

Reviewer ID	Reviewer Comment	Authors' Response	Response Added
A	The manuscript is quite long for the limited information it contains.	Non-essential information removed.	Throughout manuscript
A	The information contained in this manuscript would be better suited to a small section of a manuscript describing app development that included the expert.	We appreciate this feedback. We believe the information in the manuscript to be significant and helpful as an article, as resubmitted.	
A	From the description of the study, it sounds like the app was already developed and feedback from the adolescents was solicited, as opposed to the adolescents' opinions and preferences contributing to the development of the app. This approach makes the information from the adolescents specific to the developed app and of limited generalizability.	Edited to clarify. The CommitFit app was conceptualized by health experts, but the design was influenced and driven by adolescent feedback (bottom-up approach). The app was not previously completed/developed before adolescent feedback. (see Page 4, Lines 135-137)	Clarified in Abstract, Introduction, and Methods
A	[Lines 21-22] This is not a research aim, but rather an implication of the research.	Changed to: "These findings can inform future researchers and app developers about adolescent needs and preferences, as identified by adolescent users." (see Page 2, Line 65-66)	Abstract (Objectives)
A	[Abstract] The sample and sampling approach lacks description (age, sex, BMI percentile; sampling strategy, focus population, setting, etc.).	Added	Abstract
A	a sample size of 10 is small, particularly for the quantitative portion of the study	Noted in limitations. Although this is concern for the quantitative data, we reached saturation with the qualitative data.	Limitations
A	Opening paragraph refers to the continued problem of obesity and does not refer to the increasing prevalence, particularly during the COVID-19 pandemic. The prevalence statistic is from 2012, 10 years ago.	Updated to most recent surveillance (2020). Removed overweight from statistic – only obesity. (see Page 3, Lines 109-111)	Introduction
A	It would be helpful to give a clear definition of adolescents in the Introduction (what age range is considered an adolescent?).	Definition added to introduction; Adolescents are defined as 12-19 y/o (see Page 3, Lines 112-113)	Introduction
A	[Introduction] The last sentence of the first paragraph should be moved to the start of the second paragraph.	Moved as recommended	Introduction

A	Line 51 refers to current literature, but the next statement does not include any citations. As such, the background does not provide evidence that adolescents are not included in the app design process.	References added	Introduction, Line 51
A	Lines 70-72 refer to a systemic review but has two articles cited. Over this paragraph on page 3 has information that overlaps with that contained in the second paragraph on page 2.	Reference changed to only include systematic review citation.	Introduction, Lines 70-72
A	Lines 77-83 make a number of assertions without citing supporting evidence.	Citations added: Psihogios, Stiles-Shields, Neary, 2020, Journal of Pediatric Psychology.; Jusoh. 2017, Int. J. Interact. Mob. Technol..	Introduction, Lines 77-83
A	Lines 85-86 do not include citations.	Removed the original lines of 85-86	Introduction, Lines 85-86
A	Lines 96-97 The objective of this study was to explore visual design needs required for designing mHealth apps for adolescents. – The study objective should be specific. This study was focused on the CommitFit app and not mHealth apps in general.	Changed <i>Section 1.3 Objectives</i> to, “The objective of this study is to describe the co-development process working with adolescent users. From this, we aim to explore the visual design and functional requirements when developing the CommitFit mHealth app. This study aims to uncover the gamification techniques that incentivize adolescents to set and achieve healthy lifestyle goals. We utilized an iterative user-centered design and development framework focused on using a bottom-up approach, as opposed to scaling down an adult-targeted mHealth application. The additional purpose of this study was to identify adolescent expectations when using the CommitFit mHealth application and to understand visual user-interface needs and wants, as well as design-related functional requirements.” (see Page 4, Lines 171-187)	Introduction, Lines 96-97; <i>Section 1.3 Objectives</i>
A	User-centered design process started with expert-developed prototypes, rather than initial prototypes	Initial prototype developed by expert; adolescent feedback was used developed all other	Methods

	being developed with the adolescents as part of the design process.	prototypes. Edited to clarified process in methods.	
A	The Method section could benefit from a better explanation of the recruitment process. How many clinics did the authors recruit from, and how were these clinics selected? Were all adolescents receiving treatment at these clinics contacted? What was the response rate, i.e. how many adolescents expressed interest vs how many adolescents were contacted in total? If more than 10 adolescents expressed interest, how did the authors select which adolescents could take part in the study?	<p>Agree - added to methods</p> <p>A total of 131 adolescents were contacted for interviews and 13 agreed to participate for a response rate of about 10%. 3 adolescents were interested but unable to participate in the scheduled interviews and were added to a list for future studies. All the adolescents contacted met the inclusion criteria and were invited to participate.</p> <p>Added “Adolescents were enrolled in the study on a first come-first serve bases until ten adolescents were enrolled” (see Page 6, Lines 258-259)</p> <p>Added “...a single-family medicine and pediatric clinic in the MU Health Care system, where one of the researchers (ASB) works as a physician...” (see Page 6, Lines 245-249)</p>	Methods
A	Line 159 refers to using the EHR without describing the health system in which the EHR was accessed.	EHR was accessed in the MU Health Care health system, added in methods (see Page 6, Lines 245-249)	Methods
A	Line 166: ‘adolescents who participated in previous developmental focus groups were excluded’ – why?	To avoid priming bias – added to manuscript. (see Page 6, Lines 256-258)	Methods
A	The paper states that adolescents were recruited from varied demographic backgrounds, but it is not stated how this was done and 80% of the sample was White, only 1 participant was from a low-income background and 1 participant was rural - it is also not clear whether this is the same participant or whether this refers to different participants. Did the authors use stratified sampling or	Added to methods, “Stratified sampling was utilized with a goal of obtaining at least 10% (1) of participants of African American race, 10% from a low-income family (Medicaid recipient), and 10% from rural community, and with an even distribution of gender.” (see Page 6, Lines 254-256)	Methods, under <i>2.2 Adolescent Semi-structured Interviews and Task Analysis</i>

	had any other mechanisms in place to try and get a sample from a varied demographic background?		
A	Line 179: 'Interviewees were generally asked open-ended questions' – does this mean they were also asked closed questions? What questions were asked?	Closed questions included yes/no questions, such as, "Do you like the general design of the app?" Edited to clarify. (See Table 1; See Page 7, Lines 273-275)	Methods
A	Line 239 A total of ten adolescent stakeholders participated in both the interview and surveys. – Were there additional adolescents who participated in either the interview or the surveys, but not both?	All adolescents in this study participated in both the interview and surveys; no one completed either task without the other. Edited to clarify the manuscript. (See Page 9, Lines 337-338)	Methods
A	Only in lines 242-244 does it become clear that the adolescent sample did not select for high BMI. Only three of ten participants had BMI at the 85th percentile or higher. Adolescents who do not have an elevated BMI would not be users of this app. It is unclear why they are referred to as stakeholders or why they were included in the sample at all.	Clarified word 'stakeholder' into 'user(s)'. The key element of CommitFit is lifestyle and health behavior modifications. While CommitFit may improve weight, overweight and obese adolescents are not the only group that could benefit from setting positive health behavior goals. Only those who were severely underweight were excluded (to avoid risk of eating disorder exacerbation). Added, "Improved lifestyle and health behavior modifications are a key element of CommitFit. While CommitFit may improve weight, overweight and obese adolescents are not the only group that could benefit. Thus, the weight classification of adolescents was not an exclusion criterion, except those who were severely underweight to avoid potential eating disorder exacerbation." (See Pages 9-10, Lines 339-343)	Word change/replace ment occurs throughout manuscript; methods
A	Table 1 – would not use percentages given the small sample size.	Percentages removed from Table 4	Table 4
A	Qualitative results section did not confine results to findings from the study and included information from literature.	Literature information within the results section was removed and moved to the discussion section. Edited to only include results from study.	Results (Qual.)

A	In general, the discussion strays beyond what this limited study can say.	Removed 2nd paragraph from User Design Requirements and 6th paragraph from User's Functional Requirements.	Discussion
B	The Objectives paragraph seems awkwardly phrased and is a bit hard to follow. Is the aim to describe user requirements, to identify adolescent expectations, to develop an engaging user interface, etc.?	Clarified "The objective of this study is to describe the co-development process working with adolescent users. To identify adolescent expectations when using the CommitFit mHealth app and understand visual user-interface needs, we aim to describe the design and functional user 65 requirements for the CommitFit mHealth app. These findings can inform future researchers and app developers about adolescent needs and preferences, as identified by adolescent users" (see Abstract>Objectives; Section 1.3 Objectives)	Abstract/ Introduction
B	The Conclusions paragraph seems to repeat the Results rather than give a succinct conclusion what the reader should take away and why these results matter.	Extra details were removed, and the last sentence was added to clarify "By utilizing adolescent-approved designs and features, user engagement can be enhanced. As a result, improved user engagement can lead to increased compliance to health goals set in the CommitFit mHealth app; thus, leading to positive health changes, such as weight loss or management." (see Page 20, Lines 714-717)	Conclusion
B	Line 43: The obesity statistic among adolescents is from 2012 and should be updated to a more recent statistic.	Edited to update to 2020 data (see Page 3, Lines 109-111)	Introduction
B	Line 92-93: the statement "Current literature feels to deeply explore the gamification techniques that are impactful for and preferred by adolescents" seems quite broad; has this not be considered at all or is the gap in the literature more nuanced?	Clarified; the gap in the literature more nuanced. Literature well describes adult gamification, but adolescent mHealth gamification is not well understood. "Despite literature on the use of gamification by adults, current literature fails to deeply explore the nuances of gamification techniques that are impactful for and preferred by adolescent users." (see Page 4, Lines 167-169)	Introduction

B	Line 96: why did the authors decide to focus only on visual design needs? What about functional requirements or other user needs?	Some functional requirements overlap with visual design needs; thus, those elements are addressed. Most functional requirements follow pre-established and well understood conventions. Therefore, visual design needs would be the most impactful in literature (added to the aims statement).	
B	Did the authors follow a particular user-centered design framework?	<p>We utilized the framework found here: Interaction Design Foundation. User centered design. https://www.interaction-design.org/literature/topics/user-centered-design. Published 2020. Accessed 2020.</p> <p>Added to clarify in the Methods, “All preceding prototypes of the CommitFit mHealth app were influenced by adolescent feedback through a previous qualitative study involving focus groups of adolescents and caregivers, leading to evolutions of the visual interface.” (see Page 5 Lines 203-206)</p>	Methods
B	Where did the list of health behavior goals originate from? Were these informed by prior work and/or user findings?	Added “These goals were selected based on clinical experience working with adolescents with obesity (ASB, RK, AT) and with prior research experience on child obesity.” (see Page 5 Lines 211-213)	Methods
B	The paper mentions that early prototypes were informed by stakeholder feedback; it would be helpful to expand on what feedback was given and how this informed the prototype design.	Added “All preceding prototypes of the CommitFit mHealth app were influenced by adolescent feedback through a previous qualitative study involving focus groups of adolescents and caregivers, leading to evolutions of the visual interface.” (see Page 5 Lines 203-206)	Methods
B	The Method section could benefit from a better explanation of the recruitment process. How many clinics did the authors recruit from, and how were these clinics	Added to methods, “The first stage identified eligible candidates using the electronic health record (EHR), from a single-family medicine and	Methods

	<p>selected? Were all adolescents receiving treatment at these clinics contacted? What was the response rate, i.e. how many adolescents expressed interest vs how many adolescents were contacted in total? If more than 10 adolescents expressed interest, how did the authors select which adolescents could take part in the study?</p>	<p>pediatric clinic in the MU Health Care system where one of the researchers (ASB) works as a physician, who met the inclusion criteria: age 13 to 18 years old to speak English fluently, read at the 6th grade level or higher, and be proficient with smartphone app use to participate. Candidates were excluded if they had a pre-existing severe mental health diagnosis (other than mild or controlled anxiety and/or depression), intellectual disabilities, or eating disorders. Adolescents with a normal BMI were included in the study, as the CommitFit mHealth app aims to improve the user’s lifestyle and health behaviors. The second stage of recruitment occurred from provider referrals of identified populations. Stratified sampling was utilized with a goal of obtaining at least 10% (1) of participants of African American race, 10% from a low-income family (Medicaid recipient), and 10% from rural community, and with an even distribution of gender. Adolescents who participated in previous developmental focus groups were excluded from the recruitment process for adolescent interviews to avoid priming bias. Adolescents were enrolled in the study on a first come-first serve basis until ten adolescents were enrolled.” (see second paragraph under section 2.2 Adolescent Semi-structured Interviews and Task Analysis)</p>	
B	<p>Line 163: ‘adolescents were not required to be patients of either of the clinics we recruited from’ – this is confusing; if they were not patients, how were they recruited? Was snowball sampling used?</p>	<p>Removed – All participants were patients within MU Healthcare.</p>	<p>Methods</p>

B	Line 231: what question was asked to measure participants' phone usage?	Removed as it is not mentioned again in the manuscript and not relevant to the results.	Results
B	What data analysis methods were used to analyze the data? For example, it is mentioned several times throughout the paper that 'several themes were uncovered'. How were these themes derived and identified?	Feedback from the interviews was transcribed. The transcripts were inductively coded by two researchers (KTB, PG) using the Dedoose software. Added to Methods sections (see Page 6, Lines 272-273)	Methods under Adolescent Semi-structured Interviews and Task Analysis section
B	Some of the results are not new and are standard UX principles (e.g., using icons that fit convention, easy-to-use navigation, easy access to home screen). I would recommend the authors to shorten these sections or cut them altogether, and instead focus on new insights that contribute to the literature.	Sections of well-known and standard UX principles were consolidated or removed (e.g., <i>Logos</i> subsection).	Results
B	It helps to provide each participant quote with a participant ID, to assess whether quotes came from the same participants or not.	Added. Some quotes were consolidated, and new ones were added to improve context.	Results
B	Lines 292-296 seem to be a bit biased to prompt participants about an improvement in navigation. Did the authors explicitly ask participants about the navigation or did this come up organically during the sessions?	Initially organic – adolescents would comment on navigation concerns when prompted about improving function of the application. See Table 1. Added: "Feedback from the interviews was transcribed verbatim from the Zoom recording. The transcripts were inductively coded by two researchers (KTB, PG) using the Dedoose software. Interviewees were generally asked open-ended questions to allow for organic conversation, as shown in Table 1. Interviewees were asked close-ended questions, such as, "do you like the general design of the app?" (see Page 6, Lines 272-275)	

B	Line 332: were participants explicitly asked what types of gamification they would like to see?	Participants were explicitly asked what types of gamifications they would like to see or prefer. However, some participants were pointing out what gamification they liked within the CommitFit app, while also making some suggestions. This explanation has been added to manuscript. (see Page 13, Lines 450-452)	Results, Section 3.2 Qualitative under "Gamification"
B	Line 427: 'in the future, we would like to use AI...' – these are not Results and should be moved to the Discussion section.	Removed	Results
B	Conclusions: Study participants found CommitFit easy to use and provided feedback for design preferences.	Agreed, we're happy to clarify further, if needed	
B	Discussion: It would be helpful to start the Discussion by re-iterating the aim of the paper and summarize the main findings.	Agreed; added "The goal of this mixed-methods study was to identify adolescent expectations when using the CommitFit mHealth app and understand visual user-interface needs, as well as develop an intuitive and engaging user-interface; in doing so, the design and functional user requirements for mHealth app are described. Our findings on adolescent design (color scheme, modern interface, etc. (9,11,35)) and function (algorithms, expert generated content) preferences with mHealth apps align and expand with current literature on this topic (9,11,35). These findings can inform future researchers and app developers about adolescent needs and preferences, as identified by adolescent users. " (see Page 17, Lines 592-599)	Added to discussion
B	The Discussion does not discuss prior work. How do the paper findings fit into what has been done and found before? For example, the need for personalization has been found in the wider mHealth literature.	Prior work is now highlighted under Section 4.3 Comparison with similar research.	Discussion

B	Line 578: ‘Despite our small sample size, data saturation was reached’ – how was it determined that data saturation had been reached?	Added “Data saturation was reached when no additional novel feedback was collected from interviews, which occurred after ten participants.” (see Page 18, Lines 605-607)	Added to 4.2 Limitations
C	The abstract and introduction focus on adolescent obesity and issues regarding general mHealth app development. Yet, the authors missed the opportunity to explore the use of mHealth apps for healthy lifestyle promotion and their effectiveness. Further, the availability and efficacy of mHealth apps for adolescents remain unclear.	<p>Added to introduction: “As a result, we created the CommitFit mHealth app in collaboration with adolescent users. CommitFit is an app that focuses on lifestyle and health behavior modifications in adolescents. While CommitFit may improve weight, overweight and obese adolescents are not the only group that could benefit from the improved health behaviors” (see Page 3, Lines 117-119)</p> <p>The availability and efficacy of mHealth apps for adolescents is addressed in the fourth paragraph of the introduction.</p>	Introduction> 1.1 Background
C	The aims of the paper should match the methods and results. The authors state several aims related to the user interface, but the methods and results describe the co-development of an app with end users. If this manuscript is intended to describe the development of a mHealth app, this should be clear from the outset.	Clarified to describe the development of a mHealth app. Changed <i>Section 1.3 Objectives</i> to, “The objective of this study is to describe the co-development process working with adolescent users. From this, we aim to explore the visual design and functional requirements when developing the CommitFit mHealth app. This study aims to uncover the gamification techniques that incentivize adolescents to set and achieve healthy lifestyle goals. We utilized an iterative user-centered design and development framework focused on using a bottom-up approach, as opposed to scaling down an adult-targeted mHealth application. The additional purpose of this study was to identify adolescent	Changed <i>Section 1.3 Objectives</i>

		expectations when using the CommitFit mHealth application and to understand visual user-interface needs and wants, as well as design-related functional requirements.”	
C	The introduction is missing definitions for mHealth app. This is confusing for the reader when words, such as "app", "application", "mHealth app", and "health-focused application", are used synonymously. I suggest clearly defining mHealth app and using this terminology consistently.	Agree – Edited to include mHealth definition (see Page 3, Lines 114-116) and consolidated synonyms to ‘mHealth app’	Throughout manuscript
C	Furthermore, there are inconsistencies in the opening and closing components of the manuscript. The introduction describes the issue of adolescent obesity, but there is no mention in the closing paragraphs of how this mHealth app, or mHealth apps in general, might ameliorate this issue. It is also important to note that app engagement is one of the first steps toward establishing an effective mHealth intervention.	<p>“In the future, we hope to link the data collected from the CommitFit mHealth app to a provider-facing, ambulatory, EHR tool. This will allow for effective, safe, and monitored weight management and lifestyle interventions to occur to help address child obesity.” (added to Discussion, see Page 20, Lines 702-705).</p> <p>App engagement comments have been added to the manuscripts. We believe that gamification, as well as adolescent feedback, will improve engagement and, subsequently, health outcomes.</p>	Discussion
D	Title: add study design	Added, title now “Mixed-Method Study of Development and Design Needs for Adolescent mHealth Apps: CommitFit”	Added to title
D	Objective, needs to clear and concise. The first sentence is very long. Perhaps needs a primary and secondary objective.	Agree – Objective of abstract now reads, “The objective of this study is to describe the co-development process working with adolescent users. To identify adolescent expectations when using the CommitFit mHealth app and understand visual user-interface needs, we aim to describe the design and functional user requirements for the CommitFit mHealth app. These findings can inform future researchers and app developers	Objective of abstract

		about adolescent needs and preferences, as identified by adolescent users.”	
D	Method: How were the interviews conducted, semi-structured?	"Interviews were conducted online using Zoom and transcribed verbatim from the recorded audio. Interviews were hosted by researchers with experience conducting adolescent interviews, and at least one observer." Added to the manuscript. (see Page 6, Lines 241-243)	Added to Methods and Abstract
D	Add age range	Added, age range for recruited adolescents was 13-15 y/o.	Added to Methods, Introduction, and Abstract