

## 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. Some articles will have been accepted based in part or entirely on reviews undertaken for other BMJ Group journals. These will be reproduced where possible.

### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	An investigation of the effects of the common cold on simulated driving performance and detection of collisions: A laboratory study
<b>AUTHORS</b>	Andrew P. Smith and Samantha L. Jamson

### VERSION 1 - REVIEW

<b>REVIEWER</b>	<p>Dr. Nadia Mullen Post-Doctoral Fellow Centre for Research on Safe Driving Lakehead University Thunder Bay, Ontario Canada</p> <p>I have no competing interests.</p>
<b>REVIEW RETURNED</b>	08/03/2012

<b>THE STUDY</b>	<p>Abstract/Summary</p> <p>p. 3, line 47: Participants with a cold did not “drive closer to the car in front”, rather they spent a greater percentage of time driving at a headway of less than 2 seconds. Similarly, p. 4, line 11 states that drivers with a cold “drive too close to the car in front”. Indeed, healthy drivers also drove too close to the car in front, just for a smaller percentage of time (39.2% versus 51.7% for unhealthy drivers). The headway results should be accurately reported.</p> <p>Research Question</p> <p>I suggest adding the first sentence of your Abstract (which clearly states the project’s objective) to the last paragraph of the Introduction section.</p> <p>Study Design</p> <p>Session 1 was conducted when Sample 1 was healthy and Sample 2 was unhealthy, with both Samples being healthy for Session 2. Session 2 data were then used as covariates when analysing Session 1 data. It is possible that healthy participants were able to learn how to drive the simulator to a higher degree during Session 1 than unhealthy participants (i.e., being unhealthy may have impaired Sample 2’s ability to learn, and so practice effects cannot be assumed to be equal for the two samples); if this was the case, then Session 2 driving performance would be inflated for healthy participants and deflated for unhealthy participants. Hence, there is some concern that Session 2 data is not as suitable for use as covariates as it would have been if the experimental design had involved both samples being healthy for Session 1. Consider addressing this in the Discussion section.</p>
------------------	---

	<p><b>Participants</b></p> <p>Please consider providing more information about participants, such as the age range of participants in Sample 1 and Sample 2, and their mean driving experience (in years). In addition, an explanation would be helpful for the uneven ratio of Males to Females in Sample 1 and Sample 2 (Sample 1 was 40% male, while Sample 2 was 66.7% male). Since gender can affect some measures of driving performance, this might be considered a limitation of the study.</p> <p>It is stated that the sample size calculation suggested 24 participants should be tested. Was this calculation conducted with the ratio of Control to Experimental participants being 10:15? If so, this should be mentioned. If not, then the sample size calculation likely assumed that 12 participants would be allocated to each group, and you should address this since it affects the power of your study.</p> <p>Were Sample 2 participants asked if they had taken any medications for their symptoms (and if they had, were they excluded from participating that day)? If not, any effects found (such as decreased reaction time) could be due to medications rather than cold symptoms (many over-the-counter cold medications slow reaction times and come with cautions not to drive or operate machinery after ingestion). I suggest including details in the Method section about how participants were asked if they had ingested medications or, if participants were not asked, addressing this as a limitation of the study in the Discussion section.</p> <p><b>Method</b></p> <p>Please provide more information about the symptom checklist – there were 52 symptoms listed, with Sample 2 participants being required to score at least 9 on symptoms typical of a cold, and 2 or less on symptoms not associated with a cold. How many of the 52 symptoms were typical of a cold versus atypical of a cold?</p> <p>I suggest including some details about the “familiarisation period on the driving simulator”. The drive completed during this time is not described in the Driving Simulator section (e.g., setting [urban, rural], distance of drive), nor the method used to determine competence (e.g., were participants considered ‘familiarised’ after simply completing the drive or did they need to attain a certain measure of competence such as completing the drive without crashing).</p> <p>Did Sample 1 and Sample 2 participants return for their second session after a similar amount of time?</p> <p>The Abstract states that participants completed the OMEDA collision detection task during both Session 1 and Session 2, while the Method states that participants completed the OMEDA task during Session 1 only. Please clarify. If they completed the task during both sessions, was Session 2 data used as a covariate when analysing the OMEDA data? If so, please add this detail to the Results section.</p> <p><b>Other Minor Revisions</b></p> <p>p. 4 line 54: I suggest replacing “accidents” with “crashes” (this also applies to all subsequent references to ‘accident(s)’ in the</p>
--	--

	<p>manuscript). We believe motor vehicle crashes are preventable, which is better reflected with “crash(es)” rather than “accident(s)”.</p> <p>p. 5 line 18: “the people” --&gt; “that people”</p>
<b>RESULTS &amp; CONCLUSIONS</b>	<p>Results</p> <p>I recommend providing more information about the symptom checklist results. One option would be to include a table showing the mean number of cold symptoms reported and the mean number of non-cold symptoms reported at Session 1 and Session 2, for both Sample 1 and Sample 2.</p> <p>Please state the type of analysis you conducted (e.g., t-tests) and provide the value in Table 1 (i.e., add a column showing the t-value). Also include the standard deviation of the means in Table 1.</p> <p>In Table 2, I recommend showing results from all analyses rather than only analyses with a p-value less than .05 (e.g., show data for Speed and Lateral Control analyses). The title of Table 2 would then need to be revised accordingly. Again, providing the standard deviation of the means presented in Table 2 would be helpful.</p> <p>Take care with how results are reported. For example, p. 13, line 8 reads “. . . were more likely to spend”, when it should read “spent”. ANCOVAs statistically examine whether the means from Sample 1 and Sample 2 are equal; they do not examine ‘likelihood’.</p> <p>For the ‘Collision with a Pedestrian’ data, was a Chi-square analysis (or similar analysis, such as a Fisher exact) conducted? A similar analysis should also be conducted for ‘Traffic Light Violation’ data.</p> <p>p. 14, line 37: “. . . drivers who reported cold symptoms violated the traffic lights twice as often as when they were symptom free” suggests you are comparing Sample 2 data from Session 1 with their data from Session 2. To remove this ambiguity, consider rephrasing to “. . . drivers who reported cold symptoms violated the traffic lights twice as often as drivers who were symptom free.”</p> <p>When a green light changes to amber, a driver should stop if they can do so safely. Hence, driving through an amber light is not “violating the traffic light” (assuming the light did not change to red before they had completed crossing the intersection). It is possible that participants with cold symptoms were simply cognizant that their reaction time was slower than usual because they were unwell, and so they decided to continue driving through the amber light rather than stop because they felt they were unable to stop safely.</p> <p>Discussion</p> <p>Take care when discussing your results. For example, p. 14, line 50 states “. . . volunteers presenting with symptoms . . . drive too closely to the car in front.” Indeed, healthy participants also drove too close to the car in front, spending a mean of 39.2% of the drive driving at a headway of less than 2 seconds. Volunteers presenting with symptoms simply spent a greater percentage of time driving too close to the car in front compared with healthy volunteers.</p> <p>p. 14, line 58: I suggest mentioning the exact blood alcohol concentration (BAC) level you are referring to when you state “a dose that would lead to a ban from driving”, since the BAC limit that</p>

	<p>would lead to a ban from driving differs by country and state.</p> <p>p. 15, line 6: Please include a citation for the “previous study using elderly participants”. This is a great comparison to mention and a reader may wish to access this study.</p> <p>p. 15, line 23: It is stated that “impairments associated with the common cold . . . may be observed . . . after the symptoms have gone.” Please consider providing information about the period of time that impairments might be observed after symptoms have gone. In your study, Sample 2 were considered ‘healthy’ when they reported being symptom-free for more than 7 days. It is important that the reader knows whether impairments could be observed 8 days after symptoms have gone.</p> <p>p. 15, paragraph 3: Caffeine and other stimulant drinks can produce a short-term increase in alertness that is subsequently followed by a decrease in alertness to a level lower than it was at the time caffeine was consumed. Thus, although caffeine might temporarily alleviate cold-induced performance impairments, it may subsequently enhance impairments. In addition, many over-the-counter medications designed to relieve cold symptoms come with cautions to refrain from driving or operating heavy machinery for a period of time following ingestion. This would suggest such medications would not “remove the behavioural problems associated with the common cold”, but could instead compound driving-related impairments (i.e., driving after taking medication to reduce cold symptoms may be more unsafe than simply driving with cold symptoms). Please consider discussing these issues in this paragraph. They would certainly be relevant when it came to information campaigns.</p> <p>p. 16, line 3: Please consider rephrasing this sentence, since information campaigns do not aid in the “prevention of these effects”.</p> <p>Other Minor Revisions</p> <p>p. 11, line 57: add “of” so it reads “. . . no effect of having . . .”</p> <p>p. 19, Table 2, 3rd row: “51.7” --&gt; “51.7%”</p> <p>p. 19, Table 2, 11th row: “a. Mean number of traffic light violations” --&gt; “d. Mean number of traffic light violations”</p>
--	---

<b>REVIEWER</b>	Hans Schaumann
	No competing interests.
<b>REVIEW RETURNED</b>	19/04/2012

<b>THE STUDY</b>	<p>Inclusion/exclusion criteria not sufficient</p> <ul style="list-style-type: none"> <li>- the definition of “cold” is not clear</li> <li>- which checklist was used</li> <li>- was medical data compiled (temp, bloodparameter etc.)</li> <li>- was there a medication or domestic remedy</li> </ul> <p>Representativity</p> <ul style="list-style-type: none"> <li>- age of volunteers</li> <li>- driving history/experience of volunteers</li> </ul>
------------------	--

## VERSION 1 – AUTHOR RESPONSE

Reviewer: Dr. Nadia Mullen  
Post Doctoral Fellow  
Centre for Research on Safe Driving  
Lakehead University  
Thunder Bay, Ontario  
Canada

I have no competing interests.

### Abstract/Summary

p. 3, line 47: Participants with a cold did not “drive closer to the car in front”, rather they spent a greater percentage of time driving at a headway of less than 2 seconds. Similarly, p. 4, line 11 states that drivers with a cold “drive too close to the car in front”. Indeed, healthy drivers also drove too close to the car in front, just for a smaller percentage of time (39.2% versus 51.7% for unhealthy drivers). The headway results should be accurately reported.

Suggested changes made.  
Research Question

I suggest adding the first sentence of your Abstract (which clearly states the project’s objective) to the last paragraph of the Introduction section.  
Suggested changes made.

### Study Design

Session 1 was conducted when Sample 1 was healthy and Sample 2 was unhealthy, with both Samples being healthy for Session 2. Session 2 data were then used as covariates when analysing Session 1 data. It is possible that healthy participants were able to learn how to drive the simulator to a higher degree during Session 1 than unhealthy participants (i.e., being unhealthy may have impaired Sample 2’s ability to learn, and so practice effects cannot be assumed to be equal for the two samples); if this was the case, then Session 2 driving performance would be inflated for healthy participants and deflated for unhealthy participants. Hence, there is some concern that Session 2 data is not as suitable for use as covariates as it would have been if the experimental design had involved both samples being healthy for Session 1. Consider addressing this in the Discussion section.  
Information on this now provided.  
Participants

Please consider providing more information about participants

In addition, an explanation would be helpful for the uneven ratio of Males to Females in Sample 1 and Sample 2 (Sample 1 was 40% male, while Sample 2 was 66.7% male). Since gender can affect some measures of driving performance, this might be considered a limitation of the study.  
Information on this now provided.

It is stated that the sample size calculation suggested 24 participants should be tested. Was this calculation conducted with the ratio of Control to Experimental participants being 10:15? If so, this should be mentioned. If not, then the sample size calculation likely assumed that 12 participants

would be allocated to each group, and you should address this since it affects the power of your study.

Information on this now provided.

Were Sample 2 participants asked if they had taken any medications for their symptoms (and if they had, were they excluded from participating that day)? If not, any effects found (such as decreased reaction time) could be due to medications rather than cold symptoms (many over the counter cold medications slow reaction times and come with cautions not to drive or operate machinery after ingestion). I suggest including details in the Method section about how participants were asked if they had ingested medications or, if participants were not asked, addressing this as a limitation of the study in the Discussion section.

Information on this now provided.

## Method

Please provide more information about the symptom checklist – there were 52 symptoms listed, with Sample 2 participants being required to score at least 9 on symptoms typical of a cold, and 2 or less on symptoms not associated with a cold. How many of the 52 symptoms were typical of a cold versus atypical of a cold?

Information on this now provided.

I suggest including some details about the “familiarisation period on the driving simulator”. The drive completed during this time is not described in the Driving Simulator section (e.g., setting [urban, rural], distance of drive), nor the method used to determine competence (e.g., were participants considered ‘familiarised’ after simply completing the drive or did they need to attain a certain measure of competence such as completing the drive without crashing).

Information on this now provided.

Did Sample 1 and Sample 2 participants return for their second session after a similar amount of time?

Information on this now provided.

The Abstract states that participants completed the OMEDA collision detection task during both Session 1 and Session 2, while the Method states that participants completed the OMEDA task during Session 1 only. Please clarify. If they completed the task during both sessions, was Session 2 data used as a covariate when analysing the OMEDA data? If so, please add this detail to the

Information on this now provided.

Results section.

## Other Minor Revisions

p. 4 line 54: I suggest replacing “accidents” with “crashes” (this also applies to all subsequent references to ‘accident(s)’ in the manuscript). We believe motor vehicle crashes are preventable, which is better reflected with “crash(es)” rather than “accident(s)”.

Suggested changes made.

p. 5 line 18: “the people” > “that people”

Suggested changes made.

## Results



I recommend providing more information about the symptom checklist results. One option would be to include a table showing the mean number of cold symptoms reported and the mean number of non cold symptoms reported at Session 1 and Session 2, for both Sample 1 and Sample 2.  
Suggested changes made.

Please state the type of analysis you conducted (e.g., t tests) and provide the value in Table 1 (i.e., add a column showing the t value). Also include the standard deviation of the means in Table 1.  
Information on this now provided.

In Table 2, I recommend showing results from all analyses rather than only analyses with a p value less than .05 (e.g., show data for Speed and Lateral Control analyses). The title of Table 2 would then need to be revised accordingly. Again, providing the standard deviation of the means presented in Table 2 would be helpful.  
Information on this now provided.

Take care with how results are reported. For example, p. 13, line 8 reads “. . . were more likely to spend”, when it should read “spent”. ANCOVAs statistically examine whether the means from Sample 1 and Sample 2 are equal; they do not examine ‘likelihood’.  
Information on this now provided.

For the ‘Collision with a Pedestrian’ data, was a Chi square analysis (or similar analysis, such as a Fisher exact) conducted? A similar analysis should also be conducted for ‘Traffic Light Violation’ data.  
Information on this now provided.

p. 14, line 37: “. . . drivers who reported cold symptoms violated the traffic lights twice as often as when they were symptom free” suggests you are comparing Sample 2 data from Session 1 with their data from Session 2. To remove this ambiguity, consider rephrasing to “. . . drivers who reported cold symptoms violated the traffic lights twice as often as drivers who were symptom free.”  
Suggested changes made.

When a green light changes to amber, a driver should stop if they can do so safely. Hence, driving through an amber light is not “violating the traffic light” (assuming the light did not change to red before they had completed crossing the intersection). It is possible that participants with cold symptoms were simply cognizant that their reaction time was slower than usual because they were unwell, and so they decided to continue driving through the amber light rather than stop because they felt they were unable to stop safely.

## Discussion

Take care when discussing your results. For example, p. 14, line 50 states “. . . volunteers presenting with symptoms . . . drive too closely to the car in front.” Indeed, healthy participants also drove too close to the car in front, spending a mean of 39.2% of the drive driving at a headway of less than 2 seconds. Volunteers presenting with symptoms simply spent a greater percentage of time driving too close to the car in front compared with healthy volunteers.  
Suggested changes made.

p. 14, line 58: I suggest mentioning the exact blood alcohol concentration (BAC) level you are referring to when you state “a dose that would lead to a ban from driving”, since the BAC limit that would lead to a ban from driving differs by country and state.  
Suggested changes made.

p. 15, line 6: Please include a citation for the “previous study using elderly participants”. This is a great comparison to mention and a reader may wish to access this study.

Suggested changes made.

p. 15, line 23: It is stated that “impairments associated with the common cold . . . may be observed . . . after the symptoms have gone.” Please consider providing information about the period of time that impairments might be observed after symptoms have gone. In your study, Sample 2 were considered ‘healthy’ when they reported being symptom free for more than 7 days. It is important that the reader knows whether impairments could be observed 8 days after symptoms have gone.

Suggested changes made.

p. 15, paragraph 3: Caffeine and other stimulant drinks can produce a short term increase in alertness that is subsequently followed by a decrease in alertness to a level lower than it was at the time caffeine was consumed. Thus, although caffeine might temporarily alleviate cold induced performance impairments, it may subsequently enhance impairments. In addition, many over the counter medications designed to relieve cold symptoms come with cautions to refrain from driving or operating heavy machinery for a period of time following ingestion. This would suggest such medications would not “remove the behavioural problems associated with the common cold”, but could instead compound driving related impairments (i.e., driving after taking medication to reduce cold symptoms may be more unsafe than simply driving with cold symptoms). Please consider discussing these issues in this paragraph. They would certainly be relevant when it came to information campaigns. I disagree with the comment that caffeine may subsequently enhance impairments. In addition, medications containing caffeine do seem to remove effects of having a cold (in preparation).

p. 16, line 3: Please consider rephrasing this sentence, since information campaigns do not aid in the “prevention of these effects”.

Suggested changes made.

#### Other Minor Revisions

p. 11, line 57: add “of” so it reads “. . . no effect of having . . .”

Suggested changes made.

p. 19, Table 2, 3rd row: “51.7” > “51.7%”

Suggested changes made.

p. 19, Table 2, 11th row: “a. Mean number of traffic light violations” > “d. Mean number of traffic light violations”

Removed from table.

Reviewer: Hans Schaumann

Institut für Rechtsmedizin, Verkehrsmedizin und Forensische Psychiatrie, Universität Zürich

No competing interests.

Inclusion/exclusion criteria not sufficient

the definition of “cold” is not clear

which checklist was used

was medical data compiled (temp, bloodparameter etc.)

was there a medication or domestic remedy

More details provided.



Representativity  
age of volunteers  
driving history/experience of volunteers  
negative: very selected group of patients.  
More details provided.