Author's response to reviews

Title: The Manchester Colour Wheel: Development of a novel way of identifying colour choice and its validation in healthy, anxious and depressed individuals

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Author's response to reviews:

Dear Sir/Madam,

Thank you for giving us an opportunity to revise our paper in the light of your reviewer’s comments. We have dealt with the points in turn highlighting the changes in the text in red.

Reviewer: David Simmons

1. We have included the citations mentioned and some additional references in the introduction.

2. We have clarified how the colour samples were presented and why a computer screen was not used. We have also explained how the homogeneity of colour presentation was ensured.

3. It is important to bear in mind that this is an exploratory analysis of the data. Consequently it was necessary to search for optimal permutations by identifying those which best discriminated between the various subgroups and which displayed a greater strength of relationship between the degree of anxiety/depression and positive/negative colours. This simple approach to the statistical analysis was considered to be most appropriate because of the developmental style of the paper which also resulted in the need to use a variety of statistical approaches.

4. We have now included Dr Simmon’s observations on the distribution of colours between healthy, anxious and depressed subjects in the results section of Study 3. We have also included an alternative explanation for the mood colour results which takes into account the findings of Valdez and Mehrabian.

5. We have included in the discussion a section on the possible effects of aging on colour perception and how this may apply to our study. While responding to
this point we noticed that we had not included the age and sex distribution of the anxious and depressed subjects and have now rectified this omission.

6. We have extended the discussion on the gender differences in our study and how it may affect colour perception and added the suggested reference.

7. We have included the terms saturation and brightness in various parts of the text as suggested.

8. While developing the questionnaire we found that forcing volunteers to make a colour choice with respect to mood colour was associated with much poorer reproducibility.

9. The statistician involved in this study thought that it would be easier for subjects to classify colours in this way rather than using a continuous scale and certainly when we undertook the study, participants appeared to have no hesitation in deciding on the positive or negative attribution of a colour. Furthermore, there is the traditional problem of continuous scales where participants are inclined to choose the middle, which may have made data interpretation difficult.

10. These are two very reasonable points and we have referred to them in the discussion in the sections dealing with children and mood colour choice in adults.

Reviewer: Sophie Wuerger

Response to general comment:

Our paper contains three separate studies and it was difficult to decide how to present the data. We considered writing two separate papers back to back but felt this might be viewed as 'milking' the data and therefore have tried to gather all the information together into the one paper. Consequently some of the methodology may have become less clear in trying to make the paper as concise as possible. We really appreciate these suggestions that should help us to make this piece of work more understandable and will deal with them in turn.

1. We have now defined the colours used in the study as CIE coordinates as suggested and have thanked Danny Pascale, a colour expert from Montreal, for his help in the acknowledgements.

2. This point was also raised by Dr Simmons who suggested a different way of defining positive and negative colours to Dr Wuerger, highlighting the point that there can be several different ways of dealing with this issue. It is interesting that Dr Wuerger’s method comes up with approximately the same answer as ours. However, we have now included, in the methods section, an explanation about why the permutations employed were used.
3. This is a paper describing the development of a completely novel instrument and we therefore felt that it was important to include each step in its development so that the reader can see exactly how we came to the final version, even though some steps might seem somewhat lengthy. We have consulted our statistician and she feels that the statistics used, namely the Chi-square test, is appropriate for comparing percentages between subgroups. Furthermore she thinks that, because this is an exploratory study, which aims to select the best discriminating permutation, as opposed to a conventional definitive analysis, the number of statistical tests used on the same data is acceptable.

4. We have improved the ‘in text’ explanation of these figures. We have also improved the legends to these figures but have not included a full statistical explanation as this is described completely in the text. We accept that if this were an article for a ‘paper’ journal including all these plots, especially as they are in colour, would not be practical. However, the BMC format provides us with an ideal platform for describing each step of the process which we feel is important for the reasons outlined in response to the previous reviewer. It was important to include all the plots of the permutations to give the reader the opportunity to assess the data for themselves. The rho values, written in black, represent the overall magnitude of the relationships of the three groups namely, healthy, anxious and depressed whereas the rhos values written in red, orange and blue represent the individual groups. This explanation has been added to the figure legends.

5. We agree that on ‘eyeballing’ Figures 5 and 6 the anxiety scores in healthy subjects seem to be somewhat higher in those choosing a negative colour but this difference did not reach significance, so we treated it as indicating no difference between any of the colour groups. However we have now modified the results section to comment on this apparent trend. With regard to the rho value for depression scores in healthy subjects the information presented in the text does confirm a significant relationship.

6. We have now included, in the methods section, an explanation of why drawn to, favourite and mood colour were used.

7. Dr Goncalves also raises the same point about Table 1 and it is obviously proving a very difficult table for readers to understand. We have therefore taken Dr Wuerger’s advice and now presented these data in histogram form which we think is much clearer. Obviously this has now become a figure (Figure 5) rather than a table.

8. The data in Table 1 are currently presented as a percentage of those making a colour choice, rather than a percentage of the total. However, by changing this to a figure (point 7 above) the data are now presented as a percentage of the total to allow direct visual comparison.
9. We have added more statistical information to various parts of the text as suggested in response to all three reviewers.

Reviewer: Miguel Goncalves

1. Dr Goncalves, in accord with the other reviewers, likes the content of the paper but finds it hard to follow because of the scattering of the methods and results of the different studies. Rather than have all the methods and results grouped together for the different studies as was in the original version, we have now combined the methods and results for each study but retained an introduction and discussion to cover the whole study. This has led to a brief introductory methodology section and the ethical statement being somewhat unconventionally placed in this section. We feel this re-configuration improves the clarity of the paper but would be happy to revert to the old format if the editors so wished.

2. We feel that the major reconfiguration of the paper into separate, consecutive studies answers this question. However, if it is felt that a summary table is still required, especially if you want us to revert to the old format, we would be very happy to construct a table.

3. We agree that for some of the permutations the number of subjects in some of the subgroups is very small and this was taken into account when selecting the optimal permutation. In terms of the “complexity of the analysis”, we consider that correlations and analyses of variance were necessary, again because of the need to completely explore the data.

4. The asymmetric distribution of gender was raised by Dr Simmons and we have dealt with this in the discussion. The additional comments about gender raised by Dr Goncalves have also now been dealt with in the same section of the discussion.

5. We felt that an important aspect of the development of an instrument would be reproducibility as this would exclude the possibility of colour choice just being a random event. In addition, we anticipated that if this were not included it would inevitably be raised by a potential reviewer. We have added some more text to the discussion about the reasons for including reproducibility and the choice of a two week interval. We do have experience of questionnaire development and have often included reproducibility with a time interval depending on the variability of parameter being measured. In this case we felt that colour choice should be reasonably constant over a two week period, but this should be long enough for them to forget their previous choice. With regard to the statistics used, our statistician felt that simple percentages should be presented rather than Kappa statistics as the former would be more understandable to the average reader than Kappa statistics.
6. The distribution of the data was assessed by calculating skewness and kurtosis statistics and this has been added to the sentence beginning “Parametric tests were used for the Normally distributed data”. We have added a reference for the Scheffe post-hoc comparison as suggested. Finally, we have amended the text to read “non-Normally distributed data”.

7. In response to Dr Wuerger’s comments and in the light Dr Goncalves’ remarks we have now changed Table 1 into a figure (Figure 5). It should be noted that some of the text referring to Table 1 has now been deleted.

8. The other reviewers have also raised this point and we have now generally improved the legends to all the figures and the descriptions of the tables.

We feel we have been able to answer all the reviewers’ comments and hope that the paper now proves to be acceptable.

Yours faithfully,

PJ Whorwell