

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	The impact of school closures on the health and well-being of primary school children in Wales UK; a routine data linkage study using the HAPPEN survey (2018-2020).
AUTHORS	James, M; Marchant, Emily; Defeyter, Margaret; Woodside, Jayne; Brophy, Sinead

VERSION 1 – REVIEW

REVIEWER	Raviv, Tali Northwestern University Feinberg School of Medicine, Ann & Robert H. Lurie Children's Hospital
REVIEW RETURNED	27-May-2021

GENERAL COMMENTS	<p>This paper represents an important contribution to the emerging literature on the association between the COVID-19 pandemic and resulting school closure on the physical and emotional health of young people. The inclusion of child-reported data and the ability to compare the time period following school closure to similar time periods in previous years are significant strengths of the study. However, the lack of information regarding demographic characteristics of the three cohorts of data and the degree of independence of the participants introduce a significant limitation to the interpretation of the findings. Additional clarity about the measures used and the coding of items is required. Also, the ability to draw conclusions regarding the overall sample is unclear given potentially significant differences between the FSM and non-FSM participants, raising the possibility that all analyses should examine these groups separately. The results are interesting and, at times, challenge existing assumptions. Following are suggestions to strengthen the paper.</p> <p>Abstract:</p> <ul style="list-style-type: none">• The use of the word “impact” implies causality. I recommend changing this in the abstract (and throughout).• Recommend spelling out the HAPPEN acronym in the abstract and again when it first appears in the manuscript• It is unclear how to interpret the percentages in the results. From looking at Table 3, it appears that in the statement, “...children on FSM ate less fruits and vegetable (21% (95% CI (5.7% to 37%))...” 21% refers to the differences in the percentage of the those with FSM who ate the appropriate amount of fruits and
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vegetables as compared with those without FSM. This should be stated more clearly.

- There is a typo in the “Conclusions” section of the Abstract

Introduction:

While there has been limited empirical research on the impact of school closure on children’s health and mental health outcomes, there are some international studies and more are being published all the time. I would encourage the authors to include empirical data on the association between school closure and children’s health and mental health outcomes, rather than solely reviewing commentary articles that theorize as to potential disruptions without corresponding data. This would help contextualize the findings of this paper and identify areas of consistency and inconsistency of findings with extant literature.

It is also important to note that, while school closures are a primary change in the lives of students and families, other changes related to both the stress of the COVID-19 pandemic and other environmental changes related to social distancing may also be driving the changes that are seen in this study.

Methods:

Additional information on the measures is required. Specifically, without referencing supplemental material, it is unclear whether measures were continuous or dichotomous. Further, it is unclear how (and why) continuous variables such as the wellbeing items (rated on a 1-10 scale) were converted to percentages. It is also unclear how other variables were coded to create percentages.

It would be helpful to briefly summarize differences between the original HAPPEN survey and the HAPPEN at Home survey for the reader.

Please note whether or not parental consent was needed and obtained.

Results:

A potential confound of the data is the independence of the 2018, 2019, and 2020 surveys. It is possible that a subset of students responded at two or all three timepoints, while other data were completely independent. If it is not possible to identify the independence, please address this and include as a limitation.

It would be helpful to add to Table 1 the percentages of the sample in receipt of FSM for the 2018, 2019, and 2020 samples.

Is it possible to add any additional information to Table 1 to help understand the similarities and differences among the three samples? For example, a description of the number of schools

	<p>represented in the 2018, 2019, and 2020 samples, and the degree of overlap of schools from these three years? A serious potential confound to the results is that it is unclear to what degree the samples were similar or different, especially in terms of affluence/socioeconomic status, neighborhood and school type/quality, and other factors that could influence the differences between the findings for these three cohorts. This makes it particularly difficult to interpret changes from 2018-2019, since the sample from 2018 was recruited from a different area within Wales. Therefore, the differences from 2018 to 2019 are difficult to interpret and it's unclear whether they can truly be used as a baseline.</p> <p>Please include statistical significance testing for the data provided in Table 1.</p> <p>In addition to improvements in sleep and physical activity, there is a significant increase in those reported to be sedentary in 2020 as compared to 2019. Please note this in the results. This also goes back to the question about which measure (item) you are using to measure sedentary behavior. If you are using 2 or more hours of TV/video games, then perhaps it is more accurately labeled as "screen time" or something of that sort rather than sedentary behavior.</p> <p>On page 8, lines 3-5, the statement about teeth brushing uses the phrase, "more significant." This is confusing as it sounds like it may be referring to statistical significance. Was statistical testing conducted comparing 2018-2019 changes to 2019-2020 changes? Please clarify.</p> <p>Throughout the results, please include data when discussing results (e.g., page 12, lines 13-16; "Despite being away from the school environment, children report feeling happier with school.")</p> <p>Table 3 includes the difference between 2019 and 2020 data for participants with FSM separately from participants without FSM. This is an interesting comparison, and it worth noting in the results section that the vast majority of significant differences (improvements) in functioning were only noted within the non-FSM group—indicating that the findings for the overall sample reported were driven by participants not eligible for FSM.</p> <p>The results section describes within-timepoint differences between the FSM and Non-FSM group during school closures. One statistically significant finding was discussed (for daily physical activity). Were statistical tests conducted to examine the significance of differences on all items? If so, please report these in a table. If not, I recommend adding those. In addition, if many/most of those differences are significant (as it appears they may be from visual examination of the data), it perhaps is misleading to report changes in Cohort 3 overall. It perhaps would be</p>
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	<p>more accurate to describe changes over time for FSM and non-FSM participants separately for all three cohorts.</p> <p>Discussion:</p> <p>The most significant limitation of these findings, in my opinion, is the fact that the composition of the three cohorts is unclear. It is possible that differences between the three cohorts are due to sample characteristics in addition to COVID-19/school closure. Please add this to the limitation section.</p> <p>Related to the point discussed above, please discuss why there would be an increase in feeling safe in your area in 2020 as compared to 2019. This seems unlikely to change based on the factors related to COVID-19; therefore, it raises the possibility that there may be sample differences that could account for this.</p> <p>It is also of critical importance to consider whether the opening statement of the discussion and interpretation of the results as a whole is accurate. Is it true that improvements were seen “when considering the group as a whole?” Looking at the data in Table 3 seems to indicate that nearly all the significant changes from 2019 to 2020 occurred within the non-FSM group, which seems to have driven the overall results. Reporting the results for the overall sample minimizes the health disparities that existed prior to COVID-19 and during COVID-19. This should be further emphasized in the discussion.</p> <p>In the discussion, you suggest that perhaps the increase in screen time was due to participating in educational programming via screens. However, the question about screentime asks about TV, video games, and using the internet. It is unclear if children would also be counting use of screens for educational purposes in this category. Therefore, many of the conjectures in this section may not be accurate. In particular, the statement that “This suggests that non-FSM children were more engaged with learning tasks and therefore had perceived higher competence and confidence with learning and development” goes far beyond the data available and is misleading. Relatedly, and as mentioned earlier in this review, it is more accurate to use the term “screen time” rather than “sedentary behavior” for this item.</p>
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REVIEWER	Lee, Shawna University of Michigan, School of Social Work
REVIEW RETURNED	07-Jun-2021

GENERAL COMMENTS	<p>Thank you for the opportunity to review this study on children during COVID-19. This is an interesting study that is very timely. I agree that this is an important study that contributes to a significant gap in knowledge regarding the experiences of school-aged children. The true extent of impact of the lockdown and school closures on children is very poorly understood. In particular, there are very few studies that have utilized self-reported data from children. In this regard, this study is particularly</p>
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	<p>informative. Overall, I think this is one of the most comprehensive and rigorous study I have seen on school-aged children's experiences during COVID-19.</p> <p>Introduction:</p> <ol style="list-style-type: none"> 1. The introduction is appropriate for the research question. 2. In the first paragraph of the introduction, it may be helpful to clarify the extent of school closures in Wales during the survey time period. 3. In the study aims, it may be helpful to further clarify in the introduction and abstract that this particular study focuses on the very early initial school closure period in Wales. Approximately how many weeks or months had elapsed since the WHO declared the coronavirus pandemic? <p>Data analysis:</p> <ol style="list-style-type: none"> 4. The sample size is large. 5. The use of pre-COVID and during-COVID is particularly informative. 6. The analysis approach is appropriate to answer the research question. 7. I think it would strengthen the study to say a bit more about how representative this sample of children is compared to the population in Wales more generally. <p>Results:</p> <ol style="list-style-type: none"> 8. Overall the results of this study are interesting and are encouraging. It may be that children were actually happier in some domains during the school closures than many researchers have thought, although they also felt less efficacy in school-related matters and experienced some declines in physical health. 9. It may be worthwhile to reiterate that this study was conducted early in the lockdown period. As school closures persisted, the effects of the pandemic on mental health and wellbeing may worsen.
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VERSION 1 – AUTHOR RESPONSE

Reviewer #1

Abstract:

- The use of the word “impact” implies causality. I recommend changing this in the abstract (and throughout).

Thank you for highlighting this. We have now amended throughout the manuscript.

- Recommend spelling out the HAPPEN acronym in the abstract and again when it first appears in the manuscript

We have now amended for this clarity:

“This study aimed to explore the effect of school closures on children’s health by comparing health and wellbeing outcomes collected during school closures (April – June 2020) via HAPPEN (The Health and Attainment of Pupils in a Primary Education Network) with the ‘HAPPEN At Home’ survey with data from the same period in 2019 and 2018 via the HAPPEN survey.”

“HAPPEN (Health and Attainment of Pupils in a Primary Education Network) Wales was established at Swansea University in 2015 following research with headteachers who advocated for collaboration and a joined up approach to prioritising health and wellbeing within the school setting¹⁶.”

- It is unclear how to interpret the percentages in the results. From looking at Table 3, it appears that in the statement, “...children on FSM ate less fruits and vegetable (21% (95% CI (5.7% to 37%))...” 21% refers to the differences in the percentage of the those with FSM who ate the appropriate amount of fruits and vegetables as compared with those without FSM. This should be stated more clearly.

This has been reworded to make it clearer what is meant here:

“However, children on FSM ate less fruit and vegetables (21% less at five or more portions of fruit and vegetables (95%CI (5.7% to 37%)) and had lower self-assessed school competence compared to 2019.”

- There is a typo in the “Conclusions” section of the Abstract

Thank you for highlighting this. This has been corrected:

“This study suggests that schools are important in reducing inequalities in physical health.”

Introduction:

- While there has been limited empirical research on the impact of school closure on children’s health and mental health outcomes, there are some international studies, and more are being published all the time. I would encourage the authors to include empirical data on the association between school closure and children’s health and mental health outcomes, rather than solely reviewing commentary articles that theorize as to potential disruptions without corresponding data. This would help contextualize the findings of this paper and identify areas of consistency and inconsistency of findings with extant literature.

We agree that this would strengthen the background. We have added some further empirical research on the impact of school closures, however as the reviewer notes, this is still limited. We believe this adds further context to the introduction:

“There is an ongoing debate regarding the effectiveness of schools closures on transmission rates⁴⁻⁶ but the fact schools were closed for a long period of time could have had detrimental effect on pupil’s mental and physical health^{4,5,7,8}. For example, a study from England suggests 53.3% of girls and 44% of boys aged 13 – 18 years reported having anxiety and trauma above normative levels during lockdown enforced school closures⁹ while those aged 10 – 17 reported lower life-satisfaction in 18% of participants with 26.9% reported clinically low wellbeing scores¹⁰.”

“Thus, there is a real possibility that, in addition to a widening of the educational attainment gap which has been noted by research to be a learning loss of around 3 percentile points, or 1/5th of a school year¹⁶, school closures are also likely to result in widening inequalities in children’s physical health, mental wellbeing, and health related behaviours.”

- It is also important to note that, while school closures are a primary change in the lives of students and families, other changes related to both the stress of the COVID-19 pandemic and other environmental changes related to social distancing may also be driving the changes that are seen in this study.

We have now noted the implications of social distancing in the introduction. We will bring this back in the discussion also as we believe this is important to note:

“For example, pre-existing inequalities such as food poverty are likely to be exacerbated through reduced access to free school meals¹⁷. Thus, there is a real possibility that, in addition to a widening of the educational attainment gap which has been noted by research to be a learning loss of around 3 percentile points, or 1/5th of a school year¹⁸, school closures are also likely to result in widening inequalities in children’s physical health, mental wellbeing, and health related behaviours. While school closures were the primary change in children’s lives this, coupled with other restrictions such as social distancing, have been noted to result in feelings of isolation, stress, anxiety and unhappiness (8) particularly as support networks (e.g., friends, sports clubs) were unable to operate (13).”

Methods:

- Additional information on the measures is required. Specifically, without referencing supplemental material, it is unclear whether measures were continuous or dichotomous. Further, it is unclear how (and why) continuous variables such as the wellbeing items (rated on a 1-10 scale) were converted to percentages. It is also unclear how other variables were coded to create percentages.

Thank you for this suggestion. We have now added further clarification regarding how this was done for analysis:

“For the analysis, continuous data was dichotomised to bring in line with government guidelines for example physical activity and diet and dental health responses were coded as 1 if participants responded with being active for 7 days and 0 if less. Diet and dental health were coded as 1 if participants reported eating over 5 portions of fruit and vegetables and 1 if they reported brushing their teeth more than twice a day. Wellbeing question responses (including school) were coded as 1 if participants reported a score ≥ 8 and a 1 if less than 7. Mental health questions were coded as 1 if continuous scores equated to clinical emotional or behaviour difficulties²⁶. This coding then gave a percentage of participants meeting government guidelines for health behaviours in this age group. S1 provides further information on the variables used in the analysis.”

- It would be helpful to briefly summarize differences between the original HAPPEN survey and the HAPPEN at Home survey for the reader.

This has now been briefly summarised in the data collection section of the methods:

“The primary difference between the original survey and the ‘at home’ version was those questions relating to the school day specifically were removed during school closures.”

- Please note whether or not parental consent was needed and obtained.

We have further described our consent procedure in the methods to clarify this:

“Schools were invited to share details of the survey (including study aims and a parent information sheet) amongst parents/guardians so that children could complete the survey at home at a convenient time. Communication between schools and parents/guardians was achieved through existing channels such as text messages, newsletters and social media. This gave parents the opportunity to opt their child out from the survey. Child consent was also obtained at the start of the survey. This is the same sampling method as the 2019 data however, 2018 data was collected in South Wales as the network was not pan-Wales in 2018.”

Results:

- A potential confound of the data is the independence of the 2018, 2019, and 2020 surveys. It is possible that a subset of students responded at two or all three timepoints, while other data were completely independent. If it is not possible to identify the independence, please address this and include as a limitation.

During the analysis we did explore the possibility of the same pupil completing at different time points. We took their ID number and matched across the time points, between 2019 and 2020 only 14/1000+ pupils matched. This sample was too small to draw conclusions from and to ensure anonymity was being protected. Therefore, when conducting the analysis this was not addressed, therefore we have included this as a limitation:

“Furthermore, a small subset of participants (n=14) responded at two timepoints to the various HAPPEN surveys. This sample was too small to analyse and therefore, it is not possible to identify the independence which is a limitation of this study.”

- It would be helpful to add to Table 1 the percentages of the sample in receipt of FSM for the 2018, 2019, and 2020 samples.

This has now been added to table 1:

Demographics		March to June 2018 (n=475)	March to June 2019 (n=1150)	School closures 2020 (n=1068)	Difference (2019 – 2020)
Gender	Boy	233 (49.19%)	594 (51.65%)	535 (50.09%)	-1.56% (-.26 to 5.71)
	Girl	241 (50.65%)	548 (47.65%)	528 (49.44%)	1.79% (-2.37 to 5.94)
	Prefer Not To Say	1 (0.16%)	8 (0.70%)	5 (0.47%)	-.23% (-.04 to .09)
Age	Mean	10.30	10.27	9.99	-.28 (-.36 to -.19)
	3	NA	NA	92 (8.61%)	NA
	4	69 (14.54%)	303 (26.35%)	373 (34.93%)	8.58% (.47 to 12.39)
	5	233 (49.12%)	403 (35.04%)	283 (26.50%)	-8.54% (.47 to 12.34)
Year Group	6	173 (36.35%)	444 (38.61%)	320 (29.96%)	-8.65% (.47 to 12.55)
	FSM	Eligible for FSM	9.77%	16.98%	15.75%
Deprivation*	WIMD Rank	1247.77	946.48	913.52	32.96 (-25.74 to 91.66)

*As measured by the WIMD (Welsh Index of Multiple Deprivation is the official measure of relative deprivation in Wales where 1 = most deprived and 1909 = least deprived)²⁷

- Is it possible to add any additional information to Table 1 to help understand the similarities and differences among the three samples? For example, a description of the number of schools represented in the 2018, 2019, and 2020 samples, and the degree of overlap of schools from these three years? A serious potential confound to the results is that it is unclear to what degree the samples were similar or different, especially in terms of affluence/socioeconomic status, neighborhood and school type/quality, and other factors that could influence the differences between the findings for these three cohorts. This makes it particularly difficult to interpret changes from 2018-2019, since the sample from 2018 was recruited from a different area within Wales. Therefore, the differences from 2018 to 2019 are difficult to interpret and it's unclear whether they can truly be used as a baseline.

As above, we have now added the FSM eligibility of each year as well as the deprivation level as measured by WIMD. We believe this now helps understand the similarities and differences between the three samples. It shows there is no significant difference between the 2019 and 2020 cohorts in terms of deprivation. Unfortunately, we cannot add in the number of schools represented as we remove any school-level data to protect anonymity at this level of analysis.

- Please include statistical significance testing for the data provided in Table 1.

We have now noted this in the methods section:

“Primary analysis looked at whole group mean comparison of all children from 2018 and 2019 (pre-school closures) to 2020 (school closures). Secondary analysis included the subset of children from 2019-2020 stratified by FSM. The 2018 data was used to account for annual trends prior to lockdown. Two sample t-tests with equal variance using groups (years) were used to determine whether there was any significant difference between means. This was carried out in STATA (version 16).”

- In addition to improvements in sleep and physical activity, there is a significant increase in those reported to be sedentary in 2020 as compared to 2019. Please note this in the results. This also goes back to the question about which measure (item) you are using to measure sedentary behavior. If you are using 2 or more hours of TV/video games, then perhaps it is more accurately labeled as “screen time” or something of that sort rather than sedentary behavior.

We have added this into the results:

“Children also report increases in screen time (95% CI: 23.39% (19.37 to 27.43) and feeling less tired (95% CI: 9.64 to -4.23).”

We have also more accurately labelled sedentary behaviour as screen time throughout the manuscript.

- On page 8, lines 3-5, the statement about teeth brushing uses the phrase, “more significant.” This is confusing as it sounds like it may be referring to statistical significance. Was statistical testing conducted comparing 2018-2019 changes to 2019-2020 changes? Please clarify.

We have amended the phrasing of this to clarify:

“Regarding dietary and dental health behaviours, the amount of daily teeth brushing decreases annually (Table 2) but this is more pronounced between 2019 and 2020 (-14.92%, CI: -18.62 to -11.21).”

- Throughout the results, please include data when discussing results (e.g., page 12, lines 13-16; “Despite being away from the school environment, children report feeling happier with school.”)

Thank you for this suggestion. This has been amended throughout the result section of the manuscript. All results discussed now include corresponding data.

- Table 3 includes the difference between 2019 and 2020 data for participants with FSM separately from participants without FSM. This is an interesting comparison, and it worth noting in the results section that the vast majority of significant differences (improvements) in functioning were only noted within the non- FSM group—indicating that the findings for the overall sample reported were driven by participants not eligible for FSM.

This sentence has been added to the end of the FSM comparison results:

“It is worth noting that the majority of differences, particularly improvements, in health behaviours were noted within the non-FSM group suggesting that findings for the overall group during school closures were driven by those who are not eligible for FSM.”

- The results section describes within-timepoint differences between the FSM and Non-FSM group during school closures. One statistically significant finding was discussed (for daily physical activity). Were statistical tests conducted to examine the significance of differences on all items? If so, please report these in a table. If not, I recommend adding those. In addition, if many/most of those differences are significant

We have added further detail to the methods section to clarify this point (see above). Two sample ttests by group with equal variance were carried out to identify any statistical difference in the means. Any significant findings were highlighted in bold (this is noted at the bottom of tables 2 and 3). Findings discussed in the main body of text relate to those that were statistically significant. This has been further clarified by the addition of adding results to corresponding points (see above).

- (as it appears they may be from visual examination of the data), it perhaps is mis-leading to report changes in Cohort 3 overall. It perhaps would be more accurate to describe changes over time for FSM and non-FSM participants separately for all three cohorts.

For clarity and in relation to this study's aims, the 2018 data was used as a reference point to highlight any occurring trends in the data. We believe the discussion of FSM and non-FSM separately for all three cohorts would muddy the results and discussion and would redirect the focus away from school closures.

Discussion:

- The most significant limitation of these findings, in my opinion, is the fact that the composition of the three cohorts is unclear. It is possible that differences between the three cohorts are due to sample characteristics in addition to COVID-19/school closure. Please add this to the limitation section.

This has been noted in the limitations:

“There is evidence that FSM status is not a perfect measure of socio-economic deprivation³⁷ and there are also a number of other factors that contribute to the deprivation levels of a child. However, FSM status does come very close to identifying a group of children who may be at disadvantage due to their socio-economic position³⁷. With this in mind it is also possible that differences between the three groups are due to sample characteristics (e.g., varying deprivation levels) in conjunction with school closures.”

- Related to the point discussed above, please discuss why there would be an increase in feeling safe in your area in 2020 as compared to 2019. This seems unlikely to change based on the factors related to COVID-19; therefore, it raises the possibility that there may be sample differences that could account for this.

We have discussed this point in more detail now, hypothesising why this may be occurring in our study population:

“Overall, small improvements to time spent being physically active were seen during school closures. However, this increase is likely to be amongst non-FSM pupils. For those on FSM activity decreased, recent research around school staff perceptions of the return to school echo this finding. Teachers perceived that their pupils had been less active during lockdown restrictions and observed upon the phased return to school that some children had gained weight²⁸. Findings from the current study suggest this may be more pronounced for more deprived pupils. Those eligible for FSM did report feeling less safe in their areas which may be why they were less active. Evidence shows that physical activity is associated with the wider environment including the socioeconomic status of a neighbourhood which underpins the contextual effects of higher social disorder and lower perceived safety as the status lowers²⁹. However, those not eligible for FSM report feeling safer in their local areas. Therefore, this study suggests that the implications of being confined to your local area during periods of restricted movement alongside parents/caregivers may improve perceptions of safety for

those less deprived. This in turn, could mean they were happier to be active in their areas which would account for differences in physical activity by deprivation. Due to the lack of significant difference in deprivation levels between 2019 and 2020, it is likely that increased exposure to these environments would account for higher safety scores rather than a difference in cohort demographics.”

- It is also of critical importance to consider whether the opening statement of the discussion and interpretation of the results as a whole is accurate. Is it true that improvements were seen “when considering the group as a whole?” Looking at the data in Table 3 seems to indicate that nearly all the significant changes from 2019 to 2020 occurred within the non-FSM group, which seems to have driven the overall results. Reporting the results for the overall sample minimizes the health disparities that existed prior to COVID-19 and during COVID-19. This should be further emphasized in the discussion.

This has now been noted in the introduction of the discussion:

“Improvements during school closures for children included physical activity, sleep, wellbeing (family, health, life) and emotional and behavioural difficulties. However, it is likely that these improvements were predominantly because of participants who were not eligible for free school meals according to this study’s findings. Highlighting the health inequalities between less and more deprived that existed even prior to the pandemic and school closures.”

- In the discussion, you suggest that perhaps the increase in screen time was due to participating in educational programming via screens. However, the question about screentime asks about TV, video games, and using the internet. It is unclear if children would also be counting use of screens for educational purposes in this category. Therefore, many of the conjectures in this section may not be accurate. In particular, the statement that “This suggests that non-FSM children were more engaged with learning tasks and therefore had perceived higher competence and confidence with learning and development” goes far beyond the data available and is misleading. Relatedly, and as mentioned earlier in this review, it is more accurate to use the term “screen time” rather than “sedentary behavior” for this item.

We agree that this needed some further clarity and we have now added more discussion around this point:

“Non-FSM children were more active. However, non-FSM children’s screen time was significantly higher during school closures. Their reported daily screen time (>2 hours) doubled compared to the previous year. This is comparative to similar research which also notes increases in screen time during the pandemic²⁸. It has been proposed that this could be because loosening household rules around screen time usage to facilitate entertainment or social connection through computer games or social media²⁸. While deprivation is associated with higher screen time in adults²⁹, it is less clear what that means for children. This study suggests that less deprived children have higher screen time which is a contrast to adults. It may be that these children have more access to technology which enables screen time.

The HAPPEN survey asks about screen time in reference to “TV, video games, and using the internet”. It is possible that children perceived using the internet as the delivery of education through online learning. Thus, children will have utilized screens (e.g., laptops and tablets) to aid learning. Less deprived families may have better access to these resources and therefore, screen time may be higher in this group. This is supported by research from the Institute for Fiscal Studies³⁰ where children from less deprived families were spending 30% more time engaging in home learning activities than those more deprived. This may also reflect why perceptions of school competency remains much higher in the less deprived group. This suggests that non-FSM children were more engaged with learning tasks and therefore had perceived higher competence and confidence with

learning and development. This may contribute towards the estimated 46% increase in learning gap between disadvantaged children and their peers reported by teachers³¹. With the relationship between education and health well documented, this has implications for children's future health and wellbeing outcomes³². Further evidence of this is seen in feeling part of your school community which again is much higher in those not on FSM."

Reviewer #2:

Thank you for the opportunity to review this study on children during COVID-19. This is an interesting study that is very timely. I agree that this is an important study that contributes to a significant gap in knowledge regarding the experiences of school-aged children. The true extent of impact of the lockdown and school closures on children is very poorly understood. In particular, there are very few studies that have utilized self-reported data from children. In this regard, this study is particularly informative. Overall, I think this is one of the most comprehensive and rigorous study I have seen on school-aged children's experiences during COVID-19.

Introduction:

- The introduction is appropriate for the research question.
- In the first paragraph of the introduction, it may be helpful to clarify the extent of school closures in Wales during the survey time period.

We have now included a sentence to highlight when school closures commenced in Wales – this will help clarify the extent of school closures during the survey time period:

"In Wales, schools were required to close for statutory provision of education at the latest on 20th March 2020⁵."

- In the study aims, it may be helpful to further clarify in the introduction and abstract that this particular study focuses on the very early initial school closure period in Wales. Approximately how many weeks or months had elapsed since the WHO declared the coronavirus pandemic?

We have now clarified this in the abstract:

"This study aimed to explore the relationship between initial school closures and children's health by comparing health and wellbeing outcomes collected during school closures (April – June 2020) via HAPPEN (The Health and Attainment of Pupils in a Primary Education Network) with data from the same period in 2019 and 2018 via the HAPPEN survey."

And in the study aims:

"This study was a rapid response to the initial announcement of school closures in Wales which occurred 9 days after the WHO declared a global pandemic."

Data analysis:

- The sample size is large.
- The use of pre-COVID and during-COVID is particularly informative.
- The analysis approach is appropriate to answer the research question.

- I think it would strengthen the study to say a bit more about how representative this sample of children is compared to the population in Wales more generally.

Thank you for this comment. We have now added a line in to our methods section to discuss how we aimed to ensure a representative sample were recruited:

“This opt-out method of recruiting participants aimed to ensure that a representative sample were recruited which could reflect all children in Wales.”

However, we have added a line into the limitations which discusses how we cannot imply a fully representative sample:

“This also means we cannot ensure a fully representative sample of children has been recruited across Wales.”

Results:

- Overall the results of this study are interesting and are encouraging. It may be that children were actually happier in some domains during the school closures than many researchers have thought, although they also felt less efficacy in school-related matters and experienced some declines in physical health.

- It may be worthwhile to reiterate that this study was conducted early in the lockdown period. As school closures persisted, the effects of the pandemic on mental health and wellbeing may worsen.

Thank you for your suggestion. We have added a line at the beginning of the discussion to reiterate this point:

“This study aimed to capture the associations between the initial school closures between March and June 2020 and the health and wellbeing of children.”

We have also noted in the conclusion how the long-term effects of the pandemic may worsen mental health and wellbeing:

“This paper shows the short-term associations of school closures on children’s health and wellbeing and it is worth noting that the long-term impacts of further school closures and national lockdown may have more detrimental impacts on the health and wellbeing of children.”

We thank the reviewer for their time and believe their suggestions have strengthened our manuscript.

VERSION 2 – REVIEW

REVIEWER	Lee, Shawna University of Michigan, School of Social Work
REVIEW RETURNED	19-Jul-2021
GENERAL COMMENTS	The revisions are responsive to the first round of reviewer comments. I have no additional concerns at this time.