May 24th, 2024

Dr. Marco Marelli, PhD

Action Editor

*Behavior Research Methods*

Dear Dr. Marelli:

We have submitted a revision of our manuscript BR-Org-24-167 “Affordance Norms for 2825 Concrete Nouns” for your consideration. We appreciate the thorough examination provided by our reviewers and are pleased that our manuscript was generally well-received. We are particularly encouraged that both reviewers saw the utility of this norm set and that Reviewer 2 was able to make connections between this work and their own. Below, we list our responses to each reviewer’s comments and cite page numbers when referring to specific changes. To facilitate the review process, we have made all primary modifications to the manuscript using blue-colored font. We look forward to your response and hope that our revised manuscript is now suitable for publication in *Behavior Research Methods*.

Sincerely,

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**Reviewer 1**

**Comment 1:** What were the age mean and SD of the participants? How many were female, male, or other?

***Response*:** We have updated Table 1 (pg. 35) to now provide this information. We now report the mean age, SD, and % female for each participant recruitment source. Thank you for this suggestion.

**Comment 2:** Although the authors state that the number of participants who responded to each cue word is found in their Shiny Applications, could they also provide the range of participants who provided responses to the 100 lists of words in the text of the procedure section?

***Response*:** We’ve now added the minimum number of participants who responded to each cue item (pg. 15).

**Comment 3:** I was quite surprised at the mean for the AFSS measure, in that, on average, there were 36 affordance responses/cue. This result obviously impacted the two other measures, and they were lower than what I would have expected. Did these results surprise the authors? Do the authors have any concerns about these results? I would like to see some discussion regarding these questions.

***Response*:** We agree that the mean AFSS of 36 is a bit surprising given how high it is; however, for most cues, we ended up with a small number of highly common affordances followed by many relatively uncommon ones leading to a positively skewed distribution. To borrow an example from the norms, the top three strongest affordances from the cue *chair* were *sit*, *push* and *stand*. However, the AFSS for chair was 51, with the majority of these affordances only being provided once or twice (e.g., *knock over*, *build*, *balance*, etc.). As noted on pg. 19 of our initial submission (now on pg. 20), this led to a negative correlation between affordance strength (AFS) and AFSS, such that cues with larger set-sizes had a reduction in mean AFS compared to cues with small set-sizes.

To account for this, we also computed affordance proportion (AFP) as an additional affordance measure. Like AFS, AFP similarity provides the likelihood of an object eliciting a specific affordance but also corrects for negative effects of set-size on the overall strength of the relationship. In our revised manuscript, we now discuss the link between AFSS and AFS in greater detail in the General Discussion (pg. 23).

**Comment 4:** Regarding the animacy effect, what were the means for the set-sizes for animate vs. nonanimated cue words?

***Response*:** Our observation that animate objects had higher set-sizes was initially based on us noticing that several animate cues had the highest reported set sizes (*me*, AFSS = 88; *someone*, AFSS = 77; *man*, AFSS = 72; *arm*, AFSS = 69, etc.). However, our dataset did not code for animacy, making it difficult to quantify this statement. To account for this, we have added an additional normed value for each cue assessing the cue’s animacy, which was derived from VanArsdall and Blunt’s (2022) animacy norms. This dataset provides norms for several facets of animacy, including an object’s degree of living, thinking, similarity to a person, and ability to move under its own power. Because only 745 of VanArsdall and Blunt’s normed items appear as cues in our norms, animacy analyses are limited to these overlapping items.

Living ratings derived from this dataset were used to quantify the animacy of our cues. These ratings were elicited via a 100-700, with higher values corresponding to a greater perception that the cue word represents a living entity. For completeness, all available Living Scale ratings have been added to Table 1 in the Shiny Application under the Animacy column.

Overall, high animacy cues (defined as cues with living scale ratings > 400) had higher *M* set-sizes compared to low animacy cues (defined as cues with living ratings < 400; 37.84 vs. 35.40, respectively). In our revised manuscript, we now report this analysis assessing animacy effects on pg. 19 and additionally report correlations between animacy and affordance measures on pgs. 19-20. Table 3 has similarly been updated to include correlations between all variables and animacy (please also see our response to Reviewer 2, Comment 8).

Taken together, animacy appears to impart a small increase to a cue’s affordance set size. However, because our dataset only partially overlapped with VanArsdall and Blunt’s norms, future work will be needed to fully explore potential animacy effects on affordances. As such, we now note this as a potential limitation in the General Discussion (pg. 22).

**Comment 5:** In the last paragraph of the GD, the authors state, “because semantic variables are often associated with the speed of lexical access in visual word recognition studies, future research may additionally wish to assess the degree to which affordance variables account for variance within this paradigm after accounting for other lexical/semantic variables”. I am surprised that the authors did not do this type of analysis at least for lexical decision latencies, as Pexman et al. (2019) did for BOI. LDT latencies are easily accessible, and this type of analysis would go a long way to support the authors’s assertions that affordance information is a key type of semantic knowledge (which I hope is true). I would encourage the authors to conduct such an analysis. It should not be too burdensome. It would be especially intriguing to see amounts of accounted for variability for their measures versus BOI in the same analysis.

***Response*:** We agree that these analyses would provide useful insights regarding how our affordance measures compare with other semantic variables. Unfortunately, as noted on pg. 20, our cue-affordance pairs have little overlap with existing associative/semantic datasets, making it difficult to run these analyses (of our 2825 cues, only 98 have targets that appear in other databases measuring semantic similarity or free-association While the lack of overlap between databases suggests that our affordance measures reflect a separate facet of meaning compared to other semantic measures (see our response to Reviewer 2, comment 14), the sample size of 98 cues is too small to confidently run these analyses. However, this study provides an important starting point for measuring affordances, and we are planning future work which will employ a larger set of cues to conduct these analyses.

**Reviewer: 2**  
  
**Comments 1:** Pg 5 l 45: Often, the ecological psychologists take issue with the use of Gibson for the concept of affordances within cognitive psychology, which is better attributed to Tucker and Ellis (1998). This is especially relevant since the Gibsonian idea is that we do not represent these things, and they are not really properties of objects per se. It would be beneficial to give a clear definition / operationalization of the term here. The later reference to Costall could be used to do so (see also point below about structural and functional affordances).

***Response*:** We appreciate you bringing this to our attention. We now provide a citation for the Tucker and Ellis paper when first introducing affordances and have provided additional framing for our definition of affordances (pgs. 5-6).

**Comments 2 and 3:** Reviewer suggested citations for additional normed databases.

***Response***: Thank for you bringing this additional literature to our attention. We now cite these additional norm sets in the Introduction when describing prior measures of sensorimotor information (pg. 6).

**Comment 4:** Pg 7 l 47: The authors state “Given the link between sensorimotor experience and knowledge representation, the present study sought to develop a set of affordance norms for concrete objects.” The focus on concrete objects here undermines their first criticism in the paragraph above i.e. that BOI correlates with concreteness. It is not clear how the presented norms overcomes the issue of only concrete nouns are used. The authors may wish to remove that critique.

***Response:*** We focused specifically on concrete objects, as by nature, objects which afford various actions are likely to be highly concrete. Our primary criticism of BOI is that as a singular, quantitative rating, that is provided retrospectively. BOI is strongly correlated with concreteness, making it unclear whether BOI is purely assessing object interactivity or if it is also capturing concreteness. As noted on pg. 7 of our initial submission, we attempted to account for this by utilizing an open-ended response format (vs. a likert rating scale), which allowed us to capture information pertaining to specific affordances rather than gathering quantitative ratings which might similarly correlate with concreteness.  
  
**Comment 5:** PG 8 l 52: should read “ensured that EACH object would be….”

***Response*:** We have corrected this sentence. Thank you for your attention to detail.  
  
**Comment 6:** Pg 10 ln 13: is there an analysis available of these metrics?

***Response***: We did not provide analyses in this section as the reported metrics are simply describing the lexical properties of the cue items.  
  
**Comment 7:** Pg 14 l 32: I could not seem to find the relative ‘raw(ish)’ data file; please clarify.

***Response*:** The raw datafile can be accessed at:https://osf.io/dsy2e. If running the cleaning script in R, we would suggest downloading the entire “4 Example Cleaning Code” folder from OSF and setting this folder as the working directory.  
  
**Comment 8:** Pg 18 l 27: The difference for animacy vs in animate is interesting but no statistic is provided. This would be useful, especially since the finding might seem counterintuitive to some readers. Also, this analysis was not described in the introduction as an interest and it would be beneficial to add a paragraph exploring why animacy is interesting or in what ways it was dealt with in the development of the stimulus set. I think this could make a great addition to the paper.

***Response*:** We have updated the manuscript accordingly. We now discuss the potential for animate objects to elicit more potential affordances when we introduce our research questions (pg. 17). Additionally, we now report mean animacy ratings for our cue items on pg. 10 of the Methods and report changes in AFSS as a function of animacy for a subset of our cues (Please see our response to Reviewer 1, comment 4, for details). Finally, we now discuss our animacy findings in the General Discussion (pg. 22)   
  
**Comment 9:** Pg 18 l 41: What does ‘strongest affordance pairing’ mean here? Please clarify.

***Response:*** By strongest affordance pairing, we mean taking each cue word and pairing it with the affordance response which had the highest AFP value. We have clarified this point on pg. 19.  
  
**Comment 10:** Pg 21 l 43: What is the ‘behavioural ecology account of affordances’? Is there elaboration/a citation that can be provided? Specifically, why would frequent objects lend themselves to more uses?

***Response*:** By a behavioral ecology account, we simply mean that because one’s environment provides individuals with opportunities for action, objects which occur more frequently within the environment are likely to receive more uses, leading to a larger potential action set versus infrequent objects (see Withagen, de Poel, Araújo, and Pepping, 2012) We have added an additional citation on pg. 23 directing readers to a review of this account.  
  
**Comment 11:** Pg 22 l 26: While reading, I was struck by how similar this task is to a common task of divergent thinking called The Alternative Uses task (AUT). In that task, participants are given a word (e.g. pen) and asked to generate as many uses for a pen as possible. They are often encouraged to ‘be creative’ and responses are often coded for how creative they are. Typically, more obvious boring descriptions come first, then they increase in creativity. In this way, it is extremely similar to the generation task participants performed in the present study. Recently, colleagues and I have been developing an ‘embodied/grounded’ conceptualization of this task, in which we posit that creative performance is supported by the generation of multiple action affordances with the objects, and a key to creativity is finding uncommon affordances (which creative people tend to have the ability to do by definition, or environmental changes can be used to facilitate uncovering them). We have a coding scheme that codes ‘embodied’ dimensions of the responses in the AUT (e.g. whether a described use invokes a common action or a novel action). For instance, a use for a hammer might require a typical hammer-related swinging motion (e.g. if you are using it to pound out bread), or an atypical action (e.g. if you are using the handle as a rolling pin to flatten bread). I agree with the authors that their norms are a great addition to investigations looking at common vs. uncommon uses of objects and the underlying affordances associated with objects. I wonder if the authors would find it useful to elaborate on their idea here (they give it one sentence and then move on), especially given the history of the AUT. Indeed, my first excited thought about these norms was to investigate the relationship between creativity measures and the affordance dimensions the authors have developed.  
  
If the authors are interested, our most relevant publications include:  
  
Matheson, H. E., & Kenett, Y. N. (2020). The role of the motor system in generating creative thoughts. NeuroImage, 213, 116697.  
  
Matheson, H. E., & Kenett, Y. N. (2021). A novel coding scheme for assessing responses in divergent thinking: An embodied approach. Psychology of Aesthetics, Creativity, and the Arts, 15(3), 412.  
  
Matheson, H. E., Buxbaum, L. J., & Thompson-Schill, S. L. (2017). Differential tuning of ventral and dorsal streams during the generation of common and uncommon tool uses. Journal of Cognitive Neuroscience, 29(11), 1791-1802.  
  
Yes this is in part a shameless ‘self plug’ but also I hope it might be useful, especially to draw the reader’s attention to the related task of the AUT and the idea that different affordances of objects are key to their meaning, as the authors propose early in the manuscript.

***Response*:** This is an interesting connection with our work, and we agree that there are many similarities between the AUT task and our affordance norming prompt. We have expanded our discussion of common versus uncommon affordances in the General Discussion and now discuss how the AUT task relates to our affordance norms (pg. 24). Thank you for bringing this additional literature to our attention.  
  
**Comment 13:** Pg 24 l 6: related to my previous comment, what do the authors mean when they say “we wanted to avoid inadvertently priming participants to respond with specific object uses based on a certain type of object?” Do they mean they used words to avoid visually presenting particular affordances? Or do they mean they wanted to see creative object uses? Please clarify.

***Response:*** We simply mean that we did not want to prime participants towards responding with specific particular affordances by showing them pictures of specific objects. For example, the word *ball* may elicit different affordances based on the type of ball and the corresponding sport that it is associated with. For example, a *baseball* may afford *throwing*, *catching*, and *hitting*, an *American Football* might also afford *throwing* and *catching* but also afford *kicking*, and a *Basketball* might afford *dribbling* and *shooting*, in addition to *throwing* and *catching*.

We have rephrased this sentence on pg. 26 to indicate that we did not want to prime specific affordances. We have also clarified this point on pg. 8 when we first introduce our norming task.  
  
**Comment 14:** General comment: The authors seem to want to make the point that their values provide unique information compared to BOI and other semantic measures. To elaborate on this point, the authors may consider data reduction techniques like factor analysis or ICA. They may be able to further quantify the extent to which their ratings exist as a separate factor.

***Response*:** Yes, you are correct that one of our primary conclusions is that affordance information reflects a unique construct of meaning. As we noted in the General Discussion of our initial submission (pg. 22), this notion is consistent with previous studies which have identified clear separations between normed measures assessing different facets of meaning (e.g., cue-target associations, semantic feature similarity, etc.; see Maki & Buchanan, 2008). We agree that applying these types of analyses to our affordance norms would provide interesting insights; however, these analyses are beyond the scope of this paper (please also see our response to Reviewer 1, comment 5).

In our revision, we have expanded our discussion of the need for future work to explore the degree to which affordances comprise a separate factor of meaning (pg. 25). We thank you for this suggestion.