PEER REVIEW HISTORY

BMJ Paediatrics Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

<table>
<thead>
<tr>
<th>TITLE (PROVISIONAL)</th>
<th>Carbon Dioxide Rebreathing Induced by Crib Bumpers and Mesh Liners Using an Infant Manikin</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTHORS</td>
<td>Maltese, Matthew; Leshner, Michael</td>
</tr>
</tbody>
</table>

VERSION 1 – REVIEW

<table>
<thead>
<tr>
<th>REVIEWER</th>
<th>Reviewer name: Peter Flom Institution and Country: Peter Flom Consulting, USA Competing interests: None</th>
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<tbody>
<tr>
<td>REVIEW RETURNED</td>
<td>15-Oct-2018</td>
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</tbody>
</table>

GENERAL COMMENTS

I confine my remarks to statistical aspects of this paper.

A minor point P in p value should be lower case.

page 3 - how can 25 cases be "bumper alone" when only 23 cases involve the bumper at all?

page 4 - if there were different products in each of the three categories, that needs to be addressed.

page 5 - why use p of 0.01 here? It would be better to look at effect size. Also, what are the three samples listed and why those in particular?

Page 6 - the last sentence does not make sense. Correlation cannot be assessed this way. The authors might mean "relationship" rather than "correlations". In addition the regression models must be described in more detail What was the dependent variable? What was/were the independent variables? Why were these sorts of regression models chosen? How were models built?

Page 7 - Instead of giving IQR as a number, it would be more informative to give it as a range.

Page 23 - top panel - is there one outlier or more than one in the ALT? If more than one, add jitter to show them all.

both panels - It would be nice to have the labels on teh Y axis printed horizontally (if the authors used R, this can be done with las = 2)

bottom panel - this might be better with a log axis on the vertical axis

<table>
<thead>
<tr>
<th>REVIEWER</th>
<th>Reviewer name: Donna Traves Institution and Country: Derbyshire Childrens Hospital, UK Competing interests: None</th>
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</thead>
<tbody>
<tr>
<td>REVIEW RETURNED</td>
<td>18-Nov-2018</td>
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I find this a good study looking at an area that is relatively understood but so very important. The general public in the UK are all told to avoid bumpers/ cot sides etc but often continue to use and maybe showing evidence such as this would help in getting this message across.

The design of the study appears to be sensible and well thought out and I appreciate the conclusions and agree that the study is clearly limited to high fidelity mannikins and not infants; however as they have compared to other situations infants find themselves in, such as use of pacifiers/ blankets then this brings across the point being made regarding the difference in CO2 levels well.

I was unable to see the images of the manikins or positions etc, and these would be essential to fully gain the most benefit form the paper. I also feel that some explanation of how the mannikin works and how gas exchange is undertaken would be helpful to validate the study. For the non- research individual more explanation around the CO2RB would also be helpful.

**GENERAL COMMENTS**

**VERSION 1 – AUTHOR RESPONSE**

Reviewer #1

COMMENT: A minor point P in p value should be lower case.

RESPONSE: Thank you. We have corrected this throughout the manuscript.

COMMENT: page 3 - how can 25 cases be "bumper alone" when only 23 cases involve the bumper at all?

RESPONSE: Thank you for catching our errant review of the literature. We have modified the sentence to now read (changes underlined), “Crib bumpers have been implicated in 48 deaths between 1985 and 2012, including 23 deaths between 2006 and 2012 (2). 25 of the 48 cases were found to have the “bumper alone” as the cause of death, including . . . .”

COMMENT: page 4 - if there were different products in each of the three categories, that needs to be addressed.

RESPONSE: Thank you for bringing this to our attention. Perhaps our writing is not clear. To answer your question, there were different products in each of the categories. Said another way, each product tested was categorized into one (and only one) of three categories. We have modified the text on page 3 to make it more clear that each product tested only fell into one of the three categories.
COMMENT: page 5 - why use p of 0.01 here? It would be better to look at effect size. Also, what are the three samples listed and why those in particular?

RESPONSE: Thank you for the prompt to highlight effect size, as the magnitude of the difference in means is a key feature of the data. An appreciation for the effect size can be gained from Supplemental Figure 1 (page 26), but we agree that this needs to be highlighted in the main text. Thus, we have included the percent change in the mean value between the horizontal and vertical tests in the main text on page 5. The added sentence reads as follows: “The percent change in CO2RB between the horizontal and vertical crib side positions was 2.41% across all samples. An appreciation for the effect size can be gained from Supplemental Figure 1 (available online).” We selected p<0.01 because it is a generally accepted level of significance for experimental studies in medicine.

Page 6 - the last sentence does not make sense. Correlation cannot be assessed this way. The authors might mean “relationship” rather than “correlations.” In addition the regression models must be described in more detail What was the dependent variable? What was/were the independent variables? Why were these sorts of regression models chosen? How were models built?

RESPONSE: Thank you. We realized from your comment that we have provided scant details on the regression analysis of the relationship between permeability and CO2RB. To answer your specific questions, first, we agree that correlation is not the right term and we replaced “correlation” with “relationship” in the offending sentence. Second, in all models the dependent variable was permeability and independent variable was CO2RB. Third, we selected the regression models because they are the most common model used to establish the extent to which a correlation exists in natural phenomenon. Fourth, the models were all built using the least squares for single or multiple regression. To clarify these points in the manuscript, we modified the text on page 6 as follows:

“Across all samples, the correlation relationship between median CO2RB and median permeability was quantified via exponential, linear, logarithmic, polynomial and power regression models. All models were built by least squares methods, and permeability was the independent variable and CO2RB was the dependent variable (Table 1).”
In addition, we have added Table 1 to the manuscript, which shows the coefficient of determination and the mathematical model formula for all models:

Table 1 - The mathematical model formula and coefficient of determination for all models used to evaluate the relationship between permeability (x) and CO2RB (y).

<table>
<thead>
<tr>
<th>Model</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>y = ax+k</td>
<td>0.28</td>
</tr>
<tr>
<td>Y = ax²+bx+k</td>
<td>0.28</td>
</tr>
<tr>
<td>Y = ax³+bx²+cx+k</td>
<td>0.31</td>
</tr>
<tr>
<td>Y = ax⁴+bx³+cx²+dx+k</td>
<td>0.36</td>
</tr>
<tr>
<td>y = zln(x) + k</td>
<td>0.16</td>
</tr>
<tr>
<td>y = ae²</td>
<td>0.36</td>
</tr>
<tr>
<td>y = axb</td>
<td>0.20</td>
</tr>
</tbody>
</table>

COMMENT: Page 7 - Instead of giving IQR as a number, it would be more informative to give it as a range.
RESPONSE: Thank you. We agree and have replaced all instances of IQR in the text with 25th and 75th percentile values.

COMMENT: Page 23 - top panel - is there one outlier or more than one in the ALT? If more than one, add jitter to show them all.
RESPONSE: Yes, there is just one outlier in the ALT box plot.

COMMENT: Page 23 - both panels - It would be nice to have the labels on the Y axis printed horizontally (if the authors used R, this can be done with las = 2)
RESPONSE: We are happy to format the graphs in this way. Modified graphs have been uploaded.

COMMENT: Page 23 - bottom panel - this might be better with a log axis on the vertical axis
RESPONSE: We agree. We have changed the vertical axis of the bottom panel to a logarithmic scale (see below).
I find this a good study looking at an area that is relatively understood but so very important. The general public in the UK are all told to avoid bumpers/ cot sides etc but often continue to use and maybe showing evidence such as this would help in getting this message across. The design of the study appears to be sensible and well thought out and I appreciate the conclusions and agree that the study is clearly limited to high fidelity mannikins and not infants; however as they have compared to other situations infants find themselves in, such as use of pacifiers/ blankets then this brings across the point being made regarding the difference in CO2 levels well.

I was unable to see the images of the manikins or positions etc, and these would be essential to fully gain the most benefit form the paper. I also feel that some explanation of how the mannikin works and how gas exchange is undertaken would be helpful to validate the study. For the non-research individual more explanation around the CO2RB would also be helpful.
RESPONSE: Thank you for your favorable review of our manuscript. We have provided images of the manikins and positions in the supplementary materials that will be available to the readers online. In addition, we have revised the paragraphs on page 4 and 5 to that describe how the manikin works and how gas exchange is undertaken. The new text is as follows:

“CO2RB was assessed via an Anthropomorphic Rebreathing Surrogate (ARS) (3, 10). The ARS makes use of a mechanical “lung” of 120 mL total volume, actuated at a frequency of 45 breaths per minute and 35 mL tidal volume. The volume of the tubing connecting the lung to the manikin’s nose is similar to the infant trachea with a resistance to airflow of 40 cm H2O / liter / second.”

“As the manikin breathes in and out of its nose, carbon dioxide is metered into the lung to simulate CO2 produced by metabolism. Interactions between the manikin’s face and external materials causes a change in the CO2 concentration in the lung, which is measured by withdrawing a very small sample and measuring the CO2 concentration. (Fuji Electric Non-Dispersive Infrared Gas Analyzer, Type ZRF). Rotameters ensured constant flow rates (Figure 2).”