PEER REVIEW HISTORY

ARTICLE DETAILS

TITLE (PROVISIONAL)	Central themes, core concepts and knowledge gaps concerning social media use, and mental health and well-being among adolescents. A protocol of a scoping review of published literature.
AUTHORS	Schønning, Viktor; Aarø, Leif; Skogen, Jens

VERSION 1 – REVIEW

REVIEWER	Christopher Ferguson Stetson University, USA
REVIEW RETURNED	27-Apr-2019

GENERAL COMMENTS	I appreciate the authors' efforts here and think this scoping review of social media could be valuable. Here are just a few comments I have which I hope will be helpful. First, I'd suggesting taking a bit more time to reference some of the ongoing controversies, which have become quite explosive. For instance there is a heated debate going on with Twenge and colleagues on one side and Przybylski and Orben on the other that is broaching a line of implying ethical violations. Others have also weighed in, such as the 2019 longitudinal study by Teena Willoughby's lab, as well as myself (Berryman, Ferguson & Negy) albeit in a much smaller way. It also extends to government agencies, some of which have advocated a more cautious approach to declaring "harm" (UNICEF, Royal College of Paediatricians) whereas others have declared the existence of things like "Facebook Depression" (American Academy of Pediatrics, although they took a lot of heat for mainly using newspapers as references…See Elson et al., in press with Advances in Methods and Practices in Psychological Science for some critiques of that statement.) I'd also suggest the authors take a moment to consider their own biases (as we all must). To be clear I'm not saying the authors have any in particular, but scholars have a natural kind of bias to find problems, often where they aren't really there. I'd also suggest the authors consider an effect size cut-off for evidence. Many large n studies can find "statistical significance" for effect sizes that are tiny (below r = .10) that are likely due to "crud" or methodological limitations (like common method variance, demand characteristics). These can be overinterpreted as providing evidence for a hypothesis when, in fact, they do not represent a population effect size, but rather error. I have some work in progress that suggests the Type I error rate for effect sizes below r = .10 is very high and not controlled by alpha. Przybylski also suggests an r = .10 minimum effect size for interpretation, and I agree this should be the minimum standard for evidentiary value, and even at that

	quite the minimum. I think it's worth also examining the issue of moral panic, which has been discussed in other media psychology realms such as video games. Is there evidence that scholars, politicians, etc., are indulging in moral panic that may be misrepresenting the strength, quality and consistency of evidence? Lastly, I suggest the authors consider the use and misuse of epidemiological data. For instance, several recent papers have focused on US teen suicide rates without considering that, a.) teen suicide rates in other high-tech countries such as the UK have decline and b.) US suicide rates and increases are actually much higher among lower-tech middle-aged adults than teens. Thus cherry-picking of epidemiological data also seems to be a significant problem for this research field.

REVIEWER	Judith A Vessey, PhD, MBA, RN, FAAN Boston College, William F. Connell School of Nursing and Boston Children's Hospital USA
REVIEW RETURNED	01-Jul-2019

GENERAL COMMENTS	Comments by section: Strengths and Limitations • These should be made more explicit as to whether they are strengths or limitations; currently they are just mainly statements about what is to be accomplished. • The authors may be correct in stating their proposed study will be the first to examine the relationship between social media and mental health. However, there has been some published reviews that have examined the relationship between social media and aspects of mental health, including two by this team. The authors need to better clarify this work's unique contributions. Background • Statistics and general information are given for the general population yet the focus is on adolescents. Data specific to this population should be provided. • Including a sentence that describes how ubiquitous SM usage is in adolescents worldwide (regardless of geographic region, economic development, or culture) would strengthen the case for this review. • While the reviewer does not disagree with the sentence "social media is complex and multi-layered with several stakeholders", further explicating this thought would be helpful to the reader." • The description of the approach and on why using this approach will help address gaps in the literature is well-done. Aims • The secondary questions are written as aims and not questions. The first is clear and appropriate. • The second secondary question is limited. As written, its

	seems that gender is being treated in a binary fashion. A broader concern is that this singular focus omits other key components (race/ethnicity, socio-economic status, rural/metropolitan/inner city geographic location, etc.) that are known to singularly and collectively influence youths' mental health, and in some cases, social media use. • It is unclear why the investigators are limiting the focus of the third secondary question to sources of evidence presented only in the quantitative studies identified when qualitative studies will also be included. Defining Adolescence and Social Media • The definition of adolescence seems arbitrary, not embracing the stages or characteristics used to describe adolescence in the developmental literature. In westernized countries, many youths begin using social media prior to age 13, and arguably, at a more vulnerable period for mental health issues to arise. The WHO defines adolescence as youths 10-19. Adolescence is also characterized into three primary stages, each with different developmental challenges that can influence mental health. • The definition and model for social media is rich and will be useful in guiding the review. Data Sources and Search Strategy • A rationale for the start date for the search should be provided. • An additional search database to consider would be CINAHL (Cumulative Guide to Nursing and Allied Health Literature) in order to capture research being conducted by psychiatric mental health nurses and other clinical professionals. Study Selection: Inclusion/Exclusion Criteria • The inclusion or exclusion of studies conducted by discreet qualitative methods (e.g., qualitative descriptive, phenomenology, case study, etc.) needs to be addressed considering the primary aim states that "Both quantitative and qualitative studies are of interest". It is noted that these are eliminated in the exclusion criteria. Justification between the overall review's goals, theoretical underpinnings for using a scoping review technique, and inclusion/exclusion criteria need to be justified with each other. • In the inclusion criteria, the concepts of 'social support' and 'sleep' are related to mental health but so are many other concepts (e.g., academic performance; nutritional patterns, specific internalizing and externalizing disorders, parental involvement). It is unclear why just these two have been selected; a strong rationale needs to be provided. • Excluding all youths with chronic conditions or those from specific minority groups is untenable as these groups are those most at risk. Moreover, these subgroups are commonly embedded in large samples (such as any study that uses the U.S. YRBS [Youth Risk Behavior Surveillance System] data or data from numerous national, regional, or WHO surveys). How would minority status be determined if

	studies are being drawn from countries across the globe? • Training and expertise (methodological and conceptual) of the investigators needs to be described. Data Extraction and Organization • A broader range of sample descriptors (beyond gender) would be helpful in interpreting the findings Data Synthesis: Quantification and Narrative Approach • The type of study category seems simplistic, not capturing the full richness of the methods employed • The term 'mental health' needs to be more fully explicated—most studies refer to deviations in mental health (i.e., depression, anxiety, suicide ideation) rather than on the constellation of components and behaviors that comprise mental health. Mental health can also be considered a state or trait attribute. Will a standardized nomenclature be used such as the WHO mental health indicators? Although moral/ethical behavior and reasoning are not described, some see this as a component of mental health; will these studies be included? Presentation of Results • It is unclear as to whether the primary and secondary aims/questions will serve as the template for the organization of the results

REVIEWER	Gbotemi Bukola Babatunde University of KwaZulu-Natal (School of nursing and public health). Durban, South Africa.
REVIEW RETURNED	22-Jul-2019

GENERAL COMMENTS	This scoping review is a much needed addition to the literature. Overall, it was well written but can benefit from English language editing. A few areas such as the aims and methods can be strengthened. Under the aim of the study, the research questions stated should be rephrased and presented as questions. The questions presently read more like objectives. Under the data sources and search strategy sections, it is important to explain why 2014 was chosen as the target year. I am assuming that there was no strong rationale for considering studies published in the last 5 years but if there are (or even if there are not) i suggest a sentence explaining why limiting your search to studies conducted between 2014 -2019 is significant. Under the exclusion criteria explain why intervention and treatment studies relevant to the study will be eliminated. Also i will like to know why only 300 studies will be drawn during the first stage of screening (line 39-41). I hope that the authors can address these issues as I think that this is an important article that should be published.

VERSION 1 – AUTHOR RESPONSE

Reviewer 1

First, I'd suggesting taking a bit more time to reference some of the ongoing controversies, which have become quite explosive. For instance there is a heated debate going on with Twenge and colleagues on one side and Przybylski and Orben on the other that is broaching a line of implying ethical violations. Others have also weighed in, such as the 2019 longitudinal study by Teena Willoughby's lab, as well as myself (Berryman, Ferguson & Negy) albeit in a much smaller way. It also extends to government agencies, some of which have advocated a more cautious approach to declaring "harm" (UNICEF, Royal College of Paediatricians) whereas others have declared the existence of things like "Facebook Depression" (American Academy of Pediatrics, although they took a lot of heat for mainly using newspapers as references…See Elson et al., in press with Advances in Methods and Practices in Psychological Science for some critiques of that statement.)

Response: We thank you for the vital input about the ongoing debates and have included the following section in our introduction:

"There is currently an ongoing debate regarding the strength of the association between adolescent well-being and the use of digital technology and social media with Twenge and colleagues being adamant about its negative impact [8]. On the other side, Przybylski and colleagues have found that the association between digital technology use and adolescent well-being is negative but only explaining 0.4 % of the variation in well-being, and they suggest that these effects are too small to warrant any policy change [9]. The possibility that concerns regarding social media use may be exaggerated is also suggested by Berryman and colleagues in their study from 2018 [10]".

I'd also suggest the authors consider an effect size cut-off for evidence. Many large n studies can find "statistical significance" for effect sizes that are tiny (below r = .10) that are likely due to "crud" or methodological limitations (like common method variance, demand characteristics). These can be overinterpreted as providing evidence for a hypothesis when, in fact, they do not represent a population effect size, but rather error. I have some work in progress that suggests the Type I error rate for effect sizes below r = .10 is very high and not controlled by alpha. Przybylski also suggests an r = .10 minimum effect size for interpretation, and I agree this should be the minimum standard for evidentiary value, and even at that quite the minimum.

Response: We certainly do agree that effect sizes smaller than .10 should not be overinterpreted. As this is a broad scoping review which aims to describe the central themes and focus of previously published papers, the actual results or public health relevance these results of the included studies are not our main concern. In contrast to a systematic review (and meta-analysis) which has a much narrower focus, we do not aim to summarise and present aggregate effect measure of a well-defined association between for instance the use of social media and depression. Rather our aim is to shed light on what has been the focus of research within this area, what are the core concepts and what are the research topics which have not been subject to much research. Also, we aim to include both quantitative and qualitative studies in the scoping review. However, in the revised protocol, we have now revised the introduction to also include some of the published criticisms you highlight in the above comment.

I'd also suggest the authors take a moment to consider their own biases (as we all must). To be clear I'm not saying the authors have any in particular, but scholars have a natural kind of bias to find problems, often where they aren't really there.

Response: We thank the reviewer for this comment. The authors of this protocol are trained clinical psychologists educated in a model based on the scientist-practitioner model (Boulder model: https://psycnet.apa.org/fulltext/2000-13816-005.html). This education includes training in the importance of keeping an attitude of reflexivity regarding knowledge construction. We hope and believe we have avoided having a biased approach to the research literature even though we know it is impossible to guarantee. We are doing our best to be open-minded with regard to possible effects of social media use on mental health. We believe, that if the use of

social media turns out to have impacton young people's health and wellbeing, these effects may well be positive as well as negative. We have now included the following information in the revised protocol:

"The reviewers are trained clinical psychologists educated based on the scientist-practitioner model. All but one of the researchers involved have experience with different kinds of reviews, such as narrative reviews and systematic reviews."

I think it's worth also examining the issue of moral panic, which has been discussed in other media psychology realms such as video games. Is there evidence that scholars, politicians, etc., are indulging in moral panic that may be misrepresenting the strength, quality and consistency of evidence?

Response: We have now included the following section to include the important aspect of moral panic and its possible role in contributing to misrepresenting the evidence:

"There is also the possibility that the issue of moral panic is contributing to misrepresenting the detrimental effects of social media use on adolescents well-being, a phenomenon which has been heavily discussed regarding the effects of introducing new media technologies such as video games, TV and radio [9]. It is, however, difficult to pinpoint if moral panic exists and what role it plays in presenting the evidence of social media use on well-being."

Lastly, I suggest the authors consider the use and misuse of epidemiological data. For instance, several recent papers have focused on US teen suicide rates without considering that, a.) teen suicide rates in other high-tech countries such as the UK have decline and b.) US suicide rates and increases are actually much higher among lower-tech middle-aged adults than teens. Thus cherry-picking of epidemiological data also seems to be a significant problem for this research field.

Response: Again, we thank the reviewer for this comment. As this is a scoping review, our main aim is not to shed light on the credibility or validity of the findings presented in the included studies, but to present a broad picture of what the field has focused on in line with our aims described in the protocol. Further, we are not at this point aware of any studies that indicate that cherry-picking or the misuse of epidemiological data for the purposes of investigating associatins between use of social media and mental health is more prevalent than within other research areas. However, if this seems evident after the inclusion process is finished, it will of course be something to discuss in the scoping review. But we would prefer not to make this an explicit aim of the scoping review without further empirical justification.

Reviewer 2

1. Strengths and Limitations

"These should be made more explicit as to whether they are strengths or limitations; currently they are just mainly statements about what is to be accomplished."

Response: We have now revised the strengths and limitations section to explicitly name if the statements are considered strengths or limitations:

- **"A strength of the current study is that it will be the first scoping review to systematically identify and summarize the central research foci and knowledge gaps in the research field of social media use, and mental health and well-being among adolescents.**

- **Another strength is that the search strategy includes several electronic databases with published peer-reviewed literature, with an aim to cover all relevant research publications.**

- **Initial selection of articles will be done by two reviewers independently which is considered a strength of the study**

- **It is considered a strength that data extraction from included articles will be done by two reviewers independently to ensure the quality of the collected information.**

- **Being a scoping review, no formal assessment of study quality will be carried out. This is considered a limitation of the current study."**

2. "The authors may be correct in stating their proposed study will be the first to examine the relationship between social media and mental health. However, there has been some published reviews that have examined the relationship between social media and aspects of mental health, including two by this team. The authors need to better clarify this work's unique contributions"

Response: We agree, and we do not claim this to be the first study to examine the relationship between specific aspects of social media and specific aspects of mental health. But we believe that this is the first scoping review with the aim to cover studies investigating the use of social media (defined broadly) and a wide array of different mental health indicators, including well-being.

We have tried to make this clear, and the sentence now reads:

"A strength of the current study is that it will be the first scoping review to systematically identify and summarize the central research foci and knowledge gaps in the research field of social media use, and mental health and well-being among adolescents in both qualitative and quantitative studies. In an effort to cover most of the research field, social media is broadly defined, and mental health and well-being is not restricted to any particular disorder or system cluster."

3. "Background
Including a sentence that describes how ubiquitous SM usage is in adolescents worldwide (regardless of geographic region, economic development, or culture) would strengthen the case for this review. "

Response: We thank the reviewer for this input and the start of the background section now reads as follows:

"Social media is a relatively new phenomenon with an increasing popularity. The number of social media users worldwide has increased rapidly the last years, reaching 2 billion in 2015 and is estimated to reach 3 billion users in 2021 [1]. Today, social media use is ubiquitous in adolescents worldwide regardless of differences such as culture, geographic region or socioeconomic status."

4. "While the reviewer does not disagree with the sentence "social media is complex and multi-layered with several stakeholders", further explicating this thought would be helpful to the reader."

Response: We have tried to clarify what we mean and the sentence is now as following:

"The realm of social media is complex and multi-layered with several stakeholders and a constantly changing technological landscape. The content of social media is both user-generated and commercially generated and there are often both corporate and public interests and stake-holders in the phenomenon. A scoping review would help provide a foundation for further research, and in time also for policymaking and service delivery."

5. "Aims
The secondary questions are written as aims and not questions. The first is clear and appropriate"

Response: The section of secondary questions has been revised and now reads:

"Three specific secondary research questions will be addressed:

- **Which aspects of mental health and well-being have been the focus or foci of research so far?**
- **Has the research focused on different research aims across gender, ethnicity, socio-economic status, geographic location? What kind of findings are reported across these groups?**
- **Organise and describe the main sources of evidence related to social media that have been used in the quantitative studies identified."**

6. The second secondary question is limited. As written, its seems that gender is being treated in a binary fashion. A broader concern is that this singular focus omits other key components (race/ethnicity, socio-economic status, rural/metropolitan/inner city geographic location, etc.) that are known to singularly and collectively influence youths' mental health, and in some cases, social media use.

Response: We thank the reviewer for this comment and have revised the study aim in question:

"Has the research focused on different research aims across gender, ethnicity, socio-economic status, geographic location? What kind of findings are reported across these groups?"

7. Data Sources and Search Strategy
A rationale for the start date for the search should be provided.

Response: The start-date for the search was April 2019 with additional searches in May 2019 and this information has now been included in the protocol. We do not have any rationale for why this point in time was chosen as a start date for the main searches. We are not sure what such a rationale should be. We chose to start our systematic search as soon as we were able after testing the search terms and making adjustments to the search terms in collaboration with the special librarian search team at Norwegian Institute of Public Health, Division of Health Services. When it comes to the age limit of five years, this was chosen as a limitation mainly due to rapid change in the use and types of use of social media. Findings more than five years old were therefore deemed to be less relevant to shed light on our research questions. There were also practical reasons to limiting our search to 2014, related to available resources. Unfortunately, since this protocol was submitted in early April, the search has now been conducted and we have made substantial progress in selecting relevant studies and it will not be possible to change the target year of 2014. A sentence describing why we chose to limitour search has now been added to the protocol.

8. Study Selection: Inclusion/Exclusion Criteria
Training and expertise (methodological and conceptual) of the investigators needs to be described.

Response: The researchers involved in this study are trained clinical psychologists educated in model based on the scientist-practitioner model (Boulder

model: https://psycnet.apa.org/fulltext/2000-13816-005.html). This means that they have basic training in both qualitative and quantitative methodology. Two of the investigators also holds a PhD in public health. All but one of the researchers involved have experience with different kinds of reviews, such as narrative reviews and systematic reviews.

9. Data Extraction and Organization
A broader range of sample descriptors (beyond gender) would be helpful in interpreting the findings

Response: In line with the previous comment we have included a broader range of descriptors and will now include the key components gender, ethnicity, socio-economic status and geographic location.

10. Data Synthesis: Quantification and Narrative Approach. The type of study category seems simplistic, not capturing the full richness of the methods employed

Response: Thank you for this comment. Given the breadth of the area we want to cover we do not believe we do not aim to cover the included studies in full detail. Our aim is to shed light on the main themes and core concepts of the included studies and identify knowledge gaps. And we hope our research aims will be helpful in that respect. We are not sure what the reviewer means by "capturing the full richness of the methods employed" – but if the reviewer have any specific suggestions to how our data synthesis may improve we would appreciate the input.

11. The term 'mental health' needs to be more fully explicated—most studies refer to deviations in mental health (i.e., depression, anxiety, suicide ideation) rather than on the constellation of components and behaviors that comprise mental health. Mental health can also be considered a state or trait attribute. Will a standardized nomenclature be used such as the WHO mental health indicators? Although moral/ethical behavior and reasoning are not described, some see this as a component of mental health; will these studies be included?

Response: Mental health is a term composed of several components and the search strategy was to set up a a broad search that included central keywords and more specific terms on a diagnostic level for mental health problems. It is hard to imagine a search with an exhaustive list of the relevant terms on a theme with the comprehensiveness of mental health, but we believe we have included the most relevant search terms to cover mental health broadly. The search terms used to identify studies which focus on symptoms of mental disorders, or specific mental disorders are in accordance with the terminology used by ICD-10 (chapter F) and DSM-IV and DSM-V. See the uploaded additional document for an example of a full search strategy.

12. Presentation of Results. It is unclear as to whether the primary and secondary aims/questions will serve as the template for the organization of the results.

Response: We thank you for the comment and have reviewed the section to the following: "This scoping review aims to give an overview of the main research questions that have been focused on in relation to use of social media among adolescents and mental health and well-being. Both quantitative and qualitative studies are of interest. Three specific secondary research questions will be addressed and together with the main research question serve as a template for organizing the results"

13. Background. Statistics and general information are given for the general population yet the focus is on adolescents. Data specific to this population should be provided.

Response: We have revised the background section, and among other changes added the following sentence:

"Among youth aged 12-15 years in the UK, 99 % go online for at least 20 hours a week and 69 % have a social media profile according to an rapport on media use [2]."

14. Aims. It is unclear why the investigators are limiting the focus of the third secondary question to sources of evidence presented only in the quantitative studies identified when qualitative studies will also be included.

Response: We thank you again for the comment, and have now removed the specification that only evidence from quantitative studies will be organised and described.

15. Defining Adolescence and Social Media. The definition of adolescence seems arbitrary, not embracing the stages or characteristics used to describe adolescence in the developmental literature. In westernized countries, many youths begin using social media prior to age 13, and arguably, at a more vulnerable period for mental health issues to arise. The WHO defines adolescence as youths 10-19. Adolescence is also characterized into three primary stages, each with different developmental challenges that can influence mental health.

Response: There are several reasons to why we chose 13-19 as the period of adolescence. First, , although there is no consensus on the exact timing of adolescence, we believe that 13-19 years is one of many different age ranges often used as a definition of adolescence. Another reason is that nearly all social media services require users to be at least 13 years of age to access and use their services. This includes Facebook, Snapchat, Twitter, Instagram and Skype (https://www.childnet.com/blog/age-restrictions-on-social-media-services). Other social services such as WhatsApp has an age limit of 16. Although we acknowledge that many users are below the recommended/compulsory age-limits, we believe that these age-limits can serve as a reasonable lower age range for our study.

The use of social media (types of platforms, frequency and duration) among individuals younger than 13 might arguably differ (especially when approaching 10 years of age) compared to those who are older, and more likely to own their own phone or tablet: A Norwegian survey from 2019 found that only 19% of among those aged 8-11 years used social media compared to 75% among those aged 16-19 years (IPSOS target-group analysis commissioned by Norwegian Institute of Public Health, 2019). The same survey found considerable difference in which platforms the different age groups used. Snapchat (the most used platform among Norwegian children and adolescents) for instance was used daily by 66% of those aged 12-15 years and 69% of those aged 16-19 years, compared to only 14% among those aged 8-11 years. Also there is reason to believe that there are important differences with regards to mental health and well-being among those close to 10 years as compared to those who are a bit older.

To conclude, we needed a lower age limit, and it is our understanding that there exist several ways of defining adolescence with regards to age-range. We have chosen the age-range 13-19 for the stated reasons as described above. If it is deemed desirable to align more with WHO's definition of adolescence, we are of course open to changing the term adolescence to "middle to late adolescence".

Also, as mentioned previously, the search has now been conducted and we have made substantial progress in selecting relevant studies and it will not be possible change this inclusion criteria. A sentence describing why we chose to limit our search has now been added to the protocol.

16. An additional search database to consider would be CINAHL (Cumulative Guide to Nursing and Allied Health Literature) in order to capture research being conducted by psychiatric mental health nurses and other clinical professionals.

Response: Thank you for your comment. We agree, and are currently in the process of conducting another search in the CINAHL search database.

17. Study Selection: Inclusion/Exclusion Criteria. The inclusion or exclusion of studies conducted by discreet qualitative methods (e.g., qualitative descriptive, phenomenology, case study, etc.) needs to be addressed considering the primary aim states that "Both quantitative and qualitative studies are of interest". It is noted that these are eliminated in the exclusion criteria. Justification between the overall review's goals, theoretical underpinnings for using a scoping review technique, and inclusion/exclusion criteria need to be justified with each other.

Response: We thank you for the comment. It is correct that both quantitative and qualitative studies are of interest. Our exclusion criteria are as follows: "

- **Editorials, opinion pieces, commentaries**
- **Study or review protocols**
- **Book chapters**
- **Publications not peer-reviewed**
- **Non-empirical studies**
- **Theoretical studies, perspective articles**
- **Specific populations such as individuals with chronic illness or physical or mental disabilities**
- **Specific sub-populations, minority groups**
- **Intervention studies**
- **Treatment studies**
- **Internet- or app-based therapy**
- **Unpublished studies/conference proceedings**
- **Not within our definition of social media**
- **Studies were social media is only used as a moderator**
- **Studies which focus on internet gambling**
- **Clinical case-reports**
- **Studies focusing on the use of online information**
- **Studies focusing on aggression and violence (beyond cyber bullying)**
- **Studies focusing on brain disorders/cognitive disorders**
- **Studies focusing on information processing, decision-making or personality"**

Studies conducted by qualitative methods are not mentioned in our exclusion criteria. However, clinical case reports are excluded as we do not include clinical population in the current scoping review.

18. In the inclusion criteria, the concepts of 'social support' and 'sleep' are related to mental health but so are many other concepts (e.g., academic performance; nutritional patterns, specific internalizing and externalizing disorders, parental involvement). It is unclear why just these two have been selected; a strong rationale needs to be provided.

Response: We thank you again for your comment. We have removed the concept "social support" from our inclusion criteria. Regarding our inclusion of "sleep" we believe a changed sleep-pattern to be very closely related to a range of mental disorders, for example as a symptom of depression or an indicator of a range of other mental disorders. Furthermore, sleep disorders such as insomnia and delayed sleep phase syndrome are common amongst adolescents and two of several disorders included in both the Diagnostic and Statistical Manual of Mental Disorders 5 and the International Classification of Diseases 10.

19. Study Selection: Inclusion/Exclusion Criteria. Excluding all youths with chronic conditions or those from specific minority groups is untenable as these groups are those most at risk. Moreover, these subgroups are commonly embedded in large samples (such as any study that uses the U.S. YRBS [Youth Risk Behavior Surveillance System] data or data from numerous national, regional, or WHO surveys). How would minority status be determined if studies are being drawn from countries across the globe?

Response: Thank you for this important comment that we agree with. To clarify our thinking; we are not interested in studies that specifically examine sub-populations or clinical samples, but rather studies that recruits from the youth population. This will of course often include youth with chronic conditions and other minority groups and we do not exclude these groups from the large samples that you mention. We have now revised the protocol under study selection to make this point more clear for the reader.

Reviewer 3

A few areas such as the aims and methods can be strengthened. Under the aim of the study, the research questions stated should be rephrased and presented as questions. The questions presently read more like objectives. Under the data sources and search strategy sections, it is important to explain why 2014 was chosen as the target year. I am assuming that there was no strong rationale for considering studies published in the last 5 years but if there are (or even if there are not) i suggest a sentence explaining why limiting your search to studies conducted between 2014 -2019 is significant. Under the exclusion criteria explain why intervention and treatment studies relevant to the study will be eliminated. Also i will like to know why only 300 studies will be drawn during the first stage of screening (line 39-41)

Response: We thank the reviewer for an insightful comment. Our research questions have now been rephrased to questions in line with your comment and now currently reads:

- **"Which aspects of mental health and well-being have been the focus or foci of research so far?**
- **Has the research focused on different research aims across gender, ethnicity, socio-economic status, geographic location and what kind of findings are reported across these groups.**
- **Organise and describe the main sources of evidence related to social media that have been used in the quantitative studies identified."**

Furthermore, we chose to limit our search to studies published after 2014 mainly due to rapid change in the use and types of use of social media. Findings more than five years old were therefore deemed to be less relevant to shed light on our research questions. There were also practical reasons to limiting our search to 2014, related to available resources. Unfortunately, since this protocol was submitted in early April, the search has now been conducted and we have made substantial progress in selecting relevant studies and it will not be possible to change the target year of 2014. A sentence describing why we chose to limit our search has now been added to the protocol.

We are not interested in specific clinical groups and treatment studies, and a question that is worthwhile to ask would be whether the interventions studied should target mental disorders or social media use. Or should the interventions studied have an effect on social media use, mental health or both? The intervention could also be conducted via social media. Intervention- and treatment studies like these would broaden our search to include other themes and research questions than the ones we are interested in answering; when research has examined the association between social media and mental health amongst adolescents – what have they focused on?

We chose 300 studies to be drawn during the first screening to calibrate the reviewers rating in the selection-phase to examine and ensure that the interrater reliability was satisfactorily high. The number of studies drawn could have been higher or lower but 300 was deemed as a

sufficient number to identify potential lacks in our inclusion/exclusion criteria and adjust the reviewers to be more coherent.

VERSION 2 – REVIEW

REVIEWER	Christopher J Ferguson Stetson University
REVIEW RETURNED	11-Oct-2019

GENERAL COMMENTS	I am satisfied with this revised version of the paper.

REVIEWER	Judith A Vessey Boston College, Boston Children's Hospital USA
REVIEW RETURNED	29-Nov-2019

GENERAL COMMENTS	**Abstract:** Well-written; problem significance, intent and scope are clear. **Strengths/Limitations:** • Some level of quality analysis would definitely strengthen this SR; there are a variety of tools available across disciplines that can capture a full range of study types (qualitative, descriptive, interventional, etc.)—I would suggest that the researchers spend some time examining these. **Background:** • The background would be strengthened by providing a broader global view of social media use. In listing types and prevalence, focusing on incidence and using more recent statistics from government and NGO (including the WHO) reports rather than on published studies would present a more current review. For example, Facebook use has declining usage in adolescence, but usage on other platforms (e.g., TikTok) are skyrocketing. • Please define the precise population (by age) that will be included early in the paper—this is done later, but needs to be mentioned earlier as you include info on young adults in the background section. Young adults have very different usage patterns than young adolescents; emerging mental health issues also differ across age groups (e.g, first dx of schizophrenia in late adolescents/young adults). • The term 'moral panic' should be defined as this is a key concept of interest but not one that is used globally. **Aims** • For the second secondary RQ, I would add consider adding language—even though only sources written in English will be reviewed, there still can be high variability in the where the research was conducted • The third secondary RQ is not stated as a question **Defining Adolescence/Social Media** The model is very helpful and a strength. The age range may be too

	narrow, especially at the younger end. Early adolescence is thought to begin with the 'tweens' (10 or 11 years) when youths enter middle school, generally have their own phone, increasing independence, and also a time when selected mental health concerns begin to spike. While some platforms have minimum age standards, these are easily ignored/violated by younger teens—especially those more likely to engage in risky behavior; this will need to be addressed as it could affect the literature acquisition process. **Data Sources and Search Strategy** A comprehensive set of sources and inclusion/exclusion criteria are noted. Although the rationale for five years is appropriate, available resources may be fewer than what would be beneficial for a thorough scoping review. Preliminary searches will provide guidance for this concern. As mentioned before, I would definitely lower the 'floor' to 10 or 11 years—this is the age when most youths get their own phone and move on to middle school (at least in the US). This lower age is also in line with what is considered to be the youngest adolescents as well as the developmental period when mental health concerns have a higher incidence of occurrence. (See: https://www.healthychildren.org/English/ages-stages/teen/Pages/Stages-of-Adolescence.aspx) Excluding all non-refereed materials will likely limit review quality, especially if a 5 year window is used, as not including emerging knowledge published from sources such governmental reports. For the inclusion criteria 'English'—I am assuming that this is not limited to Westernized countries? How will mental health problems be defined? The authors might consider eliminating 'sleep/well-being' in the absence of 'mental health' as an inclusion criteria in the absence of a DSM-V diagnostic category. Although the case can be made for its inclusion, this is a large and widely diverse literature that may 'muddy the waters'. For example, sleep disturbances associated or be concomitant *with*, or result *in or from* mental health problems, but when transient may indicate resilience. There is also the 'blue light' screen issue that effects sleep regardless of content. Lastly, the exclusion criteria of specialty social media platforms for adolescents with chronic conditions is appropriate but as all of these references could easily be identified simultaneously, consider culling them for separate analysis and publication. This could be a significant contribution to the literature. The study selection process is well-described. It would be enhanced by stating the minimal criteria for the reviewers used for this process. **Data Extraction & Organization** Depending on the final sample size, having the second reviewer provide some level of input on all selected sources would strengthen the study. Some measure of quality (as previously noted) would be helpful. Having done work in this arena, I can promise you that there are a lot of refereed data-based publications that are frankly, of very low quality and would provide little, or even spurious, information to your review. **Data Synthesis** The proposed plan is appropriate but may need to be adjusted depending on data extraction, etc. As previously

	mentioned, consider using an age frame that captures the three generally accepted subgroups of adolescence (young, middle, old) in the analysis; also consider stratifying findings by genre of social media (e.g., dating apps such as , video sharing apps such as TikTok, YouTube). Conducting a pilot may be appropriate, as was used to identify sources. **Presentation of Results** Appropriate at this stage. **Ethical Considerations** Appropriate. **Conclusion** This study will be useful in paving the pathway for meaningful research on youth social media uses and mental health concerns.

VERSION 2 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: Christopher J Ferguson
Institution and Country: Stetson University Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below I am satisfied with this revised version of the paper.

Response: We thank the reviewer for the positive comment, and for helping us improve the manuscript.

Reviewer: 2

Reviewer Name: Judith A Vessey
Institution and Country: Boston College, Boston Children's Hospital USA Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below See attached file

Abstract: Well-written; problem significance, intent and scope are clear.
Response: We thank the reviewer for this comment. We have, however, changed the abstract to also include some more details as requested by the editor.

Strengths/Limitations:
• Some level of quality analysis would definitely strengthen this SR; there are a variety of tools available across disciplines that can capture a full range of study types (qualitative, descriptive, interventional, etc.)—I would suggest that the researchers spend some time examining these.
Response: We appreciate the reviewer's comment. We agree that the mentioned tools could

potentially strengthen the current scoping review, but at the same time, we consider it to be beyond the scope of our aims. Usually, scoping review are done to get an overview of a scientific field, without taking quality into account (please also see response related to similar comment below).

Background:
• The background would be strengthened by providing a broader global view of social media use. In listing types and prevalence, focusing on incidence and using more recent statistics from government and NGO (including the WHO) reports rather than on published studies would present a more current review. For example, Facebook use has declining usage in adolescence, but usage on other platforms (e.g., TikTok) are skyrocketing.
Response: We thank the reviewer for this comment and can see that this would be of interest for readers. However, the aim of the scoping review is not to present up-to-date statistics on the use of different social media platforms, and related demographics, but to give an overview of the published research focusing on the use of social media and mental health, including well-being.

• Please define the precise population (by age) that will be included early in the paper—this is done later, but needs to be mentioned earlier as you include info on young adults in the background section. Young adults have very different usage patterns than young adolescents; emerging mental health issues also differ across age groups (e.g, first dx of schizophrenia in late adolescents/young adults).
Response: We thank the reviewer for this useful comment, and have now revised accordingly by mentioning our age-definition as early as the “strengths and limitations”-section.

• The term ‘moral panic’ should be defined as this is a key concept of interest but not one that is used globally.
Response: We appreciate the reviewer’s comment and have now revised our section about moral panic.

Aims
• For the second secondary RQ, I would add consider adding language—even though only sources written in English will be reviewed, there still can be high variability in the where the research was conducted
Response: We thank the reviewer for this comment, and have revised the manuscript to make it clear that we include sources written in English regardless of country of origin.

• The third secondary RQ is not stated as a question
Response: We thank the reviewer for this comment and have revised accordingly.

Defining Adolescence/Social Media
The model is very helpful and a strength. The age range may be too narrow, especially at the younger end. Early adolescence is thought to begin with the ‘tweens’ (10 or 11 years) when youths enter middle school, generally have their own phone, increasing independence, and also a time when selected mental health concerns begin to spike. While some platforms have minimum age standards, these are easily ignored/violated by younger teens—especially those more likely to engage in risky behavior; this will need to be addressed as it could affect the literature acquisition process.
Response: We respect the view of the reviewer. However, as stated and discussed in the previous response letter, we chose the age range of 13-19 when defining adolescence as it aligns with the lower recommended age limit of the most used social media. As the search has now been conducted and selection of relevant studies has gained some progress, it will not be possible to change this inclusion criteria at this time.

Data Sources and Search Strategy

A comprehensive set of sources and inclusion/exclusion criteria are noted. Although the rationale for five years is appropriate, available resources may be fewer than what would be beneficial for a thorough scoping review. Preliminary searches will provide guidance for this concern. As mentioned before, I would definitely lower the 'floor' to 10 or 11 years—this is the age when most youths get their own phone and move on to middle school (at least in the US). This lower age is also in line with what is considered to be the youngest adolescents as well as the developmental period when mental health concerns have a higher incidence of occurrence. (See: https://www.healthychildren.org/English/agesstages/teen/Pages/Stages-of-Adolescence.aspx).
Response: See response above regarding the same issue.

Excluding all non-refereed materials will likely limit review quality, especially if a 5 year window is used, as not including emerging knowledge published from sources such governmental reports.
Response: Thank you for this comment – although we agree that this limits the potential material covered by this scoping review, the aim is "to give an overview of the main research questions that have been focused on in relation to use of social media among adolescents and mental health and well-being". This aim is chosen as we want to present the core themes and focus that has been the focus of research within this field.

For the inclusion criteria 'English'—I am assuming that this is not limited to Westernized countries?
Response: We thank the reviewer for this comment. Correct, we have now clarified the inclusion criteria and it now states "published in English".

How will mental health problems be defined?
Response: We have not used the term "mental health problems" in this protocol. Rather, we focus both on positive and negative mental health. Negative mental health includes symptoms related (and constituting) to mental disorders such as depression, while positive mental health is more than the lack of negative symptoms, and includes well-being.

The authors might consider eliminating 'sleep/well-being' in the absence of 'mental health' as an inclusion criteria in the absence of a DSM-V diagnostic category. Although the case can be made for its inclusion, this is a large and widely diverse literature that may 'muddy the waters'. For example, sleep disturbances associated or be concomitant with, or result in or from mental health problems, but when transient may indicate resilience.
Response: We thank the reviewer for the comment and respect the opinion – however we do not agree. Severe and longstanding sleep problems is a category of diagnoses that we believe to be highly relevant for adolescents. We also believe the research field of well-being to be an important area to cover. Well-being has received an increasing amount of attention, and our goal in the planned scoping review is to cover both negative and positive aspects regarding social media use and mental health. To us, this involves a focus on well-being, and not solely on the absence of mental disorders. There is also the 'blue light' screen issue that effects sleep regardless of content. Lastly, the exclusion criteria of specialty social media platforms for adolescents with chronic conditions is appropriate but as all of these references could easily be identified simultaneously, consider culling them for separate analysis and publication. This could be a significant contribution to the literature.
Response: We thank the reviewer for the comment. We agree that this is an important and under-studied area of research, but we deem it to be beyond the scope of the current review. The field of social media use for adolescents with chronic conditions should be explored in a scoping review of its own.

The study selection process is well-described. It would be enhanced by stating the minimal criteria for the reviewers used for this process.
Response: We thank the reviewer for this comment. The study selection process now includes a sentence on the reviewers training.

Data Extraction & Organization
Depending on the final sample size, having the second reviewer provide some level of input on all selected sources would strengthen the study. Some measure of quality (as previously noted) would be helpful. Having done work in this arena, I can promise you that there are a lot of refereed data-based publications that are frankly, of very low quality and would provide little, or even spurious, information to your review.
Response: We thank the reviewer for the comment and agree that quality assessment is important. However, regarding quality assessment in scoping reviews as opposed to systematic reviews, several methodology/guidance papers of scoping reviews highlight that scoping reviews should provide overviews of the existing evidence base regardless of quality. It is our understanding that formal assessment of methodological quality is generally not performed in scoping reviews (https://www.researchgate.net/publication/279730442_Guidance_for_conducting_systematic_scoping_reviews) & (https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/s12874-018-0611-x).

Data Synthesis
The proposed plan is appropriate but may need to be adjusted depending on data extraction, etc. As previously mentioned, consider using an age frame that captures the three generally accepted subgroups of adolescence (young, middle, old) in the analysis; also consider stratifying findings by genre of social media (e.g., dating apps such as , video sharing apps such as TikTok, YouTube).
Response: We thank the reviewer – and we will consider an appropriate stratifying of the included articles when they are to be presented in the scoping review.
Conducting a pilot may be appropriate, as was used to identify sources.
Response: We are unsure what the reviewer means. It the reviewer refers to piloting the search terms before starting, we have done so. And this information is now included in the revised manuscript.
Presentation of Results
Appropriate at this stage.
Response: We thank the reviewer for this comment.
Ethical Considerations
Appropriate.
Response: We thank the reviewer for this comment.
Conclusion
This study will be useful in paving the pathway for meaningful research on youth social media uses and mental health concerns.
Response: We thank the reviewer for this comment and appreciate the valuable feedback we have received during this process.