PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form ([see an example](#)) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

This paper was submitted to the ADC but declined for publication following peer review. The authors addressed the reviewers' comments and submitted the revised paper to BMJ Open where it was re-reviewed and accepted.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Inattention and hyperactivity in children at risk of obesity: A community cross-sectional study
AUTHORS	McWilliams, Lorna; Sayal, Kapil; Glazebrook, Cris

VERSION 1 - REVIEW

REVIEWER	Poulton, Alison University of Sydney, Sydney Medical School Nepean
REVIEW RETURNED	10-Dec-2012

GENERAL COMMENTS	Thank you for the opportunity to review this interesting paper. It addresses an important topic. A strength of this paper is the use of non-parametric statistics. However, this paper needs major revision, including reanalysis of the data. There also needs to be much more specific information about the methodology. The findings as they stand are given with insufficient detail to allow for interpretation. When rewriting the discussion it is important to be precise and avoid vagueness and ambiguity. The hypotheses need to be clearly stated. This is usually in the last paragraph of the introduction, after justifying the need for further research. The hypotheses might be along the lines of 1. Investigating the specified (listed) risk factors for obesity investigated in this study and 2. The postulated association with ADHD, as investigated using the SDQ. Could the authors please address the following specific points? 1. Introduction p4 line 14-16, identifying known childhood risk factors for adult obesity does not necessarily mean that intervention to address these will reduce the risk of subsequent obesity in adulthood. If the authors believe that intervention makes a difference, they should provide a reference. Otherwise they should be more circumspect. This assumption is implied again on p11 line 21-23. 2. When were the data collected? 3. The STAK study is intrinsic to the methodology of this study and therefore needs to be described in detail. I would like to see a figure giving the following information • Total number in population eligible for screening • Number screened (=2479 – how were these selected for screening?)

• Number eligible after screening for the present study
• Number consented for this study
• Number with full information and therefore included in the analysis
Accompanying text should state the selection criteria for screening in the participating schools (eg date of birth – to - ? Attending year - ?)

4. The STAK procedures need to be described in detail.
CSAPPA – describe as on page 6-7 but add the cut off for inclusion. Barriers to exercise - child self-reported asthma, teacher rated overweight (how was this done and validated?). Were both of these necessary (implied p5 line 96) but only 13% had asthma (p8 line 18)

5. In the methods, the cut-offs for all the scales need to be specified, together with their justification, eg the SDQ was validated on such and such population (include number) and the cut-off for ADHD was set at --- which identified --- percentage of children aged --- as being above the threshold for further diagnostic investigation. (ref).

6. Children with high levels of customary physical activity were excluded (P5 line 58). What is the reason for exclusion and how were these children identified? Also please justify using overweight as an inclusion factor and as a variable.

7. Please state whether height was measured without shoes – this is unclear. Also state the precision of measurements of height and weight.

8. Although it is unclear, it appears that many of the variables that are scores and could be therefore be analysed as continuous variables in the regression, are analysed as categorical data (ie above or below a cut-off not clearly specified). This loses precision and might fail to identify significant associations.

9. In the analysis it is important to subdivide the SDQ scores for hyperactivity/inattention into hyperactivity and inattention. This is critical because obesity might be associated with high inattention and low hyperactivity scores, with these balancing out if the total hyperactivity/inattention score is used. The analysis as it now stands means that important associations may be being overlooked. This might mean going back to the responses to the individual questions on the SDQ and classifying them into hyperactivity or inattention.

10. Are the CSAPPA and PAQ highly correlated? If so, they should be analysed in separate logistic regression analyses.

11. In reporting the results on p9 line 13, the non-significant risk factors should be listed. On p9 line 44 does 'more males' mean more in number or proportionally more? P8 line 46 sedentary activity 'differed between those with pervasive hyperactivity and those without'. Which way did it differ? Please avoid reporting non significant results (p9 line 51).

12. In Tables 1 and 3 that refer to scores on rating scales, some reference information giving normal population mean score or cut-off for likely pathology should be given either in the table or in the legend. This applies even though this information has to be included in the text, because the tables should be 'stand alone'.

13. The level of precision of reporting the variables in Tables 1 and 3 is erratic and imprecise. For example a median age of 9.0 and

| | interquartile range of 9-10 seems highly unlikely. The interquartile ranges should all be reported to the same level of precision as the median. I suggest reporting age, weight, height and BMI to 1 decimal place. BMI percentile should be to nearest percentile. Rating scale scores should not have decimal places. For p-values the journal may have specifications for decimal places. Otherwise I suggest 2 decimal places unless p<0.01. The test use should be stated in the table or table legend.

14. Table 2 – please add p-values (also add p-value in text p8 line 40). In the caption the term 'increased risk' is imprecise. Does this mean risk factor significant at p<0.05? |

– The manuscript received a second review at the Archives of Disease in Childhood but the reviewer did not give permission for their comments to be published

VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Comments to the Author

Thank you for the opportunity to review this interesting paper. It addresses an important topic. A strength of this paper is the use of non-parametric statistics. However, this paper needs major revision, including reanalysis of the data. There also needs to be much more specific information about the methodology. The findings as they stand are given with insufficient detail to allow for interpretation. When rewriting the discussion it is important to be precise and avoid vagueness and ambiguity.

The hypotheses need to be clearly stated. This is usually in the last paragraph of the introduction, after justifying the need for further research. The hypotheses might be along the lines of 1. Investigating the specified (listed) risk factors for obesity investigated in this study and 2. The postulated association with ADHD, as investigated using the SDQ.

This has now been included in the introduction pg. 6 lines 34-38.

Could the authors please address the following specific points?

1. **Introduction p4 line 14-16, identifying known childhood risk factors for adult obesity does not necessarily mean that intervention to address these will reduce the risk of subsequent obesity in adulthood. If the authors believe that intervention makes a difference, they should provide a reference. Otherwise they should be more circumspect. This assumption is implied again on p11 line 21-23.**

Studies have been referenced which have shown that childhood risk factors are associated with or predict adult obesity pg. 5 lines 12-15.

2. When were the data collected?

This information has now been included in pg. 6 lines 48-49 of methods

3. The STAK study is intrinsic to the methodology of this study and therefore needs to be described in detail.

I would like to see a figure giving the following information

• **Total number in population eligible for screening**

• **Number screened (=2479 – how were these selected for screening?)**

• **Number eligible after screening for the present study**

• **Number consented for this study**

• **Number with full information and therefore included in the analysis**

A figure has now been included on pg. 7 lines 16-27.

Accompanying text should state the selection criteria for screening in the participating schools (eg date of birth – to - ? Attending year - ?)

Selection criteria information for screening has been included in the methods/screening section, pg. 6 lines 46-55 and pg. 7-8.

4. The STAK procedures need to be described in detail.

CSAPPA – describe as on page 6-7 but add the cut off for inclusion.

Barriers to exercise - child self-reported asthma, teacher rated overweight (how was this done and validated?). Were both of these necessary (implied p5 line 96) but only 13% had asthma (p8 line 18)

Further detail has now been included in the methodology (pg. 7-8) including the CSAPPA cut-off for study inclusion pg. 7 line 48.

5. In the methods, the cut-offs for all the scales need to be specified, together with their justification, eg the SDQ was validated on such and such population (include number) and the cut-off for ADHD was set at --- which identified --- percentage of children aged --- as being

above the threshold for further diagnostic investigation. (ref).

Additional information has now been provided pg. 8 lines 38-40.

6.   Children with high levels of customary physical activity were excluded (P5 line 58). What is the reason for exclusion and how were these children identified?

This has now been explained in the method pg. 7 lines 10-15 and in screening information pg. 8 lines 15-17.

Also please justify using overweight as an inclusion factor and as a variable.

This has now been made clearer in aims/hypotheses pg. 6 lines 30-38.

7.   Please state whether height was measured without shoes – this is unclear. Also state the precision of measurements of height and weight.

This information has now been included in methods pg. 9 lines 8-13.

8.   Although it is unclear, it appears that many of the variables that are scores and could be therefore be analysed as continuous variables in the regression, are analysed as categorical data (ie above or below a cut-off not clearly specified). This loses precision and might fail to identify significant associations.

We were particularly interested in children with higher levels of inattention/hyperactivity scores and so this variable has now been treated as categorical throughout to make it clearer (see statistical analyses pg. 10 lines 18-28 and results pg. 11 lines 46-53 and pg. 12 lines 7-25.

9.   In the analysis it is important to subdivide the SDQ scores for hyperactivity/inattention into hyperactivity and inattention. This is critical because obesity might be associated with high inattention and low hyperactivity scores, with these balancing out if the total hyperactivity/inattention score is used. The analysis as it now stands means that important associations may be being overlooked. This might mean going back to the responses to the individual questions on the SDQ and classifying them into hyperactivity or inattention.

The hyperactivity/inattention subscale of the SDQ contains only 5 items realting to ADHD symptoms

making it too imprecise to assess the different components separately. This has now been addressed as a limitation in the discussion pg. 14 line 50-54.

10.   Are the CSAPPA and PAQ highly correlated? If so, they should be analysed in separate logistic regression analyses.

The CSAPPA and PAQ are not highly correlated (No r value exceeds .23)

11.   In reporting the results on p9 line 13, the non-significant risk factors should be listed.

This has now been included pg. 12 lines 20-24.

On p9 line 44 does 'more males' mean more in number or proportionally more?

More detail has now been included pg. 13 lines 21-23.

P8 line 46 sedentary activity 'differed between those with pervasive hyperactivity and those without'. Which way did it differ? Sedentary activity differed whereby

This has now been made clearer pg. 13 lines 25-28.

Please avoid reporting non significant results (p9 line 51).

This has now been removed from the results section.

12.   In Tables 1 and 3 that refer to scores on rating scales, some reference information giving normal population mean score or cut-off for likely pathology should be given either in the table or in the legend. This applies even though this information has to be included in the text, because the tables should be 'stand alone'.

Cut-off for likely pathology has been included in table 1 and 4 (additional table has been included which is now table 3) pg. 22 and 25.

13.   The level of precision of reporting the variables in Tables 1 and 3 is erratic and imprecise. For example a median age of 9.0 and interquartile range of 9-10 seems highly

unlikely. The interquartile ranges should all be reported to the same level of precision as the median. I suggest reporting age, weight, height and BMI to 1 decimal place. BMI percentile should be to nearest percentile. Rating scale scores should not have decimal places. For p-values the journal may have specifications for decimal places. Otherwise I suggest 2 decimal places unless p<0.01. The test use should be stated in the table or table legend.

The tables have been updated (table 3 is now table 4, pg. 25). The median and interquartile range for age has been amended. One decimal place has been used for variables and BMI has been amended to nearest centile. P values have been amended as suggested and test use has been included.

14.   Table 2 – please add p-values (also add p-value in text p8 line 40). In the caption the term 'increased risk' is imprecise. Does this mean risk factor significant at p<0.05?

P values have been included in the table pg. 23. The 'increased risk' refers to p <0.05.

VERSION 2 – REVIEW

REVIEWER	Dr Alison Poulton Senior Lecturer Sydney Medical School Nepean University of Sydney New South Wales Australia I have no competing interests
REVIEW RETURNED	19-Mar-2013

| GENERAL COMMENTS | This paper is much improved. There are still some issues of clarity. Figure 1 is useful, however, n=424 recruited should be given as 17% ie percentage of those screened.
Page 8 the authors used 4 of the 5 SDQ subscales - the total score presumably incorporates all 5, not just the last 4.
The statistical analysis (page 9) refers to UK normative data. That this includes 4073 boys and 4135 girls should be specified at this point so that when these numbers appear in table 2 their origin is clear. Are these teacher ratings on children of the same age range as the study cohort?
Table 1 still needs the precision of the measurements made consistent. It is apparent that apart from weight, all measurements are in whole numbers. Therefore for these measures .0 should not be there.
For table 2 the title should be correctly positioned. The numbers that are percentages should be followed by % in all cases.
On page 11, reference to 'whole sample' and 'groups' are ambiguous - these should be 'boys and girls combined' and 'subjects versus controls'. Similarly p12 line 43. Mdn should be given in full at first use. The final paragraph p11 is difficult to read - it should say something like: boys and girls with abnormal teacher rating scales for hyperactivity/inattention reported higher levels of sedentary |

activity (Mdn, p= and Mdn p= respectively). Girls with abnormal teacher rating scales for hyperactivity/inattention also reported higher levels of sedentary activity.

Table 3 boys CSAPPA low has a median outside the interquartile range.

Page 12 line 19, please add p-value: ...sedentary activities remained significant (p=?).

Discussion p12 line 56 add 'This correlation remained significant after adjusting for confounders.' Then lines 7-12 on page 13 can be removed.

The discussion comparing with other studies (p13-14) remains very disorganised and difficult to read. I suggest structuring as 'We found....which is similar (or different) to ref X which found...' That way each reference is immediately related to the present study.

A further limitation is that exercise was reported, not measured and was therefore subjective.

The authors should explain why the same individuals can have higher hyperactivity and higher sedentary activity.

REVIEWER	Professor Philip Asherson
	Kings College London, UK
REVIEW RETURNED	02-Apr-2013

RESULTS & CONCLUSIONS	The links between exercise and ADHD are of considerable interest. Here the main question being addressed is the risk of developing risk factors for later obesity in children aged 9-11 years of age. The findings are statistically significant, although the effect size is small. A related question but important question, not addressed in this paper, is whether exercise is associated with a reduction in the symptoms of ADHD. The authors do however list all the major limitations of this paper.
	39% obese is a high figure – however, how much higher is this than the background level in the general population?
	Overall the risk identified by the authors is small – 1.05 – 1.2. Furthermore, the increase in sedentary behaviour linked to ADHD symptoms could be offset by increases in physical activity. Hence it is not clear what the main findings indicate – does the presence of physical activity offset any potential problems related to increased sedentary behaviour?
	In the discussion, comparison with rates of pervasive hyperactivity in other studies should include some figures – how much more is seen than in the other studies?
	Perhaps the authors could indicate more clearly what future research is required. For example it could be that more children with ADHD are in the high exercise group that sampled in this study? The other question is whether exercise and reduced sedentary behaviour not only decreased risk for obesity, but could this also reduce the severity of ADHD?

VERSION 2 – AUTHOR RESPONSE

Reviewer: Dr Alison Poulton
Senior Lecturer
Sydney Medical School Nepean
University of Sydney
New South Wales
Australia

I have no competing interests

This paper is much improved. There are still some issues of clarity.
2. Figure 1 is useful, however, n=424 recruited should be given as 17% ie percentage of those screened.

a. The figure has been amended (pg. 7, line 24)

3. Page 8 the authors used 4 of the 5 SDQ subscales - the total score presumably incorporates all 5, not just the last 4.

a. The SDQ total score includes the four SDQ subscales where the prosocial subscale is not included. Please see http://www.sdqinfo.org/py/sdqinfo/c0.py

4. The statistical analysis (page 9) refers to UK normative data. That this includes 4073 boys and 4135 girls should be specified at this point so that when these numbers appear in table 2 their origin is clear. Are these teacher ratings on children of the same age range as the study cohort?

a. This information has now been included in the analyses section (pg. 10, line 16)

5. Table 1 still needs the precision of the measurements made consistent. It is apparent that apart from weight, all measurements are in whole numbers. Therefore for these measures .0 should not be there.

a. Table 1 and subsequent tables have been amended in this way to ensure precision (pg. 20-21)

6. For table 2 the title should be correctly positioned. The numbers that are percentages should be followed by % in all cases.

a. The title has been positioned with % included for subscale numbers (pg. 21)

7. On page 11, reference to 'whole sample' and 'groups' are ambiguous - these should be 'boys and girls combined' and 'subjects versus controls'. Similarly p12 line 43.
a. We felt that using subjects/controls may be confusing and so have termed comparisons between abnormal teacher-rated scores as high hyperactivity/inattention and low hyperactivity/inattention. Similar changes have been made for the pervasive hyperactivity and impairment comparisons (pg. 10, lines 24 and results pg 12, lines 3, 12, 45-47 and pg. 13 paragraph 2)

8. Mdn should be given in full at first use.

a. Median has been given in full on pg. 12 line 6

9. The final paragraph p11 is difficult to read - it should say something like: boys and girls with abnormal teacher rating scales for hyperactivity/inattention reported higher levels of sedentary activity

(Mdn, p= and Mdn p= respectively). Girls with abnormal teacher rating scales for hyperactivity/inattention also reported higher levels of sedentary activity.

a. This has now been amended on pg.12 lines paragraph 2

10. Table 3 boys CSAPPA low has a median outside the interquartile range.

a. This has now been amended (pg. 22)

11. Page 12 line 19, please add p-value: ...sedentary activities remained significant (p=?).

a. The p-value has now been included on pg. 13 line 3

12. Discussion p12 line 56 add 'This correlation remained significant after adjusting for confounders.' Then lines 7-12 on page 13 can be removed.

a. This change has been made and can be found on pg. 13 line 44

13. The discussion comparing with other studies (p13-14) remains very disorganised and difficult to read. I suggest structuring as 'We found....which is similar (or different) to ref X which found...' That way each reference is immediately related to the present study.

a. Please see pg. 13 lines 38-60 and pg 14-15 for changes to the discussion, we hope it is now easier to read

14. A further limitation is that exercise was reported, not measured and was therefore subjective.

a. We agree and this limitation was addressed in the discussion pg. 16 lines 14-21

15. The authors should explain why the same individuals can have higher hyperactivity and higher sedentary activity.
a. An attempt to explain this has been included in the discussion pg. 14

Reviewer: Professor Philip Asherson
Kings College London, UK

The links between exercise and ADHD are of considerable interest. Here the main question being addressed is the risk of developing risk factors for later obesity in children aged 9-11 years of age. The findings are statistically significant, although the effect size is small.

16. A related question but important question, not addressed in this paper, is whether exercise is associated with a reduction in the symptoms of ADHD. The authors do however list all the major limitations of this paper.

a. This has been addressed as an area considered for future research within the discussion pg. 17 lines 5-12

17. 39% obese is a high figure – however, how much higher is this than the background level in the general population?

a. Some information and implications of this has been included in the discussion pg. 15 31-40

18. Overall the risk identified by the authors is small – 1.05 – 1.2. Furthermore, the increase in sedentary behaviour linked to ADHD symptoms could be offset by increases in physical activity. Hence it is not clear what the main findings indicate – does the presence of physical activity offset any potential problems related to increased sedentary behaviour?

a. Relating to the previous comment, we have attempted to address this query in the discussion pg. 15 lines 31-40

19. In the discussion, comparison with rates of pervasive hyperactivity in other studies should include some figures – how much more is seen than in the other studies?

a. We have now tried to make this clearer throughout the measures (pg. 8), analyses (pg. 10) and results sections. Figures have now been included based on previous findings in the discussion pg. 13 lines 5-12

20. Perhaps the authors could indicate more clearly what future research is required. For example it could be that more children with ADHD are in the high exercise group that sampled in this study? The other question is whether exercise and reduced sedentary behaviour not only decreased risk for obesity, but could this also reduce the severity of ADHD?

a. Future research directions have been included in the discussion pg. 15 (lines 5-10) and 17 (lines 5-12)