Author's response to reviews

Title: Mental Health in Adolescents with Type 1 diabetes: Results From a Large Population-Based Study

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Author's response to reviews: see over
Dear Editor,

Thank you for the invitation to revise and resubmit our paper. The comments were most helpful and constructive. We have done our best to use the reviewers’ comments to improve the manuscript, and believe the manuscript has become clearer and more informative as a result. Below you will find our response to each of the comments:

REVIEWER #1

Major Compulsory Revisions:
1. It is essential to know the population of comparison for youth with type 1 diabetes. What other chronic conditions are represented in the study (e.g. type 2 diabetes, asthma, GI disorders, psychiatric conditions)? Was there a difference if youth with diabetes were compared to youth with no chronic conditions instead of the entire sample? As this dataset is quite large, it is likely that these results would not change. However, it is helpful to characterize the comparison sample if possible.

Response: This is an important issue, and as suggested we have now re-conducted all statistical analyses omitting every adolescents with other chronic conditions. In all, this resulted in 820 adolescents being removed from the control group. However, this did not result in any major changes. All statistical tests remained non-significant, and the effect sizes did not increase. The authors also discussed whether we should change all tables and results to include the new “healthy control group”, but as suggested by the reviewer, we have chosen to provide more details about the original/complete control group with regards to the existence of other chronic conditions:

“In addition, if the adolescents indicated having another chronic illness on the item described above, they completed an open-ended question where they provided the name of that illness. In all, 828 adolescents responded positively to this item, with the most frequently reported illnesses being atopical dermatitis, neurological, and musculoskeletal conditions.”

It is difficult to independently verify the actual nature of these 828 self-reported illnesses, therefore, we are hesitant to provide exact number of adolescents in these illness categories beyond the number of total individuals identifying as having another chronic condition (n=828).

We have also added the following text the Statistics section:

“As the control group also comprised adolescents with chronic other illnesses (n=820), all statistical analyses were repeated omitting these individuals form the control group. This, however, did not change the results or conclusions in any way, and therefore the control group used in current study include all adolescents not reporting diabetes.”

Minor Essential Reviews:
1. It is a significant limitation that the authors do not have information about diabetes diagnosis, glycemic control, and disease duration in youth. It is possible that youth with type 2 diabetes are treated with insulin. Do the authors have any information about the rate of youth who reported a diagnosis of diabetes but no insulin use and, if so, does this match the population estimates for type 2 diabetes?

Response: We agree that more detailed information about the diabetes would have preferable. As correctly identified by the reviewer, it is possible (although relatively uncommon in Norway) that
adolescents with type 2 diabetes could be also treated with insulin, and as such we cannot say with certainty that our sample only includes adolescents with type 1 diabetes. However, the majority of patients with type 2 diabetes are treated with other blood sugar lowering drugs (ATC code A10B) rather than insulin, and in the current study, all 40 participants who indicated having diabetes also reported taking insulin (ATC code A10A). We have now added the following paragraph on this issue to the Discussion:

“None of the adolescents indicated taking antidiabetic drugs (other than insulin: ATC-subgroup A10B), making it very unlikely that adolescents with type 2 being were included in the diabetes group. However as adolescents with type 2 diabetes also may take insulin, we cannot completely rule out the possibility of misclassification.”

Also of note, although reliable prevalence data on type 2 diabetes in adolescents and young adults are lacking in Norway, official statistics from Norway on the use of prescription drugs show that only around 0.1% use A10B drugs in the age group 15-24, compared to around 0.5% using insulin (A10A). [http://bit.ly/1ux6Sn7](http://bit.ly/1ux6Sn7)

2. The authors interchangeably use “youth@hordaland-survey” and “ung@hordaland study” to describe the data. Please use one term consistently.

Response: We have now fixed this – and we now use the English name of the study throughout the paper.

3. The authors hypothesize that more widespread pump use may be partially responsible for the lack of elevation on any measure in youth with type 1 diabetes. However, the introduction states that only 64% of Norwegian youth use insulin pumps, meaning that a significant percentage are still on more conventional insulin regimens. Do the authors have any other factors that may contribute to the findings (e.g. less stigmatization, greater access to peers through online communities, more sensitive regimens that allow for better matching of diet to insulin through multiple daily injections and not just pump use)?

Response: We agree with this comment, and have added the following paragraph on this issue:

“Also, a significant proportion of Norwegian adolescents still use more conventional insulin regimens. As such, there may be other possible factors that may explain why diabetic adolescents in the current study seem to be little affected and restricted by their illness in terms of mental health functioning. For example, it is possible that having Type 1 diabetes is now less stigmatizing than before, and also new and improved medical regimens and practices may allow better matching of diet to insulin through multiple daily injections. However, these factors were not specifically addressed in the current study, and should be explored in future studies.”

4. There are a number of small typos throughout the manuscript (e.g. “diabtetic” instead of “diabetic” on line 7, page 3; “ti” instead of “to” on line 8, page 3; “helth” instead of “health” line 6 page 4; “distiurbances” instead of “disturbances” line 6, page 4). Please carefully edit for spelling.

Response: We apologize for the many typos, we corrected these.
The comparison of mental health symptoms in youth with and without diabetes is somewhat more nuanced than the authors present, and there have been studies that do not demonstrate an increased risk for psychopathology in youth with type 1 diabetes (e.g. Lawrence et al., Prevalence and Correlates of Depressed Mood Among Youth with Diabetes: The SEARCH for Diabetes in Youth Study, Pediatrics, 2006). Further, while the rates of mental health issues may not be necessarily elevated in comparison to healthy peers, the implications for untreated mental health disorders in youth with chronic illness is significant and even normative levels of psychopathology should be identified given the potential impact on self-care behaviors and health. This may warrant a brief mention in the clinical implications.

Response: We are grateful for pointing us to this important study by Lawrence et al, and have added the following sentence to the Introduction:

"Furthermore, a large and well-controlled study of 2672 adolescents (aged 10-21) with diabetes found no differences in depressive symptoms between adolescents with without diabetes [1]."

We also fully agree with the latter comment, and we have therefore added this perspective to the Discussion.

REVIEWER #2

Major Compulsory Revisions:

1. The authors need to include psychometric data (i.e., validity, reliability, sensitivity, specificity) for each of the measures. This information is needed to demonstrate the surveys are valid and reliable. Further, the authors used several short form versions of the surveys, and sensitivity and specificity data are needed to confirm that these surveys are appropriate.

Response: We agree that the instrument descriptions were somewhat brief, and we have now added psychometric information regarding the reliability and validity on all instruments where available. Whereas most instruments are well validated with good psychometric properties (SMFQ, ASRS, READ), two of the instruments were shortened versions (Obsessive-Compulsive behaviors, and Perfectionism) with less psychometric data available. We now discuss this issue under study limitations.

2. The authors need to include the name of the survey for obsessive-compulsive behaviours along with psychometric data. Additional details about the survey, such as what type of scale (e.g. Likert scale) was used and what the five questions assessed, are needed.

Response: We agree that the description of the OCD measure was too briefly described, and this paragraph now reads:

"Obsessive-compulsive behaviour was assessed by the following five questions covering key aspects of obsessive compulsive disorder, as outlined by Thompson [2]: “I wash myself more than normal. I am afraid of infection”, “I often have to check or control things”, “I am concerned with order and symmetry”, “I must often have repeated assurances and answers to questions”, “I have distressing or disturbing thoughts”. These 5 items were rated on a three point Likert-scale with response options “not true”, “somewhat true” and “certainly true”. The Cronbach’s alpha in the current study was 0.71."

- The authors need to address other limitations to the study, including the small sample size of adolescents with type 1 diabetes, the limited age range (16-19 years of age) for participation, the lack of diabetes technology data, and the lack of race/ethnicity data. These limitations may limit
the generalizability of the data.

Response: We agree with these comments, and have added the following text at different points under Study limitations:

“Firstly, the measurement of Type 1 diabetes was based on self-report, and the relatively small number of adolescents with Type 1 diabetes (40 individuals) is a limitation.”

...

“Also, the fact that we had no information on use of diabetes technology data limits the ability to investigate whether newer technology (such as new generation of insulin pumps) may be related to mental health functioning.”

...

“Finally, the youth@hordaland study mainly consists of ethnic Norwegians, and the lack of ethnic diversity together with the limited age span (16-18 yrs) may limit the generalizability to other ethnicities and age groups.”

Minor Essential Revisions:
1. All sections need to be revised to address spelling and grammatical errors.

Response: We have now done our best to ensure correct spelling and grammar.

2. In the Introduction section, the authors focus on advancements in diabetes technology and the potential impact of technology on psychological functioning. The sentence, “While new technologies are likely to improve glycemic control…there is still a lack of studies examining the potential positive effect of these advances on other outcomes, such a psychological functioning.” This sentence implies that the current study explored the impact of technology on psychological functioning, which is misleading. This point may be best in the Discussion section and not in the Introduction.

Response: We agree that this sentence was misleading, and we have now removed this from the Introduction.

3. In the Results section under the subheading “Type 1 diabetes and sleep problems,” the authors should describe the results of the specific sleep parameters that were measured. Sleep problems were one of the key variables assessed in the manuscript and one sentence is not sufficient to describe the findings.

Response: This section has now been substantially expanded. It now reads:

“Adolescents with Type 1 diabetes did not differ in terms of their reported sleep problems compared to the non-diabetes group on any of the assessed sleep parameters. Neither sleep duration, sleep efficiency, sleep deficiency, SOL nor WASO, differed between the two groups. Similarly, the prevalence of insomnia and OSA was not significantly higher among adolescents with Type 1 diabetes compared to the control group.”

4. In the Results section under the subheading “Type 1 diabetes and subjective health complaints,” the authors should list the specific somatic complaints.
Response: We now report this, in addition to showing the results from each of the 5 specific complaints. This text now reads:

“Analyses of each of the 5 specific complaints showed that the Type 1 diabetes group reported significantly more back pain (P = .02) than the control group, whereas, no group differences were found for the remaining 4 items (headache, neck and shoulder pain, abdominal pain, and dizziness).”
