table that the superscripts refer to the systematic reviews. • Supplementary Material 5: No explanation in the manuscript regarding what “Secondary” means in column 2 for “Reclassification: fits WPL?” • Supplementary Material 5: In column 2 for Chang (2011), missing an ‘n’ for “Getting information”.

REVIEWER	Ashley Collinsworth, ScD, MPH Directory of Delivery Science, Baylor Scott & White Health, USA
REVIEW RETURNED	21-Dec-2017

GENERAL COMMENTS	This is an interesting and thorough review on the role of mHealth in CHW training. The paper is well written and organized. It would be helpful for the authors to include a brief summary of workplace-based learning and mobile learning frameworks for readers who are not familiar with them. It would also be helpful if the authors included

	a limitations section in the discussion.

REVIEWER	Marjolein Zweekhorst Vrije Universiteit Amsterdam
REVIEW RETURNED	16-Feb-2018

GENERAL COMMENTS	This article aims to address an important issue regarding mHealth interventions and the underlying theory behind their intentions to facilitate education and learning. Unfortunately in taking a rapid/shortcut 3-step process, authors fall into a trap of comparing apples and oranges by ignoring the lens from which both primary and secondary studies report their findings or focus their intervention descriptions. As an example, a clinical decision support device can be reported as leading to the acquisition of skills or knowledge based on underlying assumptions made by its developers, that have not been explicitly described or have been achieved using a different learning theory. Many manuscripts are written from a practical and technical angle and less from a methodological and pedagogical lens. This is not a direct indication of the deficiency of the intervention or the way it has been implemented, but of the way it has been reported. In addition, they fail to acknowledge that they inherit the biases inherent in the secondary studies from which they draw their primary studies. This could also explain why they miss relevant articles during their search that fall within the topic area and would be been additionally useful for a comprehensive overview e.g. i) Chang AY, Ghose S, Littman-Quinn R, Anolik RB, Kyer A, Mazhani L, et al. Use of mobile learning by resident physicians in Botswana. Telemedicine and e-Health. 2012; 18(1): 11–13. ii) Goldbach H, Chang AY, Kyer A, Ketshogileng D, Taylor L, Chandra A, et al. Evaluation of generic medical information accessed via mobile phones at the point of care in resource-limited settings. Journal of the American Medical Informatics Association. 2014; 21(1): 37–42. iii) Zolfo M, Iglesias D, Kiyan C, Echevarria J, Fucay L, Llacsahuanga E, et al. Mobile learning for HIV/AIDS healthcare worker training in resourcelimited settings. AIDS research and therapy. 2010; 7: 35. Scoping reviews are a form of ‘umbrella-style” synthesis that try to provide broad evidence on a specific issue or topic area. By adopting a methodology that restricts the inclusion of explicit mHealth interventions for education or learning, transfer of knowledge or skills whether actively or passively, the review cannot claim to be complete or balanced in its conclusions. It is suggested that authors re-run the search including interventions that outrightly make claims on education and learning or skills/information transfer (consider terms such as ‘eLearning’, ‘mobile learning’ ‘technology enhanced education’ etc.) and then query these interventions for their pedagogical grounding. Alternatively authors may choose to take a few steps back on the current attempt and analyze the identified 24 articles avoiding the need to compare categorizations from secondary studies, while being transparent about their limitations and modest in their conclusions.

VERSION 1 – AUTHOR RESPONSE

Reviewer comments

Reviewer 1: Kunal D Patel

1. "Overall an excellent and much needed review. Almost overdue due to the saturation of 'mhealth' solutions out there. Shame so few solid studies found, but a positive as clearly shows work needs to be done."

- We thank Kunal for his kind comments on our review and we agree that such work is very timely for publication.

2. In addition to the formal definition of a CHW (on p.5), please add a general definition of a CHW in LMICs to the introduction.

- A general definition has been added to paragraph 1 of the introduction to better contextualise the work of CHWs in LMICs for the reader: "CHWs usually receive limited but focused training on key health priorities in LMICs and they play a vital role in supporting communities to better engage with the formal health system. While the precise scope of their role differs across LMICs (see [1] for a discussion of their role in Kenya), they have become a vital part of strategies to address weaknesses in health systems."

3. "… almost all 'education theory' was ignored, I would almost suggest the authors make such a bold statement."

- Without wishing to undermine solid existing work in the area, we have added the requested sentence to the third paragraph of the introduction: "However, it is unclear if or how workplace-based learning and mobile learning research has been incorporated into mHealth platforms. Preliminary indicators suggest that almost all 'education theory' is ignored. For example, in Labrique et al.'s [11] widely regarded mHealth framework…"

4. What is the work context in the following sentence: "findings from this scoping review suggest the mHealth literature is in danger of overclaiming regarding its ability to promote CHWs' education and training within a work context. Commonly this is 'community practice', primary care and not secondary care. This will provide further clarity and just needs to be mentioned earlier in the paper."

- Agreed that we should have been clearer here. The focus is on community primarily but also primary care. As requested, we have made this clearer earlier in the paper changing the first sentence of the conclusion to: "The findings from this scoping review suggest the mHealth literature is in danger of overclaiming regarding its ability to promote CHWs' education and training within a community work context."

5. Can the discussion be broken down into some simple implications? i.e a table be formed.

- This is an excellent suggestion. We have added a new table to the discussion section, which breaks down our findings into six key implications.

6. Pre 2000? Is this not a limitation?

- This was noted as a limitation under "Strengths and limitations of this study".

Reviewer 2: Zelee Hill

1. “This is an interesting and clearly written paper, that highlights a lack of clarity about what constitutes education and training in relation to m-health.”

- We thank Zelee for the supportive comments.

2. “A clearer justification for why the two theories of learning were selected would be helpful”

- We very much agree that this is an important point. We have added a justification to the fourth paragraph of the methods section as follows: “That is, we used two coding frameworks inspired by different theories of learning—workplace-based learning [9] and mobile learning [10]. These two theories of learning (for more details see Supplementary Material 7) were selected because they are both well-developed, proven and have been applied in multiple projects in the education literature. Each builds on over a decade of research focusing on the relationship between educational theory and practice, and draws together key conceptual points into practically applicable frameworks. The chosen coding frameworks were then applied to the primary studies included in the systematic review.” We have also added a new Supplementary Material 7 that provides more background to each of the approaches for the interested reader.

3. It would be helpful to have “a description of the criteria used to determine if the interventions supported learning- a tick in any part of the coding tool?”

- This is an important point which we should have made clearer. To address it we have added the following sentence to the last paragraph of the Findings section: “In Supplementary Material 5, columns 2 and 3 show the findings of our recoding of whether the interventions can be classified as workplace learning (column 2) or mobile learning (column 3). The key criterion to determine if an intervention supported practice-based mobile learning what that at least one aspect of workplace-based learning and one aspect of mobile learning were addressed (see Supplementary Material 6 for the coding tool). From recoding the primary studies using the educational frameworks, we find that only four mHealth interventions… These are highlighted in green in Supplementary Material 5.” As noted in the text, the four remaining papers that meet the criteria are highlighted in green in Supplementary Material 5.

4. “The authors were critical of the interventions and how they supported learning. This critique needs to be placed within the context of the reality of using m-health in some low income settings.”

- This is a very important point. On reflection, we have chosen to close the paper with it as follows: “Achieving this will be challenging, given the complex realities of using mHealth in low income settings. Nevertheless, we promote the use of training tools which employ empirically proven equitable pedagogic strategies to maximise learning as a continual process of ‘participation’ [43], within a social justice approach to global health [44].” However, we believe this point deserves far more discussion. As this discussion exceeds the scope of this paper, for completeness, we will now provide the wider rationale for taking this perspective, drawing on our research submitted in another paper under review currently. The reality of low income settings generally means low availability of resources, including restricted access to or no sanitation, limited access to health care, and low or no access to education. As a result, the general view held regarding the use of mhealth in these low resource settings is that interventions should be cheap and simple. Hence, the number of primary studies we identified that rely on SMS. In our broader conceptual and empirical research more

broadly, primarily in low-income areas and informal settlements in LICs, we critique this assumption. Although it is rarely questioned in mHealth, we draw on research in global health (Farmer's Pathologies of Power), social justice (Freire's Pedagogy of the Oppressed) and ethics (Venkatapuram's Health Justice) to argue that mHealth would benefit from taking a preferential option for the poor. Our argument is that it is precisely because of scarcity in low resource settings (particularly for the most marginalised), that we need to aim for the "best care possible", in our case using advanced technology and the highest quality of education in order to help address the challenge of delivering good healthcare training / services to the poorest. This includes the development of mHealth training tools which employ empirically proven equitable pedagogic strategies to maximise learning, and thus go beyond the mere top-down dissemination of information for example via SMS, but frame learning as a continuing process of 'participation' instead.

5. "It is also important to add in the limitations that the m-health interventions may be part of a wider system to support learning and development - CHW support and learning systems need to be examined as a whole to get a realistic picture of how well CHW learning and development is being supported."

- Another excellent point with which we are in complete agreement. System-wide analysis is key and we've been doing some of this work. Most recently, Winters had a PhD student complete who used Actor-Network Theory to better understand the design, development and implementation of an ECRCDFID project within the wider system context. (Aspects of this work will be published by Vu Henry, Oliver & Winters in a paper entitled "Global-local divides or ontological politics? The case of a participatory mobile learning intervention for community health workers in Kenya" in an upcoming Special Issue of Learning, Media and Technology). Acknowledging the importance of health systems integration, we have added the following text to the second paragraph of the discussion: "Instead, mhealth training interventions need to be seen as part of a wider learning health systems approach [36] to support the learning and development of CHWs, and as such cannot be considered in isolation". Thanks again for pointing this out.

Reviewer 3: Karin Källander

1. "Overall, a very well written paper with a few minor revisions required."

- Many thanks Karin for the kind comment on our paper.

2. 'Abstract should mention that only English reviews were included in the scoping review under "Strengths and limitations of this study".'

- Good point. The last sentence under Strengths and limitations of this study has been changed to: "The review is limited to papers included in systematic reviews published in English between 2000-2017."

3. Sentence on page 5/34 does not read correctly : "Lastly, reference lists of includes reviews were used as an additional source for snowball…."

- This has been changed to: "Lastly, reference lists of included reviews were used as an additional source for snowball….".

4. "Need more explanation regarding how the categories used for inclusion of systematic reviews could be framed as supporting CHW education and training, namely "provider work planning and scheduling" and "data collection and reporting". Explanation of how the categories of "decisionsupport" and "providerprovider communication" are given but not for

these categories, which are less obvious as to how they may support CHW training and education."

- Having re-read this section, it is clear that we should have communicated our intention in a clearer way to detail how the categories may support CHWs' training and education. In order to do so, we have added the following text to the Intervention subsection: "… Likewise, following explicit decision-making algorithms could lead to the learning and acquisition of new and improved practices by CHWs. Both provider work planning and scheduling and data collection and reporting can offer opportunities for CHWs for reflective practice, for example on providing insight into the relationship between data capture and decision making. Reviewing cohort data could offer supervisors the opportunity to support peer learning. Again, we aimed to be over-inclusive at this stage so as not to miss any relevant reviews."

5. "Figure 2, add a description to the title giving an explanation of how these categories were established."

- The Figure Legends are now listed at the end of the paper have been added as follows: "Figure 1 Overview of mHealth intervention categories taken directly from the 16 included systematic reviews. The primary studies were often characterised differently by different systematic reviews."

6. "Supplementary Material 5: Unclear what "Agreement in allocation" means here, would rephrase to "Agreement in allocation between systematic reviews" and provide more explanation at the end of the table that the superscripts refer to the systematic reviews."

- Many thanks for this, we have implemented the requested change to Supplementary Material 5 in full. The header in column 1 now reads "Agreement in allocation between systematic reviews". At the end of the table we have inserted the following text: "The superscripts a–o above refer to the systematic reviews in which this study has been included. None of these primary studies were covered by Tian (2017)."

7. 'Supplementary Material 5: No explanation in the manuscript regarding what "Secondary" means in column 2 for "Reclassification: fits WPL?"'

- Thank you very much for pointing this out. We have included a footnote to Supplementary Material 5 to clarify the meaning of secondary as follows: "Secondary refers to a study relating to workplace-based and/or mobile learning only superficially. This can be caused by a lack of detailed reporting of intervention design and implementation or by workplace-based and/or mobile learning only being a minor aspect of the applied intervention that is not fully developed."

8. "Supplementary Material 5: In column 2 for Chang (2011), missing an 'n' for "Getting information"."

- This has been changed.

Reviewer 4: Ashley Collinsworth

1. "This is an interesting and thorough review on the role of mHealth in CHW training. The paper is well written and organized."

- Many thanks Ashley for your supportive words.

2. “It would be helpful for the authors to include a brief summary of workplace-based learning and mobile learning frameworks for readers who are not familiar with them.”

- This is an excellent point, which we had thought about before submission. We have now added new Supplementary Material 7, where we summarise the relevant workplace-based learning and mobile learning frameworks for readers. We have kept this brief but informative and also added the following new references for the interested reader: [43] Sfard A. On Two Metaphors for Learning and the Dangers of Choosing Just One. Educational Researcher 1998;27(2):4-13. [45] Laurillard D. Pedagogical Forms of Mobile Learning: Framing Research Questions. In: Pachler N, ed. Mobile Learning: Towards a Research Agenda. London: UCL Institute of Education. 2007. [46] Pachler N, Bachmair B, Cook J. Mobile Learning: Structures, Agency, Practices. New York: Springer. 2009. [47] Wali E, Winters N, Oliver M. Maintaining, Changing and Crossing Contexts: An Activity Theoretic Reinterpretation of Mobile Learning. Research in Learning Technology 2008; 16 (1): 41– 57. [48] Winters N. Mobile Learning in the Majority World: A Critique of the GSMA Position. In Price S, Jewitt C. Brown B. eds. Sage Handbook of Researching Digital Technologies. London: Sage. 2013: 402–411. [49] Mann, K. Theoretical Perspectives in Medical Education: Past Experience and Future Possibilities. Medical Education 2011;45: 60–68. [50] Bleakley, A. Broadening Conceptions of Learning in Medical Education: The Message from Teamworking. Medical Education 2006;40: 150–157.

3. “It would also be helpful if the authors included a limitations section in the discussion.”

- We have added a Limitations section to the Discussion. This complements what is covered in the “Strengths and limitations” information box. “Limitations Our scoping review only covers systematic reviews published up to 2017, which means that only primary studies published up to 2015 were included. Our work is open to the biases inherent in relying on existing systematic reviews. However, the scoping review seems well designed to deal with these: First, we included a large number of systematic reviews (n=16), ensuring a wide coverage of primary studies included in these reviews. Second, we further re-analyse the studies included in these reviews to mitigate any quality concerns regarding the included systematic reviews themselves. In targeting secondary literature, we rely on education researchers’ interpretation of mobile learning and workplace-based learning in order to unpack patterns in categorisations and conceptualisations. We have made this process transparent through inclusion of our coding tool (see Supplementary Material 6) and references [9-10, 38-43, 45-50]. Other researchers may take an alternative perspective on this literature.”

Reviewer 5: Marjolein Zweekhorst

1. “This article aims to address an important issue regarding mHealth interventions and the underlying theory behind their intentions to facilitate education and learning.”

- Thanks for your positive feedback. We would also like being by clarifying upfront that our article is indeed centred around different mHealth interventions and their attempts to facilitate education and learning of CHWs. Literature that is explicit about the investigation of mHealth interventions from an educational angle is therefore of core concern in our scoping review. However, this literature is small in relation to CHWs and more developed in relation to different types of health care workers (e.g. Zolfo et al 2010; Chang et al 2012). Our scoping review is therefore necessarily broader in scope, using a three-step methodology to identify both the core literature on the use of mobiles to support the education and learning of CHWs as well as literature that is broadly concerned with improvements in CHWs’ practice in which education and training is but one tool amongst many employed to this end.

2. “Unfortunately in taking a rapid/shortcut 3-step process, …”

- Having re-read the paper, we believe we were clear about our approach taken to doing this scoping review. The three-step review process is by no means rapid or a shortcut; it is a deliberate design to achieve the following two core objectives: 1. Assess the existing conceptualisation and categorisation of mHealth interventions, and, 2. To then compare this conceptualisation and categorisation with our own empirical coding of studies applying educational frameworks. We believe this to be a novel and important approach to understanding the role played by learning theory in the field of mHealth. We provide a detailed justification of this approach in the second paragraph of the methods section, which was clear to reviewers 1-4. We state: “A scoping review approach was chosen for this study because we wanted to explore how existing literature has conceptualised and operationalised the use of mobile technologies to support CHWs’ learning practices. The focus is on the diversity of understandings and definitions of CHWs’ education and training in the existing literature and what patterns and gaps might emerge from a systematic analysis of this body of knowledge. In order to capture the conceptualisation and positioning of mHealth interventions that have an education or training component, our scoping review targeted existing systematic reviews of mHealth interventions rather than primary studies as a first level of analysis. Unlike primary studies, these reviews require an explicit conceptual framework—including Labrique’s framework—in order to group mHealth interventions for analysis. Consequently, we can derive the positioning and categorisation of different mHealth interventions with respect to their support for CHWs’ education and training from these systematic reviews.” And further on in the last paragraph of the methods section: “As a result, we obtained two different set of results on how mHealth interventions were categorised regarding their support for CHWs’ education and training: (i) the categorisation of interventions in the systematic reviews themselves and (ii) our re-categorisation of the same interventions using explicit learning from educational research. These two sets of categorisations allowed us to juxtapose the prevailing positioning and understanding of education and training in mHealth with a more pedagogically grounded understanding. A more traditional review approach, without this re-analysis of primary studies, would not have allowed us to juxtapose these different understandings. The same applies had we followed a systematic review approach that only included primary studies and not the existing reviews themselves.” We believe that this level of detail is clear and sufficient.

3. “… authors fall into a trap of comparing apples and oranges by ignoring the lens from which both primary and secondary studies report their findings or focus their intervention descriptions. As an example, a clinical decision support device can be reported as leading to the acquisition of skills or knowledge based on underlying assumptions made by its developers, that have not been explicitly described or have been achieved using a different learning theory. Many manuscripts are written from a practical and technical angle and less from a methodological and pedagogical lens. This is not a direct indication of the deficiency of the intervention or the way it has been implemented, but of the way it has been reported.”

- This is an important point, which raises two important but interrelated topics. The first is how primary studies report their findings and the second is what was our approach to dealing with this, particularly given the ways in which secondary studies interpret primary findings? We agree that they may not report their “methodological and pedagogical” findings, and instead focus on a “practical and technical angle”. However, this absence of evidence in how primary studies report what they do is very important because it leads to an evidence of absence in secondary reviews. We agree that this should not happen and part of the reason for our review methodology is to highlight this problem. In other words, by not describing how learning theories were used or not describing the learning benefits of their interventions, authors of primary studies do not contribute to an evidence base for the impact of their work on learning and training using their intervention. It is no surprise then that when systematic reviews are written, potential contributions to learning and training are either not included

or misclassified. We address this point in our approach to reviewing in two ways: 1. We tailored our review design to identify and unpack differences in primary study reporting and subsequent categorisations in systematic reviews. Section “Discrepancies in categorisation” on p.10-11 deals with this problem in detail and finds that, on average, each primary study is allocated to three different intervention categories across different or within reviews. 2. We designed our review to use as broad an understanding of learning as possible at step 1 and 2 (the identification of existing reviews and primary studies therein) so that we would not be limited by the differences in interpretation of learning and training when identifying our sample of includes. The example you describe is exactly what our review was designed to cater for! We have included a range of categories of potential relevance to training and learning, including decision-support tools (as per your example) – see p.6, lines 14-19: “Education and training was defined broadly and we followed the reviews’ positioning of interventions as to how they facilitated learning. In addition, we included the following categories used in reviews based on Labrique et al’s framework to ensure no relevant interventions were missed: Decisionsupport; provider-provider communication;

4. “In addition, they fail to acknowledge that they inherit the biases inherent in the secondary studies from which they draw their primary studies.”

- Many thanks for alerting us to the fact that biases within the included systematic reviews are not made transparent enough. We have extended the text on the limitations of our scoping review as follows to reference this more explicitly (p.8 lines 8- 12): “Second, systematic reviews published up to 2017 only cover primary studies published up to 2015. Studies published after this date were not identified by the systematic reviews and by extension are not covered by our scoping review. In general, relying on systematic reviews as an identification strategy entails the risk that our review is subject to a limitation in scope because we can only re-produce the scope of the included systematic reviews in our own review1 .” The new footnote reads as follows (p.8 lines 46-47): “1 However, this limitation is mitigated by the large number of identified systematic reviews (n=16), which provides large depth and breadth in the scope of included systematic reviews and thus in our own scoping review.” For additional explanation for the reader, we have added the following text to a new subsection on Limitations (in the Discussion) (p. 13 lines 15-22): “Our work is open to the biases inherent in relying on existing systematic reviews. However, the review seems well designed to deal with these: First, we included a large number of systematic reviews (n=16), ensuring a wide coverage of evidence included in these reviews. Second, we further re-analyse the studies included in these reviews to mitigate any quality concerns regarding the included systematic reviews themselves.” We believe the above changes provide a good level of clarity for the reader.

5. “This could also explain why they miss relevant articles during their search that fall within the topic area and would be been additionally useful for a comprehensive overview…”

- We are confident that as we include 16 existing systematic reviews (of varying quality and scope), there is little risk that we miss any relevant primary studies. Indeed, we were glad that you raised three studies in particular as we did in fact identify all of these within the 16 reviews. We would like to add that the three studies were excluded for the following reason: Chang et al: Identified in Hall 2014, Aranda-Jan 2014, and O’Donovan 2015; excluded as not CHWs. Goldbach et al: Identified in Hall 2014; excluded as not CHWs. Zolfo et al: Identified in Hall 2014, O’Donovan 2015, and Chib 2015; excluded as not CHWs. For complete transparency, 9 other papers were excluded at this stage for the same reason (N = 12). Furthermore, by being able to draw from a large secondary research evidence-base (16 systematic reviews), we can further rule out that quality concerns around the categorisation of primary studies in individual systematic reviews systematically influence our

analysis. As identified primary studies were on average included in 3 systematic reviews, our analysis is not driven or grounded in the results of individual reviews.

6. “Scoping reviews are a form of ‘umbrella-style’ synthesis that try to provide broad evidence on a specific issue or topic area. By adopting a methodology that restricts the inclusion of explicit mHealth interventions for education or learning, transfer of knowledge or skills whether actively or passively, the review cannot claim to be complete or balanced in its conclusions.”

- Many thanks for this comment. We agree with you that scoping reviews only allow for the inclusion of broad evidence based (unlike, say, full systematic reviews of what works). However, it is not clear to us how the adoption of a broader scope contradicts the inclusion of explicit mHealth interventions for education or learning? We have outlined above why our inclusion criterion – in relation to training and learning – was broad. This was because we did not want to miss any relevant evidence. In this way, by being broad in inclusion we aim to cover mHealth interventions explicitly for education plus any other mHealth interventions, where the link to training and learning is implicit. We believe that because explicit mHealth interventions for training and learning are a sub-set of our broad inclusion criteria, our review design did not miss these interventions. Moreover, interrogating the 24 included primary studies and their breadth in terms of relevance to the scope of our review, we would defend our review approach as being grounded in as comprehensive and balanced sample of evidence as possible. This, at its core, includes the explicit mHealth interventions for education or learning plus additional studies, where such educational linkages are less explicit.

7. “It is suggested that authors rerun the search including interventions that outrightly make claims on education and learning or skills/information transfer (consider terms such as ‘eLearning’, ‘mobile learning’ ‘technology enhanced education’ etc.) and then query these interventions for their pedagogical grounding.”

- Many thanks for this suggestion. This is a good point and we are pursuing related work in this area. We believe this work will provide a good background context for the additional research you are requesting here. We would hope to conclude this second stage of work with a new paper, completed within the next twothree months. In the case of this paper, its scope was defined by what we believed were educational claims made in systematic reviews that we felt needed to be addressed. As such, and as detailed in the response to the comment above, our review was designed to identify explicit mHealth interventions for education or learning. We therefore do not feel that there is a need to re-run our searches. In addition, we do not feel a search for primary research studies would be appropriate for this paper as our scoping review is deliberately targeting secondary literature in order to be able to unpack patterns in categorisations and conceptualisations. This would not be possible if the paper was solely focused on a review of primary studies.

8. “Alternatively authors may choose to take a few steps back on the current attempt and analyze the identified 24 articles avoiding the need to compare categorizations from secondary studies, while being transparent about their limitations and modest in their conclusions.”

- We agree that we should have added an explicit section on limitations (as other reviewers have requested) and have now done so in the Discussion section. In our review, we do in fact analyse the 24 primary studies ourselves (see step 3 in our methodology) and would reiterate again that the comparison of this re-analysis to the categorisation of primary studies within existing reviews is an essential step required in order for our review to arrive at its conclusions and knowledge claims. This design is deliberate and we have from the onset of our study opted for such a design over your

alternative suggestion of conducting a review of primary studies. Comparing categorisations of the literature and the claims made was important for the reasons discussed in our response above. We hope we have made the case that this is important work. Thanks again for your very helpful comments.

VERSION 2 – REVIEW

REVIEWER	Kunal D Patel Faculty of Health, Social Care and Education, Kingston University and St Georges, University London, London, UK
REVIEW RETURNED	09-May-2018

GENERAL COMMENTS	Responses to corrections are satisfactory and the changes are bound to make this a better paper.

REVIEWER	Zelee Hill University College London, UK
REVIEW RETURNED	21-May-2018

GENERAL COMMENTS	The authors have responded to my comments in a thoughtful and comprehensive manner.

REVIEWER	Karin Kallander Malaria Consortium, UK
REVIEW RETURNED	23-May-2018

GENERAL COMMENTS	Accept with minor revision to the numbering of the references e.g. in the manuscript references Martinez-Fernandez [28] but this is listed in the references as [27].