

PEER REVIEW HISTORY

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

ARTICLE DETAILS

TITLE (PROVISIONAL)	A Survey of Social Support for Exercise and its Relationship to Health Behaviors and Health Status among Endurance Nordic Skiers
AUTHORS	Anderson, Paul; Bovard, Ralph; Wang, Zhen; Beebe, Timothy; Murad, M. Hassan

VERSION 1 - REVIEW

REVIEWER	Dr. Lisa Marie Warner Freie Universität Berlin Health Psychology Berlin, Germany
REVIEW RETURNED	04-Nov-2015

GENERAL COMMENTS	<p>The manuscript "Social Support for Exercise and its Relationship to Health Behaviors and Health Status among Endurance Nordic Skiers" is a cross-sectional analysis of the association of social support for exercise from family and friends with the outcomes exercise, other health behaviors and health status among Nordic Skiers in the North American general population. The descriptive analyses could be interesting for the domain for sports and exercise medicine. In its current form, this study does, however, not yet advance scientific knowledge much: That exercise specific social support is associated with exercise on a cross-sectional level was well known before. The study does not test, however, not test any theoretical assumptions or innovative constructs. Much more interesting questions would be for example, which mechanisms play a role to translate social support into behavior or health, or which support sources matter most (family or friends)? The current version of the paper does therefore not yet allow drawing strong implications for theory development, future research or physical activity programs in the general population.</p> <p>Abstract „For every 5 minute increase in weekly self- reported exercise time we found an increase of 10 points in the social support score.“ – rather phrase these results the other way around, as it sounds as if exercise elicited support (again in discussion)</p> <p>Introduction There is not much previous literature cited and some is quite outdated. “This study also analyzes the strength of the relationship between social support for exercise, health behaviors, and self-reported health status” - No mentioning of health status and other health behaviors other than nutrition and exercise in introduction. If associations of social support with any other outcome than exercise</p>
-------------------------	--

or nutrition should be analyzed, the introduction needs to be much more elaborated on these specific outcomes. There is a large body of literature on the effects general social support may have on health status directly, but the assessment of social support in this study is behavior specific, not general. Therefore the authors should rather consider mediation analyses from their behavior specific support measure to exercise to health status, if they want to determine to association of a behavior specific support measure with general health status. However, such mediation analyses would be limited by the cross-sectional nature of the data.

Studying the association between social support assessed specifically for exercise with the performance of any other health behavior does not fit. So please refrain from these cross-behavior analyses unless you cite strong theoretical background and elaborate on this in the introduction to make clear why such analyses would be justifiable.

Methods

“Health status and health behavior questions were modeled after the Behavioral Risk Factor Surveillance System (BRFSS) and questions commonly used in the National Health and Nutrition Examination Survey (NHANES). Health status questions explored how participants would rate their current health status, how they felt their health compared with others, and whether they had any chronic conditions relevant to sport participation. Health behavior questions explored topics such as nutrition, exercise habits, sleep patterns, smoking history, and alcohol use.” - Please explain each measure in detail with references and example items in the text of the manuscript, not only by pasting the questionnaire into the Appendix. If any of these items were used in a version that was altered from the original, please state why and how it was adjusted to the needs of this study. Also information on validity and reliability found in previous studies for the measures used would be desirable. Without this information, the reader cannot understand most of the outcome measures. For example: How was the exercise total score created? The authors build a threshold of 150 min per week, the item however asks for the times, a person exercised for at least 15 minutes with specific intensity. If someone went Nordic skiing three times a week for 60 minutes, wouldn't that person have indicated only 3 times in the questionnaire? Would these three times be scored as 3 x 15 min instead of 3 x 60 min? And how was the intensity of physical activity taken into account?

Results

How was the dose response association calculated? If it was merely calculated by transferring the 150 min cut-off criterion back to minutes according to the odd ration, it is probably highly inaccurate. Please rather calculate regressions with the continuous outcome (even though it is a shortcoming that it was categories into 15 min bouts in the beginning and not asked for exact minutes of each exercise session) and calculate a new dose response score.

Table 1 – ranges would also be interesting for some measures, for example age and BMI

Discussion

“So, on the one hand, the predominance of solitary training coupled with the determination to sign up for races regardless of social support suggests a high level of self-efficacy. On the other hand, the pattern of weekly exercise with others and the fact that skiers do sign up for races because of motivation derived from others suggests that any pre-existing self-efficacy may be reinforced by

	<p>regular doses of exercise specific social support” – the authors conclude effects on self-efficacy, even though they did neither assess nor test effects on self-efficacy, or forgot to report them “Studies in middle aged and elderly citizen runners have previously documented elevated health status and increased healthy behaviors.” – elevated as compared to whom?</p> <p>“In general, for every 5 minute increase in weekly minutes of exercise reported, there was a 10 point increase in the self-reported social support score. This finding points to a strong link between physical activity levels and social connection” – is this a strong association? I doubt that it is easy to obtain so much more support that one would rate 10 more points on the social support scale. But if these 10 points only elicit 5 more minutes of exercise per week, I would categorize that as a small effect. Maybe the calculation of an effect size would help the reader to categorize the size of the effect?</p> <p>“Actigraphy studies show that people report far more physical activity than they actually perform when measured with an accelerometer.” – needs a reference</p> <p>“Future studies could utilize a formal 24-hour dietary recall form, a weekly food diary, or an online program such as my fitness pal or “Lose It!” – not clear why specific maybe commercial apps are named and not relevant as the focus of this study was not to study diet</p> <p>“Patterns of social support for exercise in Endurance Nordic skiers reveal the importance of verbal processing and regular group exercise for the initiation and maintenance of a physically active lifestyle.” – Initiation and maintenance were not tested separately, so rather do not mention</p> <p>“While endurance athletes appear to have high levels of self-efficacy, they also appear to draw upon social support to bolster their motivation and skills and overcome barriers to better performance, especially support from family and friends.” – neither statement about self-efficacy nor the sources of social support can be derived from this study, as self-efficacy was not analyzed and there were only two sources of social support that were not compared to other possible sources such as trainers or acquaintances, physicians etc</p>
--	--

REVIEWER	Aldair J Oliveira Rural Federal University of Rio de Janeiro, Brazil
REVIEW RETURNED	09-Dec-2015

GENERAL COMMENTS	<p>The authors present an interesting paper to characterize patterns of social support among endurance athletes . Some suggestions for improving the document are provided below.</p> <p>Methods</p> <p>The sub-section "Study population", it is not clear the eligible population for the study.</p> <p>You should include the percentage of refuse.</p> <p>Did you provide participant consent? Mention in the paper. Ethics approval should be mention as well.</p> <p>Provide validation information about Social support scale used.</p>
-------------------------	--

	<p>You should mention how motivation was measured.</p> <p>Results You create a subsection "motivation" but you did not mention motivation as one of the focus of the paper.</p> <p>Tables are not straiwforward. Take off lines in middle of them. Take off left and right lines as well.</p> <p>Discussion As far as I understand, motivation information was based on two questions without previous validation. If I corrected you should mention as limitation.</p>
--	---

REVIEWER	Yvonne Forsell Karolinska Institutet, Department of Public Health Sciences, Sweden
REVIEW RETURNED	22-Dec-2015

GENERAL COMMENTS	<p>The aim of the study was to characterize patterns of social support among endurance skiers who participated in a race, and to analyze the relationships between social support for exercise, health behaviors and self-reported health status.</p> <p>The non-participation rate was very high (77 %). Is there any information available on the non-participants?</p> <p>The scale that was used to evaluate social support - has that been used in previous studies? Something about this would be good to have in the introduction.</p> <p>Strange that there were persons (5.84%) who reported no leisure time physical activity, is this really true?</p> <p>Self-reported health was very good, this is not surprising since the race they participated in was long and Nordic skiing requires good fitness. Those who reported problems with depression/low mood had lower levels of social support, which is not surprising. It might be state-dependent but also due to that low social support is a risk factor for depression.</p> <p>It would be interesting to have a comparison group of exercisers or to compare with previous studies in other exercise groups. It is stated in the introduction that studies like this have never been performed in Nordic skiers, but have they been performed in other groups?</p> <p>Healthy behavior; why did you use the cutoff once a day- according to recommendations this is very low. Do you have an explanation for the relationship with social support?</p> <p>Concerning tables: Table 1: Numbers are missing, the number of participants should t least be reported in the headline. % is written in to many places per row, once is enough. Table 2- why have the number of the questions in the table? Table 3- you adjusted for marriage- does that include living with partner?</p>
-------------------------	--

REVIEWER	Frederico Diniz Lima Federal University of Santa Maria - Brazil
REVIEW RETURNED	31-Dec-2015

GENERAL COMMENTS	Physical activity is essential for everyone. It is a public health case and everyone should practice.
-------------------------	---

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: Dr. Lisa Marie Warner

Institution and Country: Freie Universität Berlin, Health Psychology, Berlin, Germany Please state any competing interests or state 'None declared': none declared

The manuscript "Social Support for Exercise and its Relationship to Health Behaviors and Health Status among Endurance Nordic Skiers" is a cross-sectional analysis of the association of social support for exercise from family and friends with the outcomes exercise, other health behaviors and health status among Nordic Skiers in the North American general population. The descriptive analyses could be interesting for the domain for sports and exercise medicine. In its current form, this study does, however, not yet advance scientific knowledge much: That exercise specific social support is associated with exercise on a cross-sectional level was well known before. The study does not test, however, not test any theoretical assumptions or innovative constructs. Much more interesting questions would be for example, which mechanisms play a role to translate social support into behavior or health, or which support sources matter most (family or friends)? The current version of the paper does therefore not yet allow drawing strong implications for theory development, future research or physical activity programs in the general population.

RESPONSE: We agree with Dr. Warner that there is some general awareness of the association between exercise specific social support and exercise, but we wanted to verify that this association exists among nordic skiers in the midwestern United States and we also wanted to document the health status of this group in an effort to provide more evidence that those who report being physically active in groups do indeed also show better outcomes when we consider general health indicators.

Abstract

„For every 5 minute increase in weekly self- reported exercise time we found an increase of 10 points in the social support score.“ – rather phrase these results the other way around, as it sounds as if exercise elicited support (again in discussion)

RESPONSE: Because this is a positive odds ratio, we have stated it in the conventional fashion which is that individuals with the outcome (5 minutes increase in exercise) had greater odds of having the exposure (more social support).

Introduction

There is not much previous literature cited and some is quite outdated.

"This study also analyzes the strength of the relationship between social support for exercise, health behaviors, and self-reported health status" - No mentioning of health status and other health behaviors other than nutrition and exercise in introduction. If associations of social support with any other outcome than exercise or nutrition should be analyzed, the introduction needs to be much more elaborated on these specific outcomes. There is a large body of literature on the effects general social support may have on health status directly, but the assessment of social support in this study is behavior specific, not general. Therefore the authors should rather consider mediation analyses from their behavior specific support measure to exercise to health status, if they want to determine to association of a behavior specific support measure with general health status. However, such mediation analyses would be limited by the cross-sectional nature of the data.

Studying the association between social support assessed specifically for exercise with the performance of any other health behavior does not fit. So please refrain from these cross-behavior analyses unless you cite strong theoretical background and elaborate on this in the introduction to make clear why such analyses would be justifiable.

RESPONSE: We appreciate Dr. Warner's point here, but we would point out that our study is descriptive only and we make no suggestion of causal relationships between these self-reported outcomes. To move towards causal associations as Dr. Warner is discussing, we would want to use actigraphy and physiologic indicators to draw any strong associations between social support, exercise, and health status.

Methods

"Health status and health behavior questions were modeled after the Behavioral Risk Factor Surveillance System (BRFSS) and questions commonly used in the National Health and Nutrition Examination Survey (NHANES). Health status questions explored how participants would rate their current health status, how they felt their health compared with others, and whether they had any chronic conditions relevant to sport participation. Health behavior questions explored topics such as nutrition, exercise habits, sleep patterns, smoking history, and alcohol use." - Please explain each measure in detail with references and example items in the text of the manuscript, not only by pasting the questionnaire into the Appendix. If any of these items were used in a version that was altered from the original, please state why and how it was adjusted to the needs of this study. Also information on validity and reliability found in previous studies for the measures used would be desirable. Without this information, the reader cannot understand most of the outcome measures. For example: How was the exercise total score created? The authors build a threshold of 150 min per week, the item however asks for the times, a person exercised for at least 15 minutes with specific intensity. If someone went Nordic skiing three times a week for 60 minutes, wouldn't that person have indicated only 3 times in the questionnaire? Would these three times been scored as 3 x 15 min instead of 3 x 60 min? And how was the intensity of physical activity taken into account?

RESPONSE: The threshold of 150 minutes per week is the current minimum exercise recommendation for adults in the United States (30 minutes per day, 5 days/week, Centers for Disease Control and Prevention). These limits were established in 2008 and form the basis for physical activity guidance in the U.S. Our question could have merely asked whether or not individuals met this threshold, but we wanted to establish a more detailed understanding of minutes of exercise for other purposes.

Results

How was the dose response association calculated? If it was merely calculated by transferring the 150 min cut-off criterion back to minutes according to the odd ration, it is probably highly inaccurate. Please rather calculate regressions with the continuous outcome (even though it is a shortcoming that it was categories into 15 min bouts in the beginning and not asked for exact minutes of each exercise session) and calculate a new dose response score.

RESPONSE: We dichotomized the continuous self-reported exercise time to those more than 150 minutes and those less than 150 minutes. We tested the dichotomized outcome and continuous outcome in the regression models. We clarified these in the manuscript.

Table 1 – ranges would also be interesting for some measures, for example age and BMI Discussion "So, on the one hand, the predominance of solitary training coupled with the determination to sign up for races regardless of social support suggests a high level of self-efficacy. On the other hand, the pattern of weekly exercise with others and the fact that skiers do sign up for races because of motivation derived from others suggests that any pre-existing self-efficacy may be reinforced by regular doses of exercise specific social support" – the authors conclude effects on self-efficacy, even though they did neither assess nor test effects on self-efficacy, or forgot to report them "Studies in middle aged and elderly citizen runners have previously documented elevated health status and increased healthy behaviors." – elevated as compared to whom?

RESPONSE: We have provided ranges for age and BMI. Otherwise we have used Mean and SD. The runners health studies compared individuals to the Swiss and U.S. population. See references 4 and

12.

“In general, for every 5 minute increase in weekly minutes of exercise reported, there was a 10 point increase in the self-reported social support score. This finding points to a strong link between physical activity levels and social connection” – is this a strong association? I doubt that it is easy to obtain so much more support that one would rate 10 more points on the social support scale. But if these 10 points only elicit 5 more minutes of exercise per week, I would categorize that as a small effect.

Maybe the calculation of an effect size would help the reader to categorize the size of the effect?

RESPONSE: We changed the word to “positive”.

“Actigraphy studies show that people report far more physical activity than they actually perform when measured with an accelerometer.” – needs a reference “Future studies could utilize a formal 24-hour dietary recall form, a weekly food diary, or an online program such as my fitness pal or “Lose It!” – not clear why specific maybe commercial apps are named and not relevant as the focus of this study was not to study diet “Patterns of social support for exercise in Endurance Nordic skiers reveal the importance of verbal processing and regular group exercise for the initiation and maintenance of a physically active lifestyle.” – Initiation and maintenance were not tested separately, so rather do not mention “While endurance athletes appear to have high levels of self-efficacy, they also appear to draw upon social support to bolster their motivation and skills and overcome barriers to better performance, especially support from family and friends.” – neither statement about self-efficacy nor the sources of social support can be derived from this study, as self-efficacy way not analyzed and there were only two sources of social support that were not compared to other possible sources such as trainers or acquaintances, physicians etc

RESPONSE: We reviewed our conclusions to remove any statements about causality. This is a descriptive hypothesis generating study that was not designed for analytic purposes as you describe.

We also added the reference.

Reviewer: 2

Reviewer Name: Aldair J Oliveira

The authors present an interesting paper to characterize patterns of social support among endurance athletes . Some suggestions for improving the document are provided below.

Methods

The sub-section "Study population", it is not clear the eligible population for the study.

You should include the percentage of refuse.

RESPONSE: Reporting the response rate is adequate.

Did you provide participant consent? Mention in the paper. Ethics approval should be mention as well.

RESPONSE: The survey was voluntary and ethics approval was obtained. We will add these to the paper in the Methods section.

Provide validation information about Social support scale used.

RESPONSE: This was adapted from Dr. James Sallis, citations are provided.

You should mention how motivation was measured.

RESPONSE: We used the Likert scale responses to four questions and we have characterized this in the results section.

Results

You create a subsection "motivation" but you did not mention motivation as one of the focus of the paper.

RESPONSE: We removed the subsection, but still discussed motivation since we asked about this area.

Tables are not strait forward. Take off lines in middle of them. Take off left and right lines as well.

RESPONSE: We changed the Tables and deleted lines in Table 1 and 2.

Discussion

As far as I understand, motivation information was based on two questions without previous validation. If I corrected you should mention as limitation.

RESPONSE: We have included this as a limitation of our study.

Reviewer: 3

Reviewer Name: Yvonne Forsell

Institution and Country: Karolinska Institutet, Department of Public Health Sciences, Sweden Please state any competing interests or state 'None declared': None declared

The aim of the study was to characterize patterns of social support among endurance skiers who participated in a race, and to analyze the relationships between social support for exercise, health behaviors and self-reported health status.

The non-participation rate was very high (77 %). Is there any information available on the non-participants?

RESPONSE: To obtain participation from 5500 volunteers was great for us. The annual race participation is around 10,000 people. The additional names were from those who may have participated many years ago or those who only participated once. Also, some participants may not use email, the survey may have been sent to spam folders, or individuals may have more than one email that they use.

The scale that was used to evaluate social support - has that been used in previous studies? Something about this would be good to have in the introduction.

RESPONSE: We have added a sentence in the introduction and added the word validated to the methods section.

Strange that there were persons (5.84%) who reported no leisure time physical activity, is this really true?

RESPONSE: A small number of respondents may no longer be active skiers or physically active and we feel this represents valuable data about this population. The survey was sent to anyone who ever participated in an event and it may be that their life has now changed significantly and they are no longer active for one reason or another.

Self-reported health was very good, this is not surprising since the race they participated in was long and Nordic skiing requires good fitness. Those who reported problems with depression/low mood had lower levels of social support, which is not surprising. It might be state-dependent but also due to that low social support is a risk factor for depression.

RESPONSE: This is an interesting question which we would like to pursue in future studies with this population.

It would be interesting to have a comparison group of exercisers or to compare with previous studies in other exercise groups. It is stated in the introduction that studies like this have never been performed in Nordic skiers, but have they been performed in other groups?

RESPONSE: There are numerous studies of nordic skiers in Scandinavia and there are studies of runners in the United States, but most focus on cardiovascular events (arrhythmia) cardiovascular health, or race performance.

Healthy behavior; why did you use the cutoff once a day- according to recommendations this is very low. Do you have an explanation for the relationship with social support?

RESPONSE: This is how fruit and vegetable consumption is reported in most U.S. statistics. We do not speculate about an association, but only note the co-occurrence of these parameters.

Concerning tables: Table 1: Numbers are missing, the number of participants should at least be reported in the headline. % is written in to many places per row, once is enough.

Table 2- why have the number of the questions in the table?

RESPONSE: We made the appropriate changes in the manuscript.

Table 3- you adjusted for marriage- does that include living with partner?

RESPONSE: We dichotomized marriage into currently married versus not married. Living with partner is treated as not married. We clarified this in Table 3.

Reviewer: 4

Reviewer Name: Frederico Diniz Lima

Institution and Country: Federal University of Santa Maria - Brazil Please state any competing interests or state 'None declared': None declared.
 Please leave your comments for the authors below
 Physical activity is essential for everyone. It is a public health case and everyone should practice.
 RESPONSE: We thank the reviewer for the comments.

VERSION 2 – REVIEW

REVIEWER	Aldair J Oliveira Rural Federal University of Rio de Janeiro, Brazil
REVIEW RETURNED	06-Apr-2016

GENERAL COMMENTS	The paper is ok for me.
-------------------------	-------------------------

REVIEWER	Yvonne Forsell Karolinska Institutet, Department of Public health sciences, Sweden
REVIEW RETURNED	11-Apr-2016

GENERAL COMMENTS	<p>Concerning my questions</p> <p>High nonresponse rate: the authors have answered the question and stated that this is a limitation.</p> <p>Social support scale: has some other study used the scale? In the discussion it is stated that exercise-specific social support increase adherence. The used scale- does it measure exercise specific social support (I guess it does)? The this should be stated in the method section.</p> <p>Depression/low mood: The authors answers that this is an interesting question. It is not a question it is a statement - several studies have explored this. A sentence in the discussion could be added.</p> <p>Concerning comparison groups: The authors answers that most have been focused on CVD- have no study looked at social support and health behaviour? '</p>
-------------------------	---

VERSION 2 – AUTHOR RESPONSE

Reviewer: 2
 Reviewer Name: Aldair J Oliveira
 Institution and Country: Rural Federal University of Rio de Janeiro, Brazil
 Competing Interests: None declared

The paper is ok for me.
 Author Responses: Thank you.

Reviewer: 3
 Reviewer Name: Yvonne Forsell
 Institution and Country: Karolinska Institutet, Department of Public health sciences, Sweden
 Competing Interests: None declared

Concerning my questions
 High nonresponse rate: the authors have answered the question and stated that this is a limitation.
 Author Response: Thank you.

Social support scale: has some other study used the scale? In the discussion it is stated that exercise-specific social support increase adherence. The used scale- does it measure exercise specific social support (I guess it does)? The this should be stated in the method section.

Author Response: Dr. Sallis has a number of other studies that use this scale for evaluation of social support. We have cited the primary study he used to validate the scale (Citation #6) and we have noted that his survey was validated in our methods section.

Depression/low mood: The authors answers that this is an interesting question. It is not a question it is a statement - several studies have explored this. A sentence in the discussion could be added.

Author response: Thank you. We have added a sentence in the last paragraph of the discussion section to highlight this excellent point about depression/low mood.

Concerning comparison groups: The authors answers that most have been focused on CVD- have no study looked at social support and health behaviour?

Author response: Thank you. We are happy to review such studies if Dr. Forsell has them on hand. To be sure, there are other studies that look at the question of social support and health behaviors, but the demographics, data types, study design, and study goals are so different as to make comparisons with our study very problematic. Besides those we mention in our paper, we are unaware of any published studies or meta-analyses that attempt a health status and health behavior profile among citizen athletes.