

HEALTH PSYCHOLOGY

BULLETIN

EDITORIAL HISTORY

Web-based intervention preferences and physical activity motivation of people with depressive symptoms

Stephanie J. Alley, Martina Andersson, Nicola W. Burton, Corneel Vandelanotte, Mitch J. Duncan, Brenda Happell, Camille E. Short & Amanda L. Rebar

This document contains the editorial history, organized into three sections. This first section, section 0, provides background information about the paper and the review procedure. Section 1 is organized chronologically and contains the editorial communication and peer review history. Section 2 contains the successive preprints and is organized anti-chronologically.

DOI of article:	10.5334/hpb.3
DOI of this editorial history:	10.5334/hpb.3.pr1
Article submitted:	2017-04-06
Revision submitted:	2017-06-04
Article accepted:	2017-07-09
Editor:	Gerjo Kok
Peer reviewer A:	Joachim Bervoets
Peer reviewer B:	Gill ten Hoor

Cite this document as:

Alley, S. J., Andersson, M., Burton, N. W., Vandelanotte, C., Duncan, M. J., Happell, B., Short, C. E. & Rebar, A. L. (authors); Bervoets, J. & ten Hoor, G. (reviewers); Kok, G. (editor) (2017) Editorial history for 'Web-based intervention preferences and physical activity motivation of people with depressive symptoms'. *Health Psychology Bulletin*, 1(1). DOI: <http://doi.org/10.5334/hpb.3.pr1>

Paper abstract

Physical activity is an effective method for managing depressive symptoms, and web-based interventions may be an effective tool for promoting physical activity within this population. People with depressive symptoms may experience condition-specific facilitators and barriers to be considered when developing physical activity interventions. This study provides insight into web-based physical activity intervention preferences and physical activity motivation of people with depressive symptoms. This study was part of a larger trial of a web-based physical activity intervention for people with depressive symptoms. Thematic analysis of participants' (N = 20) written responses to open-ended survey questions was conducted. Preferences for web-based intervention features included social forums, self-monitoring, suggestions for types of physical activity in different circumstances and information targeted to people with depressive symptoms. When discussing physical activity motivation instrumental beliefs (i.e., beliefs of the benefits and cost of physical activity) and controllability (i.e., whether the behaviour is under their control) were discussed. Additionally, people reported condition-specific barriers of physical activity such as depressive symptoms of apathy, worthlessness, and pain. Further research is needed to test the effectiveness of web-based physical activity interventions targeting people with depressive symptoms, which incorporates these findings.

Background

This peer review history is published under Health Psychology Bulletin's peer review policy. Peer review at Health Psychology Bulletin (HPB) is blind, but upon acceptance of an article, the entire peer review history is made public. This policy has two aims. First, it makes the reviews citable, rewarding reviewers for their reviews, incentivizing thorough, thoughtful reviews, and stimulating constructive, considerate reviews and responses. Second, to yield the best of both worlds in terms of design of the review procedure. The common procedure of shielding authors' and peer reviewers' identities aims to prevent undue harshness or leniency. However, this anonymity also protects reviewers who make unreasonable requests or statements that are inconsistent with the literature, and authors who refuse to respond adequately to reviewers' requests. These risks are ameliorated by unblinding and publishing the peer review procedure upon paper acceptance.

Health Psychology Bulletin

Health Psychology Bulletin (HPB) is an official journal of the European Health Psychology Society (EHPS). It implements a number of innovative practices such as this peer review procedure, a strong full disclosure policy, a two-tiered review procedure, and explicitly welcoming null findings, replications, and reports of lessons learned such as failed manipulations or measurement instruments, as well as regular articles.

Section 2: editorial communication

Round 1: reviewer A

2017-04-26 10:54 AM

Definitely an informative study with good suggestions. At the same time, a few points of critique could be addressed in the manuscript to improve the final paper. Overall, the background could be set in a broader knowledge-field already in existence, and seemingly large discrepancies in participant characteristics could be taken into account more explicitly. Finally, a closer look at possible respondent profiles, and the answers that befall certain categories - could be done post-hoc. As such, after a few minor revisions, this paper deserves publishing in my humble opinion.

NOTE: This reviewer included a wordprocessor file with comments. This file is included in Section 3 as submitted manuscript.

Round 1: reviewer B

2017-04-08 07:20 AM

In this paper, the authors examine web-based intervention preferences and physical activity motivation of people with depressive symptoms. Twenty participants that previously participated in their earlier web-based intervention answered open-ended survey questions via e-mail. Because the two related but different research questions (i.e., 1) what are the participants preferences for web-based physical activity intervention features, and 2) what are determinants of physical activity for people with depressive symptoms), some of the information is confusing; I have the feeling that I read two papers that are combined into one. A clearer distinction throughout the manuscript (or considering to make two papers out of this paper) might help a reader to understand the value of this research.

1. Regarding the first research question (the preferences for web-based intervention features): this is very important information to further improve the authors' web-based physical activity intervention. Important here as the authors stated in their discussion— is that participants had previously participated in their web-based intervention, having a good understanding of their intervention. A limitation here (what the authors stated as well) is that responses might be a reflection of the participant's experience in this specific intervention. The authors should elaborate on the generalizability of the information provided by the participants: can this information be used by other researchers who are developing a web-based physical activity intervention, or is it only useful for their own specific web based physical activity intervention? If the answer is the second, the authors should describe their intervention in detail, and how they improved their own study.

Additionally to this research question:

The authors failed to describe exactly what questions they used. They do not report the question “Do you think a website like this could help you get motivated to be physically active? Why or why not?”. The question ““To what extent do you think a web-based physical activity program like the one you tried could help people cope with feeling sad or depressed?,” as described in the manuscript is in fact “How could a physical activity website specifically be designed to help people who have problems with low moods become more active?”. Although the content of the questions is similar, the phrasing might cause participants to give a more positive answer.

2. Regarding the second research question (determinants of physical activity for people with depressive symptoms): This might be an important question, but how it's currently described, it is a bit confusing. Generally, qualitative research has a holistic approach, instead of a deductive one. The authors also state that ‘people with depressive symptoms are likely to have unique attitudes, social norms and perceived behavioural control for physical activity’. This might be true, but in that case a quantitative study comparing people with and without depressive symptoms was more appropriate. This should be changed and/or discussed in the discussion section.

Additionally to this research question:

The authors failed to describe exactly what questions they used. The question “What benefits are there from being physically active?,” is more general than the actual question asked “What benefits do you experience from being physically active?”. The authors do not report all the questions that are asked in this questionnaire. Even though some questions are not part of the research questions in this paper, they at least should report that these questions were asked in the same questionnaire, as these questions might have influenced answers on other questions.

3. “The present study aimed to examine web-based intervention preferences within people with depressive symptoms and physical activity motivation using the framework of the theory of planned behaviour.” The term ‘motivation’ might be misplaced when it comes to the theory of planned behaviour. In the field of physical activity behavior, motivation is often linked (and thought of) as part of the self determination theory. (do the authors mean intention and/or behavior?)

4. Based on the authors description that they used the theory of planned behavior (with keeping in mind that a holistic approach would have been better): It might be helpful to use the more recent Reasoned Action Approach instead of TPB. The authors should make clear how and why they formulated their limited and specific set of questions. How are these questions related to the theory?

5. the second part of the results section is “Factors affecting physical activity motivation”. Again, I suggest to rephrase this. (Do the authors mean behavior or intention?)

6. The authors found, next to existing concepts in TPB, also other concepts that they describe (e.g., Consideration for depressive symptoms). This should be introduced. Related to this: within TPB, intention is also a concept, but not reported in this paper. This should be discussed. Within RAA, actual control is added to the model. This might help in structuring the answers.

Round 1: editor decision

2017-04-30 04:07 PM

Dear Dr Stephanie J Alley,

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Web-based intervention preferences and physical activity motivation of people with depressive symptoms". Our decision is to request revisions of the manuscript prior to acceptance for publication.

The full review information should be included at the bottom of this email.

Note that there is also a copy of the manuscript file with additional reviewer comments available (in track changes) once you have accessed the submission account. If you have any problems accessing this file, please let me know.

I have also read the manuscript and am in agreement with most reviewer comments. We think that although this manuscript does cover two distinct research questions, it will probably be possible to discuss both in one manuscript. I do however agree with Reviewer B that the manuscript would benefit if the distinction were a bit clearer in the narrative.

Furthermore, I would like to add the request to refrain from quantifying information in the results section; the sample size is so low that these estimates are very imprecise. Although this is clear from the manuscript, readers may nonetheless be tempted to attribute a weight to these numbers that is not justified by the sample size.

Furthermore, I would like to commend you on the completeness of your submission. This paper and its supplements show great promise to help researchers and the literature progress.

To access your submission account, follow the below instructions:

- 1) login to the journal webpage with username and password
- 2) click on the submission title
- 3) click 'Review' menu option
- 4) download Reviewed file and make revisions based on review feedback
- 5) upload the edited file
- 6) Click the 'notify editor' icon and email the confirmation of re-submission and any relevant comments to the journal.

Please ensure that your revised files adhere to our author guidelines, and that the files are fully copyedited/proofed prior to upload. Please also ensure that all copyright permissions have been attained. This is the last opportunity for major editing, therefore please fully check your file prior to re-submission.

If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by June first, 2017. If you cannot make this deadline, please let us know.

Kind regards,

Gerjo Kok
Maastricht University
g.kok@maastrichtuniversity.nl

Round 2: cover letter

2017-05-31 01:07 AM

Dear Gerjo Kok,

Thank you for the opportunity to revise and further improve our manuscript based on the reviewers' comments. Our responses to each comment, along with related extracts from the paper are in the attached file. We have also uploaded the revised manuscript with tracked changes.

Kind regards,
Stephanie Alley

Round 2: responses to reviewers

Editor:

Comment 1: I have also read the manuscript and am in agreement with most reviewer comments. We think that although this manuscript does cover two distinct research questions, it will probably be possible to discuss both in one manuscript. I do however agree with Reviewer B that the manuscript would benefit if the distinction were a bit clearer in the narrative.

Authors response. Thank you for reading the manuscript and for the opportunity to respond to the reviewers' feedback. We have responded to each comment below, including Comment 1, reviewer 2 where we made the distinction of the two research questions clearer.

Comment 2: Furthermore, I would like to add the request to refrain from quantifying information in the results section; the sample size is so low that these estimates are very imprecise. Although this is clear from the manuscript, readers may nonetheless be tempted to attribute a weight to these numbers that is not justified by the sample size.

Authors response. We have removed all quantifying information. For example:

Results, page 11:

Original: Six participants' (30%) responses highlighted self-efficacy (i.e., perceptions of ability to perform physical activity) as a factor affecting physical activity.

Revised: Some participants' responses highlighted self-efficacy (i.e., perceptions of ability to perform physical activity) as a factor affecting physical activity.

Reviewer A:

Comment 1: Definitely an informative study with good suggestions. At the same time, a few points of critique could be addressed in the manuscript to improve the final paper. Overall, the background could be set in a broader knowledge-field already in existence,

Authors Response: We have expanded the introduction to include a broader range of evidence on factors affecting physical activity in people with depressive symptoms.

Introduction, page 4

Addition: The emotional, cognitive, and motivational manifestations of depressive symptoms may affect attitudes, social norms and perceived behavioural control for physical activity (Rhebergen et al., 2010). The main physical activity barriers for people with depressive symptoms include lack of family support, negative physical activity experiences, external factors (e.g., lack of time and money) and depressive symptoms (Azar, Salmon & Cleland, 2010; Rogerson et al., 2012). Physical activity motivators identified for people with depressive symptoms include weight control, health benefits and seeing results (Azar et al., 2010; Rogerson et al., 2012). Whilst this research identifies key physical activity attitudes in this population group, further research is needed to investigate all of the theory of planned behaviour constructs for physical activity in people with depressive symptoms to inform the content of future interventions targeting this population group.

Comment 2: Seemingly large discrepancies in participant characteristics could be taken into account more explicitly.

Authors Response: We have added a discussion about the discrepancies in participant characteristics.

Results, page 8:

The large standard deviations for age, BMI, physical activity and depressive symptoms highlight a large diversity in participants.

Discussion, page 17:

The sample had diverse characteristics, particularly in terms of age and depressive symptom frequency, which may have contributed to the diversity in responses.

Comment 3: Finally, a closer look at possible respondent profiles, and the answers that befall certain categories - could be done post-hoc. As such, after a few minor revisions, this paper deserves publishing in my humble opinion.

Authors Response: Thank you for this great suggestion. We have included the characteristics of people, but only if a clear pattern was evident. For example:

Results, page 10

The participants that desired social networking tended to be females under 50 years of age.

Results, page 12

Whilst both males and females of many ages mentioned instrumental beliefs, it tended to be females who discussed the benefits of physical activity related to appearance.

We also discussed these post-hoc findings in the discussion. For example:

Discussion, page 14

Fitting with past research on health related social media use, it was younger females who suggested social support features (Thackeray, Crookston & West, 2013). Therefore, we do not know if older females or males would be interested in social support through a web-based intervention.

Discussion, page 16

In line with past research in the general population, the participants who were motivated by appearance tended to be female, whilst both genders mentioned health as a motivating factor (Molanorouzi, Khoo & Morris, 2015).

Reviewer B:

Comment 1: In this paper, the authors examine web-based intervention preferences and physical activity motivation of people with depressive symptoms. Twenty participants that previously participated in their earlier web-based intervention answered open-ended survey questions via e-mail. Because the two related but different research questions (i.e., 1) what are the participants preferences for web-based physical activity intervention features, and 2) what are determinants of physical activity for people with depressive symptoms), some of the information is confusing; I have the feeling that I read two papers that are combined into one. A clearer distinction throughout the manuscript (or considering to make two papers out of this paper) might help a reader to understand the value of this research.

Authors response: The two research questions were included as they both inform the development of future physical activity interventions for people with depressive symptoms. The first research question will help to inform the delivery and components of interventions and the second will help to inform the content of interventions (e.g. addressing barriers and facilitators specific to the target group). We have made the link between the two research questions clearer, so it does not read like two papers combined into one. For example:

Introduction, page 3:

Understanding the physical activity behaviour of people with depressive symptoms is important for the development of interventions targeting this population group.

Introduction, page 5:

Given the scarcity of previous evidence, qualitative research is an essential first step to gain insight into the perceptions of people with depressive symptoms regarding web-based physical activity intervention preferences and physical activity motivation. This data will help to inform the delivery (e.g. web-based), components (e.g. forums, self-monitoring) and content (i.e. addressing attitudes specific to the target group) of physical activity interventions for people with depressive symptoms. Discussion, page 13:

The findings revealed intervention preferences for people with depressive symptoms, and factors affecting physical activity motivation in people with depressive symptoms. These results are important for informing the development of future physical activity interventions which meet the specific needs of people with depressive symptoms.

Comment 2: Regarding the first research question (the preferences for web-based intervention features): this is very important information to further improve the authors' web-based physical activity intervention. Important here – as the authors stated in their discussion – is that participants had previously participated in their web-based intervention, having a good understanding of their intervention. A limitation here (what the authors stated as well) is that responses might be a reflection of the participant's experience in this specific intervention. The authors should elaborate on the generalizability of the information provided by the participants: can this information be used by other researchers who are developing a web-based physical activity intervention, or is it only useful for their own specific web based physical activity intervention? If the answer is the second, the authors should describe their intervention in detail, and how they improved their own study.

Authors response:

Whilst it's important to understand that participants' recent completion of a web-based intervention may influence their results, the information is very useful for other researchers developing web-based interventions for individuals with depressive symptoms. Participants in our study were exposed to a generic web-based physical activity intervention (i.e., not designed specifically for people with depression or with depressive symptoms). We asked their preferences relating to web-based interventions built specifically for people with depressive symptoms. As such, it is unlikely that the results relate only to our specific intervention. Given this, we have not included detailed information of the intervention(s), however we have provided a reference to where this information can be found. The generalisability of the findings is now discussed:

Discussion, page 17:

Although the participants had previously participated in a web-based intervention with personalised advice or interactive features, the questions were about future interventions built specifically for people with depressive symptoms. Therefore, whilst their responses may have been influenced by their experience in that intervention, the responses are useful for the development of interventions specifically for people with depressive symptoms.

Comment 3: The authors failed to describe exactly what questions they used. They do not report the question "Do you think a website like this could help you get motivated to be physically active? Why or why not?". The question ""To what extent do you think a web-based physical activity program like the one you tried could help people cope with feeling sad or depressed?," as described in the manuscript is in fact "How could a physical activity website specifically be designed to help people who have problems with low moods become more active?". Although the content of the questions is similar, the phrasing might cause participants to give a more positive answer.

Authors response: Thank you for identifying this. We have updated the manuscript to describe exactly what questions were used.

Methods, page 7:

Questions about physical activity web-based interventions were then asked. First it was explained to participants that “We are interested in developing a website to promote physical activity for people who want to improve their mood and reduce feelings like sadness, irritability and fatigue.”

Participants were then asked “Would you use a site like this? Why or why not?,” “What features would you like such a website to have?,” “Do you think a website like this could help you get motivated to be physically active? Why or why not?” and “How could a physical activity website specifically be designed to help people who have problems with low moods become more active?”

Comment 4: Regarding the second research question (determinants of physical activity for people with depressive symptoms): This might be an important question, but how it’s currently described, it is a bit confusing. Generally, qualitative research has a holistic approach, instead of a deductive one. The authors also state that ‘people with depressive symptoms are likely to have unique attitudes, social norms and perceived behavioural control for physical activity’. This might be true, but in that case a quantitative study comparing people with and without depressive symptoms was more appropriate. This should be changed and/or discussed in the discussion section.

Authors response: According to Braun and Clarke (2006) on which the analysis was based, qualitative research can have a ‘bottom down’ theoretical approach in that the analysis is based on pre-determined themes. We have updated the description of how the data were analysed for the second research question to make this clearer:

Analysis, page 7:

Original: The data were analysed based on themes of the theory of planned behaviour framework. In addition, inductive analysis was utilised to identify and examine themes beyond the theory of planned behaviour.

Revised: For the data on web-based physical activity interventions, participant themes were identified in the data. For the data on factors affecting physical activity motivation, a theoretical approach was used. Here the data were analysed based on themes of relating to, and beyond, the theory of planned behaviour framework.

The aim of the study was not to investigate uniqueness of physical activity motivation in people with depressive symptoms, but to investigate the best way to help this group increase their activity. To avoid confusion we have updated the discussion about theory of planned behaviour constructs in people with depressive symptoms to just state that depressive symptoms may affect these constructs:

Introduction, page 4:

Original: Given the emotional, cognitive, and motivational manifestations of depressive symptoms, people with depressive symptoms are likely to have unique attitudes, social norms and perceived behavioural control for physical activity (Rhebergen et al., 2010).

Revised: The emotional, cognitive, and motivational manifestations of depressive symptoms may affect attitudes, social norms and perceived behavioural control for physical activity (Rhebergen et al., 2010).

Comment 5: The authors failed to describe exactly what questions they used. The question “What benefits are there from being physically active?,” is more general than the actual question asked “What benefits do you experience from being physically active?”. The authors do not report all the questions that are asked in this questionnaire. Even though some questions are not part of the research questions in this paper, they at least should report that these questions were asked in the same questionnaire, as these questions might have influenced answers on other questions.

Authors response: Thank you for picking this up. We have updated the manuscript to describe exactly what questions were used.

Methods, page 6:

The questions on physical activity motivation were, “What motivates you to be physically active?,” “What stops you from being physically active?,” “What benefits do you experience from being physically active?,” “What do you think of being physically active as a way to feel better emotionally? Does it work?” and “How active do you think you need to be to improve your mood and reduce negative feelings?,” Participants were also asked, “What are some methods that you are aware of to help improve mood and reduce feelings of sadness or irritability and how well do you think they work?,” “Have you had any experiences with using various treatments to improve your mood?,” “What are limitations of the treatments that you may have tried?” and “Has anything stopped you from trying other treatments to feel better emotionally?”

Comment 6: “The present study aimed to examine web-based intervention preferences within people with depressive symptoms and physical activity motivation using the framework of the theory of planned behaviour.” The term ‘motivation’ might be misplaced when it comes to the theory of planned behaviour. In the field of physical activity behavior, motivation is often linked (and thought of) as part of the self-determination theory. (do the authors mean intention and/or behavior?)

Authors response: The term motivation is commonly used outside of the self-determination theory and after a discussion between co-authors, we decided that motivation is the best term to explain the paper’s second aim. This is as the theory of planned behaviour is used to understand motivation to perform a behaviour (Kwan et al., 2013). We were not focusing specifically on either intentions or behaviour which are part of the theory of planned behaviour. Changing the aim from motivation to intentions or behaviour would not be in line with what we did.

Comment 7: Based on the authors description that they used the theory of planned behavior (with keeping in mind that a holistic approach would have been better): It might be helpful to use the more recent Reasoned Action Approach instead of TPB. The authors should make clear how and why they formulated their limited and specific set of questions. How are these questions related to the theory?

Authors response: Reasoned Action Approach is very similar to the theory of planned behaviour, except for including actual control of behaviour and strength of behavioural, normative and control beliefs as influencers of attitudes, subjective norms and perceived behavioural control. Whilst the additional constructs are useful for improving prediction of behaviour, this depth goes beyond the aims of this study. Further, we do not have the data to identify strength of behavioural, normative and control beliefs.

The questions were not related to the theory as we did not want to limit their responses to be in line with the theory. We used the theory of planned behaviour to identify factors related to physical activity motivation, whilst also allowing for additional themes to be identified. We have added an explanation of how and why the questions were formulated.

Methods, page 6:

The questions were formulated to explore factors associated with participants’ physical activity motivation, their knowledge of physical activity, their knowledge of other treatments to improve mood and perceptions and preferences of web-based physical activity interventions.

Comment 8: the second part of the results section is “Factors affecting physical activity motivation”. Again, I suggest to rephrase this. (Do the authors mean behavior or intention?)

Authors response: As explained in response to Comment 6, we strongly believe that motivation of physical activity behaviour is the best term to explain the paper's second aim.

Comment 9: The authors found, next to existing concepts in TPB, also other concepts that they describe (e.g., Consideration for depressive symptoms). This should be introduced. Related to this: within TPB, intention is also a concept, but not reported in this paper. This should be discussed. Within RAA, actual control is added to the model. This might help in structuring the answers.

Authors response: We have introduced the consideration for depressive symptoms beyond the theory of planned behaviour in the results and discussion. For example:

Results, page 10:

Consideration for depressive symptoms. A theme separate to the theory of planned behaviour emerged relating to the participants' attempts to be physical active while experiencing depressive symptoms.

Results, page 15:

Separate to the theory of planned behaviour, they indicated that depressive symptoms including pain, tension, feelings of worthlessness, and apathy were barriers to physical activity.

The analysis focused on the first constructs of the theory of planned behaviour: attitudes, perceived behavioural control and subjective norms. As described in the introduction, interventions based on the theory of planned behaviour address these concepts to change intentions:

Introduction, page 3:

Interventions based on the theory of planned behaviour target individuals' *behavioural intentions* (i.e., people's plans to engage in the behaviour) by addressing *attitudes* (i.e., positive or negative evaluations), *subjective norms* (i.e., perceived social pressure and support) and *perceived behavioural control* (i.e., perceived ability to execute the behaviour; opportunities; resources) (Ajzen, 1988).

Reasoned Action Approach is a great suggestion and we will consider using this in future research. However, we do not have the data to include actual control in the current paper. The participant's responses we received fit into the concept of perceived behavioural control, rather than what their actual level of control is when increasing physical activity.

References

- Ajzen, I. (1988). *Attitudes, personality, and behaviour*. Illinois, USA: The Dorsey Press.
- Azar, D. B., K, Salmon, J., & Cleland, V. J. (2010). Physical activity correlates in young women with depressive symptoms: a qualitative study. *International Journal of Behavioral Nutrition and Physical Activity*, 7(3). doi:
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. doi:
- Kwan, M. Y., Cairney, J., Hay, J. A., & Fought, B. E. (2013). Understanding physical activity and motivations for children with developmental coordination disorder: an investigation using the theory of planned behavior. *Res Dev Disabil*, 34(11), 3691-3698. doi: 10.1016/j.ridd.2013.08.020
- Molanorouzi, K., Khoo, S., & Morris, T. (2015). Motives for adult participation in physical activity: type of activity, age, and gender. *BMC Public Health*, 1566. doi: 10.1186/s12889-015-1429-7
- Rhebergen, D., Beekman, A. T., de Graaf, R., Nolen, W. A., Spijker, J., Hoogendijk, W. J., & Penninx, B. W. (2010). Trajectories of recovery of social and physical functioning in major depression,

- dysthymic disorder and double depression: a 3-year follow-up. . *Journal of Affective Disorders*, 124(1), 148-156. doi: DOI: 10.1016/j.jad.2009.10.029
- Rogerson, M. C., Murphy, B. M., Bird, S., & Morris, T. (2012). "I don't have the heart": a qualitative study of barriers to and facilitators of physical activity for people with coronary heart disease and depressive symptoms. *International Journal of Behavioral Nutrition and Physical Activity*, 9(140). doi:
- Thackeray, R., Crookston, B. T., & West, J. H. (2013). Correlates of health-related social media use among adults. *J Med Internet Res*, 15(1), e21. doi: 10.2196/jmir.2297

Round 2: reviewer A

2017-06-29, 08:50

All recommendations were heeded and adjusted accordingly, as such, based on my previous review, I am in favor of publishing.

Round 2: reviewer B

2017-06-17, 12:39

The authors did a good job in improving their paper. There are a few points where I agree to disagree.

Round 2: editorial decision

2017-07-09 03:42 PM

Dear Dr Stephanie J Alley,

Congratulations!

We have now received reviewer reports from both reviewers regarding your submission to Health Psychology Bulletin, "Web-based intervention preferences and physical activity motivation of people with depressive symptoms", and on the basis of these reports, we are happy to accept your submission for publication, pending the completion of copyediting and formatting processes.

Although we currently have several papers under review, yours is the first empirical paper to have made it through the entire peer review process, and therefore, our first accepted paper. This means that, with your permission, we will specifically inform the EHPs members of your paper once it has been published.

And of course, we would like to express our congratulations and gratitude for contributing to improving health psychology science by publishing in Health Psychology Bulletin!

As there are no further reviewer revisions to make, you do not have to complete any tasks at this point. The accepted submission will now undergo final copyediting. You will be contacted once this is complete to answer any queries that may have arisen during copyediting and to allow a final chance to edit the files prior to typesetting. If you wish to view your submission during this time, you can log in via the journal website.

The review information should be included in this email.

Kind regards,

Gerjo Kok and Gjalt-Jorn Peters

Section 3: manuscript iterations

Round 2: revised manuscript

Web-based intervention preferences and physical activity motivation of people with depressive symptoms

Abstract

Physical activity is an effective method for managing depressive symptoms, and web-based interventions may be an effective tool for promoting physical activity within this population. People with depressive symptoms may experience condition-specific facilitators and barriers to be considered when developing physical activity interventions. This study provides insight into web-based physical activity intervention preferences and physical activity motivation of people with depressive symptoms. This study was part of a larger trial of a web-based physical activity intervention for people with depressive symptoms. Thematic analysis of participants' ($N = 20$) written responses to open-ended survey questions was conducted. Preferences for web-based intervention features included social forums, self-monitoring, suggestions for types of physical activity in different circumstances and information targeted to people with depressive symptoms. When discussing physical activity motivation instrumental beliefs (i.e., beliefs of the benefits and cost of physical activity) and controllability (i.e., whether the behaviour is under their control) were commonly discussed. Additionally, people reported condition-specific barriers of physical activity such as depressive symptoms of apathy, worthlessness, and pain. Further research is needed to test the effectiveness of web-based physical activity interventions targeting people with depressive symptoms, which incorporates these findings.

Keywords: mood disorders, exercise, intentions, e-health

Web-based intervention preferences and physical activity motivation of people with depressive symptoms

Depression is highly prevalent and is associated with significant societal and individual costs. Worldwide, more than 350 million people have depression and it is the leading cause of disability (World Health Organization, 2014). Depression can result in profound impairments in quality of life and wellbeing (Rapaport, Clary, Fayyad, & Endicott, 2005; Rhebergen et al., 2010) and, as a result of pervasive depressive symptoms, people typically lose interest in hobbies, withdraw from activities, and experience impairments in social and occupational functioning (American Psychiatric Association, 2013).

Some relief of depressive symptoms can result from conventional treatment options including pharmacotherapy, psychotherapy, or the combination of these therapies; however, there are several limitations to these treatment options such as the cost and accessibility of services (Gabriel & Violato, 2010), anticipated stigmatisation (Acosta, Rodríguez, & Cabrera, 2013), and adverse side-effects like insomnia, sedation and neurological or sexual dysfunction (American Psychiatric Association, 2013). As a result of these limitations, a large number of people with depression are not receiving help for symptoms. Nearly half (45%) of Australians in need of mental health treatment are not receiving treatment (Kohn, Saxena, Levav, & Saraceno, 2004). As such, there is an important need to explore other easily accessible treatments to reduce depressive symptoms.

Physical activity as a treatment option for depressive symptoms

Physical activity has been shown to significantly alleviate depressive symptoms (Cooney et al., 2013; A. L. Rebar et al., 2015). Some evidence suggests that the antidepressant benefits of physical activity may have the same magnitude of effect, or even larger, than that of pharmacological or psychotherapy treatments (Cooney et al., 2013; Rethorst, Wipfli, & Landers, 2009). The antidepressant effects of physical activity have been

explained partly by enhanced regulation of hippocampal neurogenesis, including increased serotonin (Ernst, Olson, Pinel, Lam, & Christie, 2006) and noradrenaline (Dishman, 1997). Physical activity also has antidepressant effects via psychological mechanisms such as enhanced self-esteem (Ossip-Klein, Doyne, Bowman, Osborn, & Neimeyer, 1989), self-efficacy and coping ability (Pickett, Yardley, & Kendrick, 2012).

Web-Based Physical Activity Interventions

Web-based physical activity interventions have the potential to offer participants advice at any time and place for a lower cost than face-to-face physical activity interventions (Vandelanotte, Spathonis, Eakin, & Owen, 2007). Web-based physical activity interventions also remove stigma of traditional treatments for depressive symptoms and delivers the treatment in a non-confrontational manner (Tate, Finkelstein, Khavjou, & Gustafson, 2009). Research has shown that web-based physical activity interventions can increase physical activity behaviour (Davies, Spence, Vandelanotte, Caperchione, & Mummery, 2012), however we do not know the perceptions and preferences of web-based interventions in people with depressive symptoms. Such knowledge is needed to inform the development of future web-based physical activity interventions effective at engaging this population group.

Understanding physical activity behaviour

Understanding the physical activity behaviour of people with depressive symptoms is important for the development of interventions targeting this population group. Behaviour theories, such as the theory of planned behaviour, are used to explain physical activity behaviour of individuals and guide intervention content. Web-based physical activity interventions based on ~~a behavioural theory such as~~ the theory of planned behaviour are more effective at changing behaviour (Ajzen, 1988; Webb, Joseph, Yardley, & Michie, 2010). Interventions based on the theory of planned behaviour target individuals' *behavioural intentions* (i.e., people's plans to engage in the behaviour) by addressing *attitudes* (i.e.,

positive or negative evaluations), *subjective norms* (i.e., perceived social pressure and support) and *perceived behavioural control* (i.e., perceived ability to execute the behaviour; opportunities; resources) (Ajzen, 1988). Attitudes can be classified as either *instrumental* (i.e., beliefs of the benefits and cost of behaviour as being beneficial or harmful) or *affective* (i.e., emotion-based evaluations of the behaviour as being enjoyable or unenjoyable); subjective norm includes an *injunctive* (i.e., whether one believes their social network wants them to perform the behaviour) and a *descriptive* component (i.e., whether one's social network performs the behaviour); and perceived behavioural control has two subcomponents of *self-efficacy* (i.e., perceived ease/difficulty of performing the behaviour and confidence) and *controllability* (i.e., personal control over behaviour, appraisal of whether one's self has control over the behaviour).

The emotional, cognitive, and motivational manifestations of depressive symptoms may affect attitudes, social norms and perceived behavioural control for physical activity (Rhebergen et al., 2010). The main physical activity barriers for people with depressive symptoms include lack of family support, negative physical activity experiences, external factors (e.g., lack of time and money) and depressive symptoms (Azar, Salmon, & Cleland, 2010; Rogerson, Murphy, Bird, & Morris, 2012). Physical activity motivators identified for people with depressive symptoms include weight control, health benefits and seeing results (Azar et al., 2010; Rogerson et al., 2012). Whilst this research identifies key physical activity attitudes in this population group, further research is needed to investigate all of the theory of planned behaviour constructs for physical activity in people with depressive symptoms to inform the content of future interventions targeting this population group.

~~Given the emotional, cognitive, and motivational manifestations of depressive symptoms, people with depressive symptoms are likely to have unique attitudes, social norms~~

~~and perceived behavioural control for physical activity (Rhebergen et al., 2010). Therefore it is of great importance to explore these constructs in people with depressive symptoms.~~

The Present Study

Given the scarcity of previous evidence, qualitative research is an essential first step to gain insight into the perceptions of people with depressive symptoms regarding web-based physical activity intervention preferences and physical activity motivation. This data will help to inform the delivery (e.g. web-based), components (e.g. forums, self-monitoring) and content (i.e. addressing attitudes specific to the target group) of physical activity interventions for people with depressive symptoms. The present study aimed to examine web-based intervention preferences within people with depressive symptoms and physical activity motivation using the framework of the theory of planned behaviour.

Method

Participants

This study recruited adults (18 years or older) who previously participated in a larger trial evaluating the effects of web-based physical activity interventions on depressive symptoms and physical activity (Amanda L. Rebar et al., 2016). All study procedures were approved by the relevant Human Research Ethics Committee (approval number: H13/08-147). For the larger trial 514 participants were recruited via Facebook and Google advertising targeting people with low mood (Amanda L. Rebar et al., 2016). The 2-arm randomised trial compared the effectiveness of two web-based interventions for increasing physical activity and reducing depressive symptoms. Participants were randomised to receive either a web-based physical activity intervention program with interactive features or a web-based physical activity intervention with personalised advice. Physical activity significantly increased and depression significantly decreased from baseline to one month and three months and no between group differences on physical activity or depression were found

(Amanda L. Rebar et al., 2016). For the current study participants in the personalised advice arm of the trial who reported depressive symptoms were recruited (based on a score >16 on the CES-D-r validated measure of depression (Van Dam & Earleywine, 2011). E-mail invitations were sent out to 50 potential participants, a size estimated a priori to be sufficient to achieve saturation with the anticipated response rates between 25 to 50% (Baker & Edwards, 2006).

Procedure & Materials

Participants' demographics, BMI and physical activity behaviour was already collected through the larger trial. Demographics included age, sex, education ($<$ year 12, $>$ year 12) and household income ($<$ 52,000AUD, $>$ 52,000AUD). BMI was calculated from self-reported height and weight, and physical activity was assessed using the Active Australia Survey (Australian Institute of Health and Welfare, 2003) which has previously been shown to have acceptable reliability and validity (Australian Institute of Health and Welfare, 2003; Fjeldsoe, Winkler, Marshall, Eakin, & Reeves, 2013). The Active Australia survey measures total time walking, participating in vigorous physical activity (e.g., jogging, cycling, aerobics, competitive tennis) and participating in moderate physical activity (e.g., gentle swimming, social tennis, golf) in the past week. Minutes of physical activity per week were calculated as the sum of the time spent walking, time in moderate activity and time in vigorous activity (weighted by two to account for the extra energy expenditure output) as per manual instructions (Australian Institute of Health and Welfare, 2003).

The invitation e-mails included information about the study and the open-response questions. The questions were formulated to explore factors associated with participants' physical activity motivation, their knowledge of physical activity, their knowledge of other treatments to improve mood and perceptions and preferences of web-based physical activity interventions. The questions on ~~motivation~~ physical activity motivation were, "What

motivates you to be physically active?,” “What stops you from being physically active?,” “What benefits ~~are there~~ do you experience from being physically active?,” “What do you think of being physically active as a way to feel better emotionally? Does it work?” and “How active do you think you need to be to improve your mood and reduce negative feelings?” Participants were also asked, “What are some methods that you are aware of to help improve mood and reduce feelings of sadness or irritability and how well do you think they work?,” “Have you had any experiences with using various treatments to improve your mood?,” “What are limitations of the treatments that you may have tried?” and “Has anything stopped you from trying other treatments to feel better emotionally?” “What risks are there for being physically active?” and “To what extent do you think being physically active could help you cope with feeling sad or depressed?” The Questions about the physical activity web-based interventions were then asked. First it was explained to participants that -“We are interested in developing a website to promote physical activity for people who want to improve their mood and reduce feelings like sadness, irritability and fatigue.” Participants were then asked “Would you use a site like this? Why or why not?,” ~~included~~ “To what extent do you think a web-based physical activity program like the one you tried could help people cope with feeling sad or depressed?,” “Would you use it?,” “If not, why not?” and “What features would you like such a website to have?,” “Do you think a website like this could help you get motivated to be physically active? Why or why not?” and “How could a physical activity website specifically be designed to help people who have problems with low moods become more active?” Willing participants provided their responses to these questions by return email.

Analysis

Data were analysed using the thematic analysis procedure as outlined by Braun and Clarke (2006). The procedure involves 9 steps including (1) familiarising yourself with your

data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes and (6) producing the report. For the data on web-based physical activity interventions, participant themes were identified in the data. For the data on factors affecting physical activity motivation, a theoretical approach was used. Here tThe data ~~was~~ were analysed based on themes ~~of relating to, and beyond,~~ the theory of planned behaviour framework. ~~In addition, inductive analysis was utilised to identify and examine themes beyond the theory of planned behaviour.~~ Specifically, the surveys were read and reviewed by MA to generate initial codes relating to, and beyond, the theory of planned behaviour (i.e., instrumental and affective attitudes; injunctive and descriptive subjective norm; and the subcomponents of perceived behavioural control, self-efficacy and controllability). Each response was then coded by both MA and ALR. Any inconsistencies were resolved by discussion between MA and ALR. As additional themes were revealed, participants' responses were reanalysed reiteratively.

Results

Responses were received from twenty participants (40% response rate) and then analysed. Both authors involved in data analysis (MA & ALR) considered there was saturation and therefore decided not to invite additional people to participate in the study. Descriptive characteristics of the study sample is presented in Table 1. The sample was mostly female ($n = 14$, 70%) and the mean age was 45 ± 18 . This was similar to the larger trial which was 70% ~~f~~Female with an average age of 46 ± 15 . Participants reported a mean score of 29.5 (SD=8.9) on the CES-D-r scale. The large standard deviations for age, BMI, physical activity and depressive symptoms highlight a large diversity in participants.

Table 1. Descriptive Statistics of Participants' Demographic Characteristics

	<i>M</i>	<i>SD</i>
Age (years)	45.2	18.18
BMI	30.43	8.91
Physical activity; minutes/week	139.33	176.57
Depression symptom frequency (CESD-r score)	29.5	8.86
	n	%
Gender		
Female	14	70
Male	6	30
Education		
< year 12	9	45
> year 12	11	55
Household Income		
< AUD\$52000 pa	6	30
> AUD\$52000 pa	9	45
Not reported	5	25

Note. CESD-r: Center for Epidemiologic Studies Depression Scale –revised on which scores > 16 represent clinical depressive symptoms.

Web-based Intervention Preferences

Consideration for depressive symptoms. ~~Eight~~ Many participants (40%) reported that it was important for physical activity web-based programs to account for depressive symptoms, specifically the symptom of low mood. They suggested beneficial features could either teach strategies or suggest methods of improving low mood: “*The recognition that exercise is very difficult for people with mood issues would do a lot more to help than any GP*

has ever done (Female, 42), “*If a person is feeling low, depressed etc. the problem is will that person at that moment of need actually check out a website (Male, 79).*” These participants had a broad range of frequencies of depressive symptoms.

Social networking. Eleven-Many participants (~~55%~~) desired a web-based physical activity program to have features that encouraged social networking and increased social support from likeminded people: “*A website with community features and options for people to share their stories with each other from similar circumstances can work to push each other (Female, 20),*” “*Also a site where people could encourage others and suggest different forms of physical activity that worked for them may be beneficial (Female, 37).*” The participants that desired social networking tended to be females under 50 years of age.

Self-monitoring. Eight-Many participants (~~40%~~) reported that features which allowed users to keep track record of their achievement would encourage further use of the website and create an opportunity to visualise benefits of regular physical activity: “*Being able to see how much exercise I’ve been doing over the last month or so really motivates me not to skip a day (Female, 19)*

Suggestions for physical activity in different circumstances. Six-Some participants (~~30%~~) reported that a web-based program with suggestions about a variety of physical activities may allow for people to be active while having a busy lifestyle or experiencing physical discomfort: “*Perhaps it could have quick ideas for ways to be active in different circumstances. Like, how can I be active for 10 mins if I’m busy, or I travel a bit so maybe what can you do when you are not at home (Female, 49).*” The participants that were interested in physical activity suggestions tended to be female.

Factors affecting physical activity motivation

Consideration for depressive symptoms. A theme separate to the theory of planned behaviour emerged relating to the participants’ attempts to be physical active while

experiencing depressive symptoms. ~~Six~~ Some participants (~~30%~~) indicated that depressive symptoms of apathy, worthlessness, and pain created a significant barrier to being physical active: “Generally it’s depression. A feeling of pain and tension, lack of sleep, worthlessness. Then I don’t want to do anything (Male 47),” “Sometimes apathy brought on by mild depressive episodes (Female, 37),” “Mental condition that leads to procrastination through fear of failure (Male, 59).” These participants had a broad range of frequencies of depressive symptoms.

Perceived behavioural control – controllability. ~~Nine~~ Many participants (~~45%~~) gave responses about physical activity motivation related to controllability (i.e., feelings of control over resources and opportunities for being physically active). Each ~~of these~~ participants mentioned lack of time as a barrier to being physically active, and other barriers were reported, including cost of gym membership, lack of energy due to work, sedentary work, and family commitments. Such responses include, “Lack of time and sedentary job (Female, 54),” “Finding time to do activity usually stops me (Female, 49),” “The major restriction on being active, such as joining a sporting team, is largely down to external pressures like, time, cost, distance etc. (Male, 57).” One respondent reported that that having time set aside first thing in the morning increased likelihood of engaging in physical activity.

Perceived behavioural control – self-efficacy. ~~Six~~ Some participants’ (~~30%~~) responses highlighted self-efficacy (i.e., perceptions of ability to perform physical activity) as a factor affecting physical activity. Some indicated that physical activity induced feelings of physical activity as being too difficult, or that they lacked the confidence to pursue an active lifestyle. Such responses included, “Fear of actually trying and not being good enough, finding small things too hard and being noticed. It’s hard to try and utilise competitiveness as a motivational drive when you don’t feel good enough to compete and won’t start out of shame (Female, 20),” and “I liked dance as a kid, and joined a few classes over the years but

I don't have the confidence to join a dance class these days (Female, 42)." Other Participants indicated that they felt like physical activity increased their sense of competence and facilitated more active behaviours: *"The thought of being able to run, or dance, or do others physical things, and actually be able to do it and enjoy it, makes me want to get fit (Female, 23),"* *"I enjoy doing things that I couldn't before (Female, 49)."* The participants whose responses reflected self-efficacy (both positive and negative) tended to be females under 50 years of age.

Attitude – instrumental beliefs. ~~Many (n = 16) responses~~The majority of participants emphasised instrumental beliefs as being a source of motivation for physical activity (e.g., benefits). Fourteen participants indicated that fitness goals, healthy lifestyle and weight control motivated them to engage in physical activity, and ~~six~~some participants also said that they were motivated to be physically active because it reduced physical pain, discomfort, and stress. Responses included, *"I am motivated by wanting to be physically stronger, able to run faster without visibly being overworked, and I'd like to be leaner as appropriate to my body shape (Female, 20),"* *"To lose weight, have a clearer head space, reduce fibromyalgia issues – reducing back pain, improve sleep and reduce stress and anxiety (Female, 18),"* and *"Usually what motivates me to be physically active is the idea that exercise will make me better physically. I like to play sport etc so the idea of being faster or stronger is a big motivator (Female, 49)."* Whilst both males and females of many ages mentioned instrumental beliefs, it tended to be females who discussed the benefits of physical activity related to appearance.

~~Two~~Some participants' responses demonstrated negative instrumental beliefs that affected their physical activity motivation (e.g., costs of physical activity). This included physical discomfort and that they did not see any benefit from exercise: *"When I do attempt to work out, the 'afterburn' of a workout generally lasts for several days, which makes it hard*

to want to pick up a 3 times a week routine (Female, 20),” “Physical discomfort, and the fact that my body very stubbornly holds on to weight and exercise doesn’t help weight loss unless I work really hard which is unsustainable for me because I don’t enjoy it (Female, 42).”

Attitude – affective evaluations. Six-Some participants had responses indicative of affective attitudes (i.e., evaluations of physical activity as fun and enjoyable). Some participants indicated that they enjoyed sports and physical activity or found it peaceful: *“I love being outside, particularly cycling along the banks of the river. It’s peaceful, scenic, and it allows a kind of meditation (Female, 64),” “I enjoy playing sports and games casually (Male, 57).”* In two-some cases, affective attitudes were described as barriers to physical activity: *“I have struggled with exercise all my adult life. I hate it (Female, 42),” “The biggest thing that stops me from being physically active is that I really, really don’t feel like it. The thought of deliberately going and doing something for no purpose other than the sake of doing it. That is no fun (Female, 23).”* Females under 50 were more likely to describe affective attitudes as barriers to physical activity.

Subjective norm – injunctive factors. There were four-a few participants who indicated injunctive factors (i.e., experienced social expectations to engage in physical activity) to be an important aspect of physical activity motivation. Participants reported injunctive factors as both a barrier: *“Because in team sport there is still pressure to perform etc (Female, 49),”* as well as a facilitator: *“I have a friend that I confided in when I felt like I was bored with my life and needed a hobby, and he suggested working out. That’s my main source of motivation, to prove to him that I can stick to a workout routine and see it through (Female, 19).”*

Discussion

The findings revealed intervention preferences for people with depressive symptoms, and factors affecting physical activity motivation in people with depressive symptoms. These

results are important for informing the development of future physical activity interventions which meet the specific needs of people with depressive symptoms.

Web-based physical activity intervention preferences

~~The findings revealed intervention preferences for people with depressive symptoms.~~

Interactive features which target social support ~~motivational constructs~~ (e.g., social forums as a medium for connecting to other people, having advice from like-minded people about getting active) were the most frequently suggested features for web-based physical activity programs. This may be that connecting with others online is not as confrontational and gives the user more control of the interaction when compared to face-to-face meetings (Breuer & Barker, 2015; Evans, Donelle, & Hume-Loveland, 2012). Fitting with past research on health related social media use, it was younger and middle aged females who suggested social support features (Thackeray, Crookston, & West, 2013). Therefore, we do not know if older females or males would be interested in social support through a web-based intervention.

Participants also reported preferences for web-based program features that self-monitor physical activity. These findings are in line with previous meta-analytic findings that self-monitoring is an engaging and effective means for promoting physical activity in the general population (Michie, Abraham, Whittington, & McAteer, 2009). In addition, the participants indicated that a web-based program should include suggestions for unique ways to be physically active and alternative physical activities for people with a busy lifestyle. Such features may be important for enhancing perceived behavioural control. Participants with a wide range of depressive symptoms also mentioned that web-based interventions should incorporate features that specifically accommodate for depressive symptoms. For example, it was suggested that promoting ‘small goals’ could help people overcome feelings of being overwhelmed or discouraged. This is effective in the general population (Gollwitzer, 1999) but may be more important in people with depressive symptoms. Interventions could

also provide participants with information about physical activity useful in reducing symptoms of depression such as tension (e.g. tai chi). Such suggestions ~~reiterate the primary study finding that depressive symptoms result in condition-specific motivational barriers, and~~ highlight the importance of tailoring interventions specifically for people with depressive symptoms.

Factors affecting physical activity motivation

~~The findings revealed factors affecting physical activity motivation in people with depressive symptoms. Participants with a wide range of depressive symptoms highlighted that depressive symptoms come with condition-specific motivational factors for physical activity. Separate to the theory of planned behaviour, they indicated that depressive symptoms including pain, tension, feelings of worthlessness, and apathy were barriers to physical activity. This finding, alongside the finding of the need for physical activity interventions to accommodate for depressive symptoms suggests that interventions should ~~It is important therefore to~~ address these condition-specific motivational barriers, ~~when promoting physical activity to people with depressive symptoms. For example interventions could promote physical activity known to reduce these symptoms (e.g. tai-chi to reduce tension) (Abbott & Lavretsky, 2013).~~~~

Within this sample of people with depressive symptoms, lack of time, cost of gym membership, lack of energy due to work, inactive work environments, and family commitments were frequently reported as barriers of physical activity. This suggests that controllability is an important factor affecting physical activity motivation in this sample. The comments were about lack of control which may be as people with depressive symptoms tend to have an external locus of control where they attribute causes and events to things and people other than themselves (Van Dijk, Dijkshoorn, van Dijk, Cremer, & Agyemang, 2013). Therefore they may be likely to view physical activity impediments as out of their control

and unable to be resolved. People with depressive symptoms might benefit from physical activity intervention tools that provide guidance about how to control the resources and opportunities to be active. For example interventions could reinforce that there are many affordable alternatives to the gym (e.g. bike riding, walking, home exercises).

Some participants' responses highlighted low self-efficacy as a barrier to physical activity. This may be as people with depressive symptoms tend to have low self-esteem and confidence (American Psychiatric Association, 2013). Conversely, a couple of participants mentioned that physical activity increases their sense of competence, which may help to improve their overall self-esteem. Interventions could encourage people with depressive symptoms to start with physical activity they feel competent doing (e.g. walking) and, if they have low self-efficacy, avoid competitive sporting environments.

Almost all participants reported instrumental benefits that could motivate them to do physical activity, including meeting fitness goals, healthier lifestyle and weight control. This is important to note, as losing interest in health and appearance can be a symptom of depression. The finding may be due to people with depressive symptoms wanting to improve their symptoms including major alternations in physical health, mood, weight, and sleep (American Psychiatric Association, 2013) through physical activity (Physical Activity Guidelines Advisory Committee, 2008). In line with past research in the general population, the participants who were motivated by appearance tended to be female, whilst both genders mentioned health as a motivating factor- (Molanorouzi, Khoo, & Morris, 2015). Interventions promoting physical activity for people with depressive symptoms should emphasise the physical and mental health benefits of physical activity to both genders, including how it can reduce depressive symptoms.

Some pParticipants, more often female, mentioned affective attitudes as a major barrier to physical activity such as disliking physical activity, particularly strenuous physical

activity. These findings are in line with evidence of affective attitudes being a strongly influential element of the theory of planned behaviour in the general population (Downs & Hausenblas, 2005; McEachan, Conner, Taylor, & Lawton, 2011). (Downs & Hausenblas, 2005; McEachan et al., 2011), and females' lower participation in strenuous activity (Australian Bureau of Statistics, 2015). People with depressive symptoms might be particularly vulnerable to affective attitudes ~~as a motivational factor~~, given that depressive symptoms include loss of interest and pleasure in activities and hobbies (American Psychiatric Association, 2013). Conversely, some participants mentioned positive effective attitudes towards physical activity such as enjoyment and the love of the outdoors. Physical activity interventions should encourage people, particularly females to engage in physical activity that they enjoy, and if intrinsic enjoyment is low, provide strategies to make the general experience enjoyable e.g., considering aspects of context, location, companionship.

The findings that people with depressive symptoms provided little reference to injunctive norms and no reference to descriptive subjective norms ~~as motivational factors of physical activity~~ is in line with previous research showing subjective norms have a smaller influence on physical activity in the general population (McEachan et al., 2011). Pressure to perform was mentioned as a barrier to physical activity which may be a reflection of the depressive symptoms of social withdrawal (American Psychiatric Association, 2013). Interventions targeting people with depressive symptoms should therefore give examples of non-competitive types of physical activity (e.g. casual walking or bike riding).

Limitations & Future Directions

As is the nature of qualitative research on small sample sizes, the findings should not be generalised to all people with depressive symptoms. The sample had diverse characteristics, particularly in terms of age and depressive symptom frequency, which may have contributed to the diversity in responses. This research should be followed up with

deductive research with larger samples. Second, the data collection was based on an e-mailed survey of open-response questions which has the benefit of reduced risk of response bias as a result of anonymity, but it is limited in that it may not have provided as in-depth responses as other methods such as a semi-structured interviews, in which the participants can be prompted to further elaborate on their responses (Sullivan, Gibson, & Riley, 2012). Although the participants had previously participated in a web-based intervention with personalised advice or interactive features, the questions were about future interventions built specifically for people with depressive symptoms. Therefore, whilst their responses may have been influenced by their experience in that intervention, the responses are useful for the development of interventions specifically for people with depressive symptoms. The participants had previously participated in a web-based intervention with personalised advice. This means they should have had a good understanding of web-based interventions, however their responses may have been a reflection of their experience in that specific intervention.

This research study contributes valuable insight into the physical activity motivation of people with depressive symptoms and indicates that there are special condition-specific barriers and facilitators to physical activity that should be accounted for in physical activity interventions targeting this population. Important next steps in this line of research includes future research on the generalisability of these findings across a broader array of people with depressive symptoms and evaluations of web-based physical activity interventions for people with depressive symptoms based on these findings.

Conclusions

The findings suggest that web-based physical activity interventions for people with depressive symptoms should include features of social forums, self-monitoring, and suggestions for different types of physical activity that can suit their lifestyle and needs. Importantly, the intervention content must address physical activity barriers specific to people

with depressive symptoms such as low mood. The findings also suggest that people with depressive symptoms experience barriers they feel are out of their control (e.g. lack of time) and depressive symptoms (e.g. apathy and worthlessness) which hinder their participation in physical activity. Many instrumental beliefs and some affective evaluations were listed as both barriers (e.g. discomfort, lack of enjoyment) and facilitators to physical activity (improved health, weight loss, enjoyment). This information is useful for informing future web-based physical activity interventions effective at increasing physical activity in people with symptoms of depression.

Declaration of Interest

The authors declare no conflicts of interest.

References

- Abbott, R., & Lavretsky, H. (2013). Tai Chi and Qigong for the treatment and prevention of mental disorders. *Psychiatr Clin North Am*, 36(1), 109-119. doi: 10.1016/j.psc.2013.01.011
- Acosta, F., Rodríguez, L., & Cabrera, B. (2013). Beliefs about depression and its treatments: Associated variables and the influence of beliefs on adherence to treatment. *Revista de Psiquiatría Y Salud Mental (English Edition)*, 6(2), 86–92. doi: 10.1016/j.rpsm.2012.08.001
- Ajzen, I. (1988). Attitudes, personality, and behaviour. Illinois, USA: The Dorsey Press.
- American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders. Arlington, VA: American Psychiatric Publishing.
- Australian Bureau of Statistics. (2015). *National Health Survey: First Results, 2014-15*. Retrieved from Canberra, Australia: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/4364.0.55.001~2014-15~Main%20Features~Exercise~29>
- Australian Institute of Health and Welfare. (2003). *The Active Australia Survey. A guide for manual implimentation, analysis and reporting*. ISBN: 978 1 74024 258 5. Retrieved from: <http://www.aihw.gov.au/publication-detail/?id=6442467449>
- Azar, D. B., K, Salmon, J., & Cleland, V. J. (2010). Physical activity correlates in young women with depressive symptoms: a qualitative study. *International Journal of Behavioral Nutrition and Physical Activity*, 7(3). doi: 10.1186/1479-5868-7-3
- Baker, S. E., & Edwards, R. (2006). How many qualitative interviews is enough? Retrieved from: <http://eprints.ncrm.ac.uk/2273>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. doi: 10.1191/1478088706qp063oa

- Breuer, L., & Barker, C. (2015). Online Support Groups for Depression: Benefits and Barriers. *SAGE Open*, 5(2). doi: 10.1177/2158244015574936
- Cooney, G. M., Dwan, K., Greig, C. A., Lawlor, D. A., Rimer, J., Waugh, F. R., . . . Mead, G. E. (2013). Exercise for depression. *Cochrane Database Syst Rev*(9), CD004366. doi: 10.1002/14651858.CD004366.pub6
- Davies, C., Spence, J. C., Vandelanotte, C., Caperchione, C. M., & Mummery, W. K. (2012). Meta-analysis of Internet-delivered interventions to increase physical activity levels. *Int J Behav Nutr Phys Act*, 9(1), 52. doi: 10.1186/1479-5868-9-52
- Dishman, R. K. (1997). Brain monoamines, exercise, and behavioral stress: Animal models. *Medicine & Science in Sports & Exercise*, 29(1), 63-74. doi: 10.1097/00005768-199701000-00010
- Downs, D. S., & Hausenblas, H. A. (2005). The theories of reasoned action and planned behavior applied to exercise: A meta-analytic update. *Journal of Physical Activity and Health*, 2(1), 76-97. doi: 10.1123/jpah.2.1.76
- Ernst, C., Olson, A. K., Pineda, J. P. J., Lam, R. W., & Christie, B. R. (2006). Antidepressant effects of exercise: Evidence for an adult-neurogenesis hypothesis? *Journal of Psychiatry & Neuroscience*, 31(2), 84-92.
- Evans, M., Donelle, L., & Hume-Loveland, L. (2012). Social support and online postpartum depression discussion groups: a content analysis. *Patient Educ Couns*, 87(3), 405-410. doi: 10.1016/j.pec.2011.09.011
- Fjeldsoe, B. S., Winkler, E. A., Marshall, A. L., Eakin, E. G., & Reeves, M. M. (2013). Active adults recall their physical activity differently to less active adults: test-retest reliability and validity of a physical activity survey. *Health Promot J Austr*, 24(1), 26-31. doi: 10.1071/HE12912

- Gabriel, A., & Violato, C. (2010). Knowledge of and attitudes towards depression and adherence to treatment: The Antidepressant Adherence Scale (AAS). *Journal of Affective Disorders, 126*(3), 388–394. doi: 10.1016/j.jad.2010.07.013
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *Am Psychol, 54*(7), 493-503.
- Kohn, R., Saxena, S., Levav, I., & Saraceno, B. (2004). The treatment gap in mental health care. *Bull World Health Organ, 82*(11), 858-866. doi: /S0042-96862004001100011
- McEachan, R. R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the Theory of Planned Behaviour: A meta-analysis. *Health Psychol Rev, 5*(2), 97-144. doi: 10.1080/17437199.2010.521684
- Michie, S., Abraham, C., Whittington, C., & McAteer, J. (2009). Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychol, 28*(6), 690-701. doi: 10.1037/a0016136.supp
- Molanorouzi, K., Khoo, S., & Morris, T. (2015). Motives for adult participation in physical activity: type of activity, age, and gender. *BMC Public Health, 15*, 66. doi:10.1186/s12889-015-1429-7
- Ossip-Klein, D. J., Doyne, E. J., Bowman, E. D., Osborn, K. M., & Neimeyer, R. A. (1989). Effects of running or weight lifting on self-concept in clinically depressed women. *Journal of Consulting and Clinical Psychology, 57*(1), 158–161. doi: 10.1037//0022-006X.57.1.158
- Physical Activity Guidelines Advisory Committee. (2008). *Physical activity guidelines advisory committee report*. Washington, DC: Department of Health and Human Services.

- Pickett, K., Yardley, L., & Kendrick, T. (2012). Physical activity and depression: A multiple mediation analysis. *Mental Health and Physical Activity, 5*(2), 125-134. doi: 10.1016/j.mhpa.2012.10.001
- Rapaport, M. H., Clary, C., Fayyad, R., & Endicott, J. (2005). Quality-of-life impairment in depressive and anxiety disorders. *Am J Psychiatry, 162*(6), 1171-1178. doi: 10.1176/appi.ajp.162.6.1171
- Rebar, A. L., Boles, C., W. Burton, N., Duncan, M. J., Short, C. E., Happell, B., . . . Vandelanotte, C. (2016). Healthy mind, healthy body: A randomized trial testing the efficacy of a computer-tailored vs. interactive web-based intervention for increasing physical activity and reducing depressive symptoms. *Mental Health and Physical Activity, 11*29-37. doi: 10.1016/j.mhpa.2016.08.001
- Rebar, A. L., Stanton, R., Geard, D., Short, C., Duncan, M. J., & Vandelanotte, C. (2015). A meta-meta-analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. *Health Psychol Rev, 9*(3), 1-78. doi: 10.1080/17437199.2015.1022901
- Rethorst, C. D., Wipfli, B. M., & Landers, D. M. (2009). The antidepressive effects of exercise: a meta-analysis of randomized trials. *Sports Med, 39*(6), 491-511. doi: 10.2165/00007256-200939060-00004
- Rhebergen, D., Beekman, A. T., de Graaf, R., Nolen, W. A., Spijker, J., Hoogendijk, W. J., & Penninx, B. W. (2010). Trajectories of recovery of social and physical functioning in major depression, dysthymic disorder and double depression: a 3-year follow-up. *Journal of Affective Disorders, 124*(1), 148-156. doi: 10.1016/j.jad.2009.10.029
- Rogerson, M. C., Murphy, B. M., Bird, S., & Morris, T. (2012). "I don't have the heart": a qualitative study of barriers to and facilitators of physical activity for people with

- coronary heart disease and depressive symptoms. *International Journal of Behavioral Nutrition and Physical Activity*, 9(140). doi: 10.1186/1479-5868-9-140
- Sullivan, C., Gibson, S., & Riley, S. C. (2012). *Doing your qualitative psychology project*. London, England: Sage.
- Tate, D. F., Finkelstein, E. A., Khavjou, O., & Gustafson, A. (2009). Cost effectiveness of Internet interventions: Review and recommendations. *Ann Behav Med*, 38(1), 40-45. doi: 10.1007/s12160-009-9131-6
- Thackeray, R., Crookston, B. T., & West, J. H. (2013). Correlates of health-related social media use among adults. *J Med Internet Res*, 15(1), e21. doi:10.2196/jmir.2297
- Van Dam, N. T., & Earleywine, M. (2011). Validation of the Center for Epidemiologic Studies Depression Scale--Revised (CESD-R): pragmatic depression assessment in the general population. *Psychiatry Research*, 186(1), 128–132. doi: 10.1016/j.psychres.2010.08.018
- Van Dijk, T. K., Dijkshoorn, H., van Dijk, A., Cremer, S., & Agyemang, C. (2013). Multidimensional health locus of control and depressive symptoms in the multi-ethnic population of the Netherlands. *Social Psychiatry and Psychiatric Epidemiology*, 48(12), 1931–1939. doi: 10.1007/s00127-013-0678-y
- Vandelanotte, C., Spathonis, K., Eakin, E., & Owen, N. (2007). Website-delivered physical activity interventions a review of the literature. *Am J Prev Med*, 33(1), 54-64. doi: 10.1016/j.amepre.2007.02.041
- Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the Internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *J Med Internet Res*, 12(1), e4. doi: 10.2196/jmir.1376

World Health Organization. (2014). *World Health Statistics 2014*. Geneva, Switzerland:

World Health Organization. ISBN: 978 92 4 156471 7. Retrieved from:

http://apps.who.int/iris/bitstream/10665/112738/1/9789240692671_eng.pdf

Round 1: submitted manuscript

Note: this version includes the comments of Reviewer A.

Web-based intervention preferences and physical activity motivation of people with depressive symptoms

Abstract

Physical activity is an effective method for managing depressive symptoms, and web-based interventions may be an effective tool for promoting physical activity within this population. People with depressive symptoms may experience condition-specific facilitators and barriers to be considered when developing physical activity interventions. This study provides insight into web-based physical activity intervention preferences and physical activity motivation of people with depressive symptoms. This study was part of a larger trial of a web-based physical activity intervention for people with depressive symptoms. Thematic analysis of participants' ($N = 20$) written responses to open-ended survey questions was conducted. Preferences for web-based intervention features included social forums, self-monitoring, suggestions for types of physical activity in different circumstances and information targeted to people with depressive symptoms. When discussing physical activity motivation instrumental beliefs (i.e., beliefs of the benefits and cost of physical activity) and controllability (i.e., whether the behaviour is under their control) were commonly discussed. Additionally, people reported condition-specific barriers of physical activity such as depressive symptoms of apathy, worthlessness, and pain. Further research is needed to test the effectiveness of web-based physical activity interventions targeting people with depressive symptoms, which incorporates these findings.

Keywords: mood disorders, exercise, intentions, e-health

Commented [a1]: Strange sentence

Commented [a2]: Physical activity

Web-based intervention preferences and physical activity motivation of people with depressive symptoms

Depression is highly prevalent and is associated with significant societal and individual costs. Worldwide, more than 350 million people have depression and it is the leading cause of disability (WHO, 2014). Depression can result in profound impairments in quality of life and wellbeing (Rapaport et al., 2005; Rhebergen et al., 2010) and, as a result of pervasive depressive symptoms, people typically lose interest in hobbies, withdraw from activities, and experience impairments in social and occupational functioning (APA, 2013).

Some relief of depressive symptoms can result from conventional treatment options including pharmacotherapy, psychotherapy, or the combination of these therapies; however, there are several limitations to these treatment options such as the cost and accessibility of services (Gabriel & Violato, 2010), anticipated stigmatisation (Acosta, Rodríguez & Cabrera, 2013), and adverse side-effects like insomnia, sedation and neurological or sexual dysfunction (APA, 2013). As a result of these limitations, a large number of people with depression are not receiving help for symptoms. Nearly half (45%) of Australians in need of mental health treatment are not receiving treatment (Kohn et al., 2004). As such, there is an important need to explore other easily accessible treatments to reduce depressive symptoms.

Physical activity as a treatment option for depressive symptoms

Physical activity has been shown to significantly alleviate depressive symptoms (Cooney et al., 2013; Rebar et al., 2015). Some evidence suggests that the antidepressant benefits of physical activity may have the same magnitude of effect, or even larger, than that of pharmacological or psychotherapy treatments (Cooney et al., 2013; Rethorst, Wipfli & Landers, 2009). The antidepressant effects of physical activity have been explained partly by enhanced regulation of hippocampal neurogenesis, including increased serotonin (Ernst et al., 2006) and noradrenaline (Dishman, 1997). Physical activity also has antidepressant effects

Commented [a3]: Was it also compared to the combination of these two? (Supposedly the highest effectiveness)

via psychological mechanisms such as enhanced self-esteem (Ossip-Klein et al., 1989), self-efficacy and coping ability (Pickett, Yardley & Kendrick, 2012).

Web-Based Physical Activity Interventions

Web-based physical activity interventions have the potential to offer participants advice at any time and place for a lower cost than face-to-face physical activity interventions (Vandelanotte et al., 2007). Web-based physical activity interventions also remove stigma of traditional treatments for depressive symptoms and delivers the treatment in a non-confrontational manner (Tate et al., 2009). Research has shown that web-based physical activity interventions can increase physical activity behaviour (Davies et al., 2012), however we do not know the perceptions and preferences of web-based interventions in people with depressive symptoms. Such knowledge is needed to inform the development of future web-based physical activity interventions effective at engaging this population group.

Understanding physical activity behaviour

Web-based physical activity interventions based on a behavioural theory such as the theory of planned behaviour are more effective at changing behaviour (Ajzen, 1988; Webb et al., 2010). Interventions based on the theory of planned behaviour target individuals' *behavioural intentions* (i.e., people's plans to engage in the behaviour) by addressing *attitudes* (i.e., positive or negative evaluations), *subjective norms* (i.e., perceived social pressure and support) and *perceived behavioural control* (i.e., perceived ability to execute the behaviour; opportunities; resources) (Ajzen, 1988). Attitudes can be classified as either *instrumental* (i.e., beliefs of the benefits and cost of behaviour as being beneficial or harmful) or *affective* (i.e., emotion-based evaluations of the behaviour as being enjoyable or unenjoyable); subjective norm includes an *injunctive* (i.e., whether one believes their social network wants them to perform the behaviour) and a *descriptive* component (i.e., whether one's social network performs the behaviour); and perceived behavioural control has two

subcomponents of *self-efficacy* (i.e., perceived ease/difficulty of performing the behaviour and confidence) and *controllability* (i.e., personal control over behaviour, appraisal of whether one's self has control over the behaviour). Given the emotional, cognitive, and motivational manifestations of depressive symptoms, people with depressive symptoms are likely to have unique attitudes, social norms and perceived behavioural control for physical activity (Rhebergen et al., 2010). Therefore it is of great importance to explore these constructs in people with depressive symptoms.

The Present Study

Given the scarcity of previous evidence, qualitative research is an essential first step to gain insight into the perceptions of people with depressive symptoms regarding web-based physical activity intervention preferences and physical activity motivation. The present study aimed to examine web-based intervention preferences within people with depressive symptoms and physical activity motivation using the framework of the theory of planned behaviour.

Method

Participants

This study recruited adults (18 years or older) who previously participated in a larger trial evaluating the effects of web-based physical activity interventions on depressive symptoms and physical activity (Rebar et al., 2016). All study procedures were approved by the relevant Human Research Ethics Committee (approval number: H13/08-147). For the larger trial 514 participants were recruited via Facebook and Google advertising targeting people with low mood (Rebar et al., 2016). The 2-arm randomised trial compared the effectiveness of two web-based interventions for increasing physical activity and reducing depressive symptoms. Participants were randomised to receive either a web-based physical activity intervention program with interactive features or a web-based physical activity

Commented [a4]: This is a sound argument, though I cannot help but wonder if such, or similar, studies have not been conducted before. If so, the background could be elaborated upon more.

Commented [a5]: I find this hard to believe when it comes to big and popular topics like physical activity and depression in the year 2013. Right now, not a single study is mentioned. That would be scarce indeed.

intervention with personalised advice. Physical activity significantly increased and depression significantly decreased from baseline to one month and three months and no between group differences on physical activity or depression were found (Rebar et al., 2016). For the current study participants in the personalised advice arm of the trial who reported depressive symptoms were recruited (based on a score >16 on the CES-D-r validated measure of depression (Van Dam & Earleywine, 2011). E-mail invitations were sent out to 50 potential participants, a size estimated a priori to be sufficient to achieve saturation with the anticipated response rates between 25 to 50% (Baker & Edwards, 2006).

Procedure & Materials

Participants' demographics, BMI and physical activity behaviour was already collected through the larger trial. Demographics included age, sex, education ($<$ year 12, $>$ year 12) and household income ($<$ 52,000AUD, $>$ 52,000AUD). BMI was calculated from self-reported height and weight, and physical activity was assessed using the Active Australia Survey (AIHW, 2003) which has previously been shown to have acceptable reliability and validity (AIHW, 2003; Fjeldsoe et al., 2013). The Active Australia survey measures total time walking, participating in vigorous physical activity (e.g., jogging, cycling, aerobics, competitive tennis) and participating in moderate physical activity (e.g., gentle swimming, social tennis, golf) in the past week. Minutes of physical activity per week were calculated as the sum of the time spent walking, time in moderate activity and time in vigorous activity (weighted by two to account for the extra energy expenditure output) as per manual instructions (AIHW, 2003).

The invitation e-mails included information about the study and the open-response questions. The questions on motivation were, "What motivates you to be physically active?," "What stops you from being physically active?," "What benefits are there from being physically active?," "What risks are there for being physically active?" and "To what extent

do you think being physically active could help you cope with feeling sad or depressed?" The questions about the physical activity web-based intervention included "To what extent do you think a web-based physical activity program like the one you tried could help people cope with feeling sad or depressed?," "Would you use it?," "If not, why not?" and "What features would you like such a website to have?" Willing participants provided their responses to these questions by return email.

Analysis

Data were analysed using the thematic analysis procedure as outlined by Braun and Clarke (2006). The procedure involves 9 steps including (1) familiarising yourself with your data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes and (6) producing the report. The data was analysed based on themes of the theory of planned behaviour framework. In addition, inductive analysis was utilised to identify and examine themes beyond the theory of planned behaviour. Specifically, the surveys were read and reviewed by MA to generate initial codes relating to, and beyond, the theory of planned behaviour (i.e., instrumental and affective attitudes; injunctive and descriptive subjective norm; and the subcomponents of perceived behavioural control, self-efficacy and controllability). Each response was then coded by both MA and ALR. Any inconsistencies were resolved by discussion between MA and ALR. As additional themes were revealed, participants' responses were reanalysed reiteratively.

Results

Commented [a6]: Interesting category, if these reasons can be helped, it could open up a new group of people potentially to be targeted by a web-based intervention. This becomes even more important when the 'offline' group is relatively large.

M

SD

Age (years)	45.2	18.18	
BMI	30.43	8.91	Respon
Physical activity; minutes/week	139.33	176.57	ses
Depression symptom frequency (CESD-r score)	29.5	8.86	were
	n	%	receive
Gender			d from
Female	14	70	twenty
Male	6	30	particip
Education			ants
< year 12	9	45	(40%
> year 12	11	55	respons
Household Income			e rate)
< AUD\$52000 pa	6	30	and
> AUD\$52000 pa	9	45	then
Not reported	5	25	analyse

Commented [a7]: Check formatting table/text

d. Both authors involved in data analysis (MA & ALR) considered there was saturation and therefore decided not to invite additional people to participate in the study. Descriptive characteristics of the study sample is presented in Table 1. The sample was mostly female ($n = 14, 70\%$) and the mean age was 45 ± 18 . This was similar to the larger trial which was 70% Female with an average age of 46 ± 15 . Participants reported a mean score of 29.5 ($SD=8.9$) on the CES-D-r scale.

Table 1. Descriptive Statistics of Participants' Demographic Characteristics

Note. CESD-r: Center for Epidemiologic Studies Depression Scale –revised on which scores > 16 represent clinical depressive symptoms.

Commented [a8]: Mean BMI of 30.43 could also be noted, this may impact the nature of your findings significantly. The importance of BMI has not been mentioned before in this paper so I take it you assume a general, depressed sample for your study.

Web-based Intervention Preferences

Consideration for depressive symptoms. Eight participants (40%) reported that it was important for physical activity web-based programs to account for depressive symptoms, specifically the symptom of low mood. They suggested beneficial features could either teach strategies or suggest methods of improving low mood: *“The recognition that exercise is very difficult for people with mood issues would do a lot more to help than any GP has ever done (Female, 42),”* *“If a person is feeling low, depressed etc. the problem is will that person at that moment of need actually check out a website (Male, 79).”*

Social networking. Eleven participants (55%) desired a web-based physical activity program to have features that encouraged social networking and increased social support from likeminded people: *“A website with community features and options for people to share their stories with each other from similar circumstances can work to push each other (Female, 20),”* *“Also a site where people could encourage others and suggest different forms of physical activity that worked for them may be beneficial (Female, 37).”*

Self-monitoring. Eight participants (40%) reported that features which allowed users to keep track record of their achievement would encourage further use of the website and create an opportunity to visualise benefits of regular physical activity: *“Being able to see how much exercise I’ve been doing over the last month or so really motivates me not to skip a day (Female, 19)*

Suggestions for physical activity in different circumstances. Six participants (30%) reported that a web-based program with suggestions about a variety of physical activities may allow for people to be active while having a busy lifestyle or experiencing physical discomfort: *“Perhaps it could have quick ideas for ways to be active in different circumstances. Like, how can I be active for 10 mins if I’m busy, or I travel a bit so maybe what can you do when you are not at home (Female, 49).”*

Factors affecting physical activity motivation

Consideration for depressive symptoms. A theme emerged relating to the participants' attempts to be physical active while experiencing depressive symptoms. Six participants (30%) indicated that depressive symptoms of apathy, worthlessness, and pain created a significant barrier to being physical active: "*Generally it's depression. A feeling of pain and tension, lack of sleep, worthlessness. Then I don't want to do anything* (Male 47)," "*Sometimes apathy brought on by mild depressive episodes* (Female, 37)," "*Mental condition that leads to procrastination through fear of failure* (Male, 59)."

Perceived behavioural control – controllability. Nine participants (45%) gave responses about physical activity motivation related to controllability (i.e., feelings of control over resources and opportunities for being physically active). Each of these participants mentioned lack of time as a barrier to being physically active, and other barriers were reported, including cost of gym membership, lack of energy due to work, sedentary work, and family commitments. Such responses include, "*Lack of time and sedentary job* (Female, 54)," "*Finding time to do activity usually stops me* (Female, 49)," "*The major restriction on being active, such as joining a sporting team, is largely down to external pressures like, time, cost, distance etc.* (Male, 57)." One respondent reported that having time set aside first thing in the morning increased likelihood of engaging in physical activity.

Perceived behavioural control – self-efficacy. Six participants' (30%) responses highlighted self-efficacy (i.e., perceptions of ability to perform physical activity) as a factor affecting physical activity. Some indicated that physical activity induced feelings of physical activity as being too difficult, or that they lacked the confidence to pursue an active lifestyle. Such responses included, "*Fear of actually trying and not being good enough, finding small things too hard and being noticed. It's hard to try and utilise competitiveness as a motivational drive when you don't feel good enough to compete and won't start out of shame*

Commented [a9]: While the web-based preferences may be novel, these general determinants should be seen in the light of previous findings. How does it add, or fit in, with the existing knowledge-base?

(Female, 20),” and “*I liked dance as a kid, and joined a few classes over the years but I don’t have the confidence to join a dance class these days* (Female, 42).” Other Participants indicated that they felt like physical activity increased their sense of competence and facilitated more active behaviours: “*The thought of being able to run, or dance, or do others physical things, and actually be able to do it and enjoy it, makes me want to get fit* (Female, 23),” “*I enjoy doing things that I couldn’t before* (Female, 49).”

Attitude – instrumental beliefs. Many ($n = 16$) responses emphasised instrumental beliefs as being a source of motivation for physical activity (e.g., benefits). Fourteen participants indicated that fitness goals, healthy lifestyle and weight control motivated them to engage in physical activity, and six participants also said that they were motivated to be physically active because it reduced physical pain, discomfort, and stress. Responses included, “*I am motivated by wanting to be physically stronger, able to run faster without visibly being overworked, and I’d like to be leaner as appropriate to my body shape* (Female, 20),” “*To lose weight, have a clearer head space, reduce fibromyalgia issues – reducing back pain, improve sleep and reduce stress and anxiety* (Female, 18),” and “*Usually what motivates me to be physically active is the idea that exercise will make me better physically. I like to play sport etc so the idea of being faster or stronger is a big motivator* (Female, 49).”

Two participants’ responses demonstrated negative instrumental beliefs that affected their physical activity motivation (e.g., costs of physical activity). This included physical discomfort and that they did not see any benefit from exercise: “*When I do attempt to work out, the ‘afterburn’ of a workout generally lasts for several days, which makes it hard to want to pick up a 3 times a week routine* (Female, 20),” “*Physical discomfort, and the fact that my body very stubbornly holds on to weight and exercise doesn’t help weight loss unless I work really hard which is unsustainable for me because I don’t enjoy it* (Female, 42).”

Commented [a10]: Another participant was 79. The SD’s for BMI and physical activity (PA) are also immense, this calls into question the generalizability of your findings. It is very well possible that this 18 year-old female, who happens to be physically active, stands alone in her ‘category’ – in such a likely case, saturation of findings is hard to achieve with a number of 20, distributed over too many categories. Age, BMI, and PA are too pertinent to the way a web-based intervention is perceived – I think.

Attitude – affective evaluations. Six participants had responses indicative of affective attitudes (i.e., evaluations of physical activity as fun and enjoyable). Some participants indicated that they enjoyed sports and physical activity or found it peaceful: “*I love being outside, particularly cycling along the banks of the river. It’s peaceful, scenic, and it allows a kind of meditation* (Female, 64),” “*I enjoy playing sports and games casually* (Male, 57).” In two cases, affective attitudes were described as barriers to physical activity: “*I have struggled with exercise all my adult life. I hate it* (Female, 42),” “*The biggest thing that stops me from being physically active is that I really, really don’t feel like it. The thought of deliberately going and doing something for no purpose other than the sake of doing it. That is no fun* (Female, 23).”

Subjective norm – injunctive factors. There were four participants who indicated injunctive factors (i.e., experienced social expectations to engage in physical activity) to be an important aspect of physical activity motivation. Participants reported injunctive factors as both a barrier: “*Because in team sport there is still pressure to perform etc* (Female, 49),” as well as a facilitator: “*I have a friend that I confided in when I felt like I was bored with my life and needed a hobby, and he suggested working out. That’s my main source of motivation, to prove to him that I can stick to a workout routine and see it through* (Female, 19).”

Discussion

Web-based physical activity intervention preferences

The findings revealed intervention preferences for people with depressive symptoms. Interactive features which target social support motivational constructs (e.g., social forums as a medium for connecting to other people, having advice from like-minded people about getting active) were the most frequently suggested features for web-based physical activity programs. This may be that connecting with others online is not as confrontational and gives

the user more control of the interaction when compared to face-to-face meetings (Breuer & Barker, 2015; Evans, Donelle & Hume-Loveland, 2012).

Participants also reported preferences for web-based program features that self-monitor physical activity. These findings are in line with previous meta-analytic findings that self-monitoring is an engaging and effective means for promoting physical activity in the general population (Michie et al., 2009). In addition, the participants indicated that a web-based program should include suggestions for unique ways to be physically active and alternative physical activities for people with a busy lifestyle. Such features may be important for enhancing perceived behavioural control. Participants also mentioned that web-based interventions should incorporate features that specifically accommodate for depressive symptoms. For example, it was suggested that promoting 'small goals' could help people overcome feelings of being overwhelmed or discouraged. This is effective in the general population (Gollwitzer, 1999) but may be more important in people with depressive symptoms. Interventions could also provide participants with information about physical activity useful in reducing symptoms of depression such as tension (e.g. tai chi). Such suggestions reiterate the primary study finding that depressive symptoms result in condition-specific motivational barriers, and highlight the importance of tailoring interventions specifically for people with depressive symptoms.

Factors affecting physical activity motivation

The findings revealed factors affecting physical activity motivation in people with depressive symptoms. Participants highlighted that depressive symptoms come with condition-specific motivational factors for physical activity. They indicated that depressive symptoms including pain, tension, feelings of worthlessness, and apathy were barriers to physical activity. It is important therefore to address these condition-specific motivational barriers when promoting physical activity to people with depressive symptoms. For example

Commented [a11]: Such points could have driven your online qualitative questions more, but that is hindsight at this point. If they were indeed driven by such meta-analyses, this should be explained.

Commented [a12]: Aside from all the previous points of critique, I also want to commend this pilot-study as it is a great ay of fine-tuning your bigger trial. It is a vital yet often overlooked step in research and you have done it well. All critical comments should also be seen in light of this being a pilot-study.

interventions could promote physical activity known to reduce these symptoms (e.g. tai-chi to reduce tension) (Abbott & Lavretsky, 2013).

Within this sample of people with depressive symptoms, lack of time, cost of gym membership, lack of energy due to work, inactive work environments, and family commitments were frequently reported as barriers of physical activity. This suggests that controllability is an important factor affecting physical activity motivation in this sample. The comments were about lack of control which may be as people with depressive symptoms tend to have an external locus of control where they attribute causes and events to things and people other than themselves (Van Dijk et al., 2013). Therefore they may be likely to view physical activity impediments as out of their control and unable to be resolved. People with depressive symptoms might benefit from physical activity intervention tools that provide guidance about how to control the resources and opportunities to be active. For example interventions could reinforce that there are many affordable alternatives to the gym (e.g. bike riding, walking, home exercises).

Some participants' responses highlighted low self-efficacy as a barrier to physical activity. This may be as people with depressive symptoms tend to have low self-esteem and confidence (APA, 2013). Conversely, a couple of participants mentioned that physical activity increases their sense of competence, which may help to improve their overall self-esteem. Interventions could encourage people with depressive symptoms to start with physical activity they feel competent doing (e.g. walking) and, if they have low self-efficacy, avoid competitive sporting environments.

Almost all participants reported instrumental benefits that could motivate them to do physical activity, including meeting fitness goals, healthier lifestyle and weight control. This is important to note, as losing interest in health and appearance can be a symptom of depression. The finding may be due to people with depressive symptoms wanting to improve

their symptoms including major alternations in physical health, mood, weight, and sleep (APA, 2013) through physical activity (Physical Activity Guidelines Advisory Committee, 2008). Interventions promoting physical activity for people with depressive symptoms should emphasise the physical and mental health benefits of physical activity, including how it can reduce depressive symptoms.

Participants mentioned affective attitudes as a major barrier to physical activity such as disliking physical activity, particularly strenuous physical activity. These findings are in line with evidence of affective attitudes being a strongly influential element of the theory of planned behaviour in the general population (Downs & Hausenblas, 2005; McEachan et al., 2011). People with depressive symptoms might be particularly vulnerable to affective attitudes as a motivational factor, given that depressive symptoms include loss of interest and pleasure in activities and hobbies (APA, 2013). Conversely, some participants mentioned positive effective attitudes towards physical activity such as enjoyment and the love of the outdoors. Physical activity interventions should encourage people to engage in physical activity that they enjoy, and if intrinsic enjoyment is low, provide strategies to make the general experience enjoyable e.g., considering aspects of context, location, companionship.

The findings that people with depressive symptoms provided little reference to injunctive norms and no reference to descriptive subjective norms as motivational factors of physical activity is in line with previous research showing subjective norms have a smaller influence on physical activity in the general population (McEachan et al., 2011). Pressure to perform was mentioned as a barrier to physical activity which may be a reflection of the depressive symptoms of social withdrawal (APA, 2013). Interventions targeting people with depressive symptoms should therefore give examples of non-competitive types of physical activity (e.g. casual walking or bike riding).

Limitations & Future Directions

Commented [a13]: The suggestions offered in the discussion are often helpful and informative. As such, this study would contribute to the field when published.

As is the nature of qualitative research on small sample sizes, the findings should not be generalised to all people with depressive symptoms. This research should be followed up with deductive research with larger samples. Second, the data collection was based on an e-mailed survey of open-response questions which has the benefit of reduced risk of response bias as a result of anonymity, but it is limited in that it may not have provided as in-depth responses as other methods such as a semi-structured interviews, in which the participants can be prompted to further elaborate on their responses (Sullivan, Gibson & Riley, 2012). The participants had previously participated in a web-based intervention with personalised advice. This means they should have had a good understanding of web-based interventions, however their responses may have been a reflection of their experience in that specific intervention.

This research study contributes valuable insight into the physical activity motivation of people with depressive symptoms and indicates that there are special condition-specific barriers to physical activity that should be accounted for in physical activity interventions targeting this population. Important next steps in this line of research includes future research on the generalisability of these findings across a broader array of people with depressive symptoms and evaluations of web-based physical activity interventions for people with depressive symptoms based on these findings.

Conclusions

The findings suggest that web-based physical activity interventions for people with depressive symptoms should include features of social forums, self-monitoring, and suggestions for different types of physical activity that can suit their lifestyle and needs. Importantly, the intervention content must address physical activity barriers specific to people with depressive symptoms such as low mood. The findings also suggest that people with depressive symptoms experience barriers they feel are out of their control (e.g. lack of time)

Commented [a14]: You could add the large SD's here to substantiate this point.

Commented [a15]: Elaborating upon this point; I wonder if any findings could be associated with certain profiles. Do people with a certain profile tend to answer in similar ways? The importance of getting to know your target-population in a bigger trial could be emphasized through this profile-matching. Answers could be analysed not individually, but as being part of a cluster.

and depressive symptoms (e.g. apathy and worthlessness) which hinder their participation in physical activity. Many instrumental beliefs and some affective evaluations were listed as both barriers (e.g. discomfort, lack of enjoyment) and facilitators to physical activity (improved health, weight loss, enjoyment). This information is useful for informing future web-based physical activity interventions effective at increasing physical activity in people with symptoms of depression.

Declaration of Interest

The authors declare no conflicts of interest.

References

- Abbott, R., & Lavretsky, H. (2013). Tai Chi and Qigong for the treatment and prevention of mental disorders. *Psychiatr Clin North Am*, 36(1), 109-119. doi: 10.1016/j.psc.2013.01.011
- Acosta, F., Rodríguez, L., & Cabrera, B. (2013). Beliefs about depression and its treatments: Associated variables and the influence of beliefs on adherence to treatment. *Revista de Psiquiatría Y Salud Mental (English Edition)*, 6(2), 86–92. doi: 10.1016/j.rpsm.2012.08.001
- Ajzen, I. (1988). Attitudes, personality, and behaviour. Illinois, USA: The Dorsey Press.
- American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders. Arlington, VA: American Psychiatric Publishing.
- Australian Institute of Health and Welfare. (2003). *The Active Australia Survey. A guide for manual implementation, analysis and reporting*. ISBN: 978 1 74024 258 5. Retrieved from: <http://www.aihw.gov.au/publication-detail/?id=6442467449>
- Baker, S. E., & Edwards, R. (2006). How many qualitative interviews is enough? from <http://eprints.ncrm.ac.uk/2273>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. doi: 10.1191/1478088706qp063oa
- Breuer, L., & Barker, C. (2015). Online Support Groups for Depression: Benefits and Barriers. *SAGE Open*, 5(2). doi: 10.1177/2158244015574936
- Cooney, G. M., Dwan, K., Greig, C. A., Lawlor, D. A., Rimer, J., Waugh, F. R., . . . Mead, G. E. (2013). Exercise for depression. *Cochrane Database Syst Rev*(9), CD004366. doi: 10.1002/14651858.CD004366.pub6

- Davies, C., Spence, J. C., Vandelanotte, C., Caperchione, C. M., & Mummery, W. K. (2012). Meta-analysis of Internet-delivered interventions to increase physical activity levels. *Int J Behav Nutr Phys Act*, *9*(1), 52. doi: 10.1186/1479-5868-9-52
- Dishman, R. K. (1997). Brain monoamines, exercise, and behavioral stress: Animal models. *Medicine & Science in Sports & Exercise*, *29*(1), 63-74. doi: 10.1097/00005768-199701000-00010
- Downs, D. S., & Hausenblas, H. A. (2005). The theories of reasoned action and planned behavior applied to exercise: A meta-analytic update. *Journal of Physical Activity and Health*, *2*(1), 76-97. doi: 10.1123/jpah.2.1.76
- Ernst, C., Olson, A. K., Pinel, J. P. J., Lam, R. W., & Christie, B. R. (2006). Antidepressant effects of exercise: Evidence for an adult-neurogenesis hypothesis? *Journal of Psychiatry & Neuroscience*, *31*(2), 84-92.
- Evans, M., Donelle, L., & Hume-Loveland, L. (2012). Social support and online postpartum depression discussion groups: a content analysis. *Patient Educ Couns*, *87*(3), 405-410. doi: 10.1016/j.pec.2011.09.011
- Fjeldsoe, B. S., Winkler, E. A., Marshall, A. L., Eakin, E. G., & Reeves, M. M. (2013). Active adults recall their physical activity differently to less active adults: test-retest reliability and validity of a physical activity survey. *Health Promot J Austr*, *24*(1), 26-31. doi: 10.1071/HE12912
- Gabriel, A., & Violato, C. (2010). Knowledge of and attitudes towards depression and adherence to treatment: The Antidepressant Adherence Scale (AAS). *Journal of Affective Disorders*, *126*(3), 388-394. doi: 10.1016/j.jad.2010.07.013
- Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *Am Psychol*, *54*(7), 493-503.

- Kohn, R., Saxena, S., Levav, I., & Saraceno, B. (2004). The treatment gap in mental health care. *Bull World Health Organ*, 82(11), 858-866. doi: /S0042-96862004001100011
- McEachan, R. R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the Theory of Planned Behaviour: A meta-analysis. *Health Psychol Rev*, 5(2), 97-144. doi: 10.1080/17437199.2010.521684
- Michie, S., Abraham, C., Whittington, C., & McAteer, J. (2009). Effective techniques in healthy eating and physical activity interventions: A meta-regression. *Health Psychol*, 28(6), 690-701. doi: 10.1037/a0016136.supp
- Ossip-Klein, D. J., Doynne, E. J., Bowman, E. D., Osborn, K. M., & Neimeyer, R. A. (1989). Effects of running or weight lifting on self-concept in clinically depressed women. *Journal of Consulting and Clinical Psychology*, 57(1), 158-161. doi: 10.1037//0022-006X.57.1.158
- Physical Activity Guidelines Advisory Committee. (2008). *Physical activity guidelines advisory committee report*. Washington, DC: Department of Health and Human Services.
- Pickett, K., Yardley, L., & Kendrick, T. (2012). Physical activity and depression: A multiple mediation analysis. *Mental Health and Physical Activity*, 5(2), 125-134. doi: 10.1016/j.mhpa.2012.10.001
- Rapaport, M. H., Clary, C., Fayyad, R., & Endicott, J. (2005). Quality-of-life impairment in depressive and anxiety disorders. *Am J Psychiatry*, 162(6), 1171-1178. doi: 10.1176/appi.ajp.162.6.1171
- Rebar, A. L., Boles, C., W. Burton, N., Duncan, M. J., Short, C. E., Happell, B., . . . Vandelanotte, C. (2016). Healthy mind, healthy body: A randomized trial testing the efficacy of a computer-tailored vs. interactive web-based intervention for increasing

physical activity and reducing depressive symptoms. *Mental Health and Physical Activity*, 1129-37. doi: 10.1016/j.mhpa.2016.08.001

Rebar, A. L., Stanton, R., Geard, D., Short, C., Duncan, M. J., & Vandelanotte, C. (2015). A meta-meta-analysis of the effect of physical activity on depression and anxiety in non-clinical adult populations. *Health Psychol Rev*, 9(3), 1-78. doi: 10.1080/17437199.2015.1022901

Rethorst, C. D., Wipfli, B. M., & Landers, D. M. (2009). The antidepressive effects of exercise: a meta-analysis of randomized trials. *Sports Med*, 39(6), 491-511. doi: 10.2165/00007256-200939060-00004

Rhebergen, D., Beekman, A. T., de Graaf, R., Nolen, W. A., Spijker, J., Hoogendijk, W. J., & Penninx, B. W. (2010). Trajectories of recovery of social and physical functioning in major depression, dysthymic disorder and double depression: a 3-year follow-up. *Journal of Affective Disorders*, 124(1), 148-156. doi: 10.1016/j.jad.2009.10.029

Sullivan, C., Gibson, S., & Riley, S. C. (2012). *Doing your qualitative psychology project*. London, England: Sage.

Tate, D. F., Finkelstein, E. A., Khavjou, O., & Gustafson, A. (2009). Cost effectiveness of Internet interventions: Review and recommendations. *Ann Behav Med*, 38(1), 40-45. doi: 10.1007/s12160-009-9131-6

Van Dam, N. T., & Earleywine, M. (2011). Validation of the Center for Epidemiologic Studies Depression Scale--Revised (CESD-R): pragmatic depression assessment in the general population. *Psychiatry Research*, 186(1), 128-132. doi: 10.1016/j.psychres.2010.08.018

Van Dijk, T. K., Dijkshoorn, H., van Dijk, A., Cremer, S., & Agyemang, C. (2013). Multidimensional health locus of control and depressive symptoms in the multi-ethnic

population of the Netherlands. *Social Psychiatry and Psychiatric Epidemiology*, 48(12), 1931–1939. doi: 10.1007/s00127-013-0678-y

Vandelanotte, C., Spathonis, K., Eakin, E., & Owen, N. (2007). Website-delivered physical activity interventions a review of the literature. *Am J Prev Med*, 33(1), 54-64. doi: 10.1016/j.amepre.2007.02.041

Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the Internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *J Med Internet Res*, 12(1), e4. doi: 10.2196/jmir.1376

World Health Organization. (2014). *World Health Statistics 2014*. Geneva, Switzerland: World Health Organization. ISBN: 978 92 4 156471 7. Retrieved from: http://apps.who.int/iris/bitstream/10665/112738/1/9789240692671_eng.pdf