Peer Community In
Health & Movement Sciences

Capturing Individual Differences in the Valuation of Physical Effort

Boris Cheval *based on peer reviews by* ***Silvio Maltagliati*** *and* ***Erik Bijleveld***

Maik Bieleke, Johanna Stähler, Wanja Wolff, Julia Schüler (2024) Development and validation of the Value of Physical Effort (VoPE) scale. OSF preprints, ver. 5, peer-reviewed and recommended by Peer Community in Health and Movement Sciences.
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Physical effort has long been viewed as an aversive experience that people generally seek to avoid, giving rise to the so-called ”law of least effort,” which posits that, other things being equal, people tend to minimize effort when engaging in goal-directed tasks. This principle has recently been applied to physical activity behavior (Cheval & Boisgontier, 2021). However, beyond this general view of physical effort as an aversive experience to be avoided, substantial individual differences in the valuation of physical effort have been observed. This suggests that some individuals may actually evaluate physical effort positively. Contrary to the law of least effort, these individuals may prefer behavioral alternatives that require more effort, all else being equal (Inzlicht et al., 2018). Until the development of the Physical Effort Scale (Cheval et al., 2024) and the present work by Bieleke et al. (2024), no formal scale existed to capture such individual differences in the valuation of physical effort. The primary goal of the present study was to design, develop, and validate such a scale. To achieve this goal, the authors conducted three independent studies (total N = 1,364) to establish the psychometric properties of the Value of Physical Effort (VoPE) scale (Bieleke et al., 2024). Across these studies, using both cross-sectional and longitudinal designs and a variety of statistical techniques (e.g., psychometric network analysis, elastic net regression), results indicated that the VoPE scale has robust associations with physical activity behaviors, strong test-retest reliability, and captures unique variance in predicting exercise behaviors. Taken together, these findings suggest that the VoPE scale is a valid and reliable measure of individual differences in the valuation of physical effort. **References**

Bieleke M, Stähler J, Wolff W, Schüler J. Development and validation of the Value of Physical Effort (VoPE) scale.PsyArXiv. 2023, version 5. https://doi.org/10.31234/osf.io/pqw26. Peer-reviewed and recommended by Peer Community in Health and Movement Sciences. https://doi.org/10.24072/pci.healthm

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Inzlicht M, Shenhav A, Olivola CY. The effort paradox: effort is both costly and valued. Trends Cogn Sci. 2018;22(4):337-349. https://doi.org/10.1016/j.tics.2018.01.007

Reviews

Evaluation round #2

Reviewed by Silvio Maltagliati, 11 August 2024

All my comments have been successfully addressed and I would like to congratulate the authors for their hard work on this manuscript.

Reviewed by Erik Bijleveld, 19 September 2024

I have re-read the manuscript and I appreciate the changes that the authors made to the manuscript in response to my comments.

Evaluation round #1

DOI or URL of the preprint: https://doi.org/10.31234/osf.io/pqw26
Version of the preprint: 4

Authors' reply, 29 July 2024

Download author's reply

Decision by Boris Cheval, posted 13 June 2024, validated 13 June 2024

Development and validation of the Value of Physical Effort (VoPE) scale - Major revision requested

Dear Authors,

Thank you for your submission titled "Development and validation of the Value of Physical Effort (VoPE) scale". The study establishes the basic psychometric properties of the VoPE and tests associations with measures of sports and exercise behavior.

I am pleased to inform you that the review process for your manuscript has been completed. In my own reading of the manuscript (and echoed by the comments from the two reviewers), this a very well-done study with several strengths, the methods and analysis are rigorously conducted, and the presentation of the results

is transparent. I found the points raised by the reviewers important to address before I can recommend publication. I agree with all of them and would like to highlight two in particular:

1) A critical aspect that needs further elaboration is the process used to arrive at the final 4-item version of the scale. The current description lacks sufficient detail, making it challenging for readers to fully understand the methods and rationale underlying the selection of the four items. In my opinion, the manuscript would be strengthened by providing more detailed information on the procedural aspects of scale development.

2) Another important consideration is the ”dual nature” of effort, at least in the context of physical effort. Based on the existing literature, it can be argued that effort can be perceived as both aversive and positive, depending on various factors such as individual differences, context, and prior experience. The manuscript would benefit from a more nuanced discussion that incorporates this point.

Therefore, I encourage the authors to address all of the reviewers' suggestions and incorporate them into their manuscript.

Best regards,

Boris Cheval

Reviewed by Silvio Maltagliati, 18 April 2024

Overview and general recommendation:

I have read this manuscript with the greatest interest and I feel it stands out by its sophisticated methods, the transparency of reported results, as well as by the quality of its figures. I also have a few comments and I hope they will help to improve the overall quality of the manuscript.

Introduction:

1- The Introduction section is straightforward and nicely expands on the fact that despite its seemingly aversive nature, effort can also be valued, at least by some individuals. At least one question came to my mind. How would the tendency to value physical effort fit other theoretical models and would potentially, enhance their predictive value? For example, could the value assigned to physical effort moderate the link between intention and physical activity behavior (see some work my research team is conducting at the moment: : https://doi.org/10.51224/SRXIV.375) or could it be rather be involved in mediational pathways between other motivational factors and physical activity? I have the feeling this point could either be addressed in the Introduction section or in the Discussion section and would facilitate the theoretical integration of this construct within other motivational models.

Methods and results:

1- I think that some important points are missing regarding the development of the scale. For example, how were items developed (e.g., number of authors involved, discussion between them), were more items initially developed (before items reduction)? Also, I wonder whether retaining four items just because they were positively framed items makes complete sense from a psychometric perspective – using reversed items could also be relevant and could had further enhanced the reliability of the scale? I think that these methodological steps should be clarified and/or identified as missing in the Discussion section. I think this article could be of interest: https://doi.org/10.3389/fpubh.2018.00149

2- Another important limitation stems from the fact that the scale seemed to be developed in German originally, but then MTurk samples were composed of US citizens. How was the translation of the scale from German to English done? Ensuring cross-cultural equivalence appears as an important step to ensure comparability across nationally diverse samples. More details could be provided here and would deserve to be discussed later in the manuscript.

2- The Methods and Results sections are very dense, because of the diversity of measures/analyses that were conducted. I am not an expert in some of these statistical approaches (e.g., machine learning, network analyses), but they seem relevant and adequately described. One point I struggled to follow was the number of participants that were retained for each analysis, as well as the Study it corresponds to. Could authors please consider adding a Table (or a Figure) summarizing the number of participants that were included for each analysis, as well as whether participants from Studies 1, 2 and 3 were gathered or not? For example, it was unclear to me which sample was used for machine learning analyses – was the full sample used there?

2- Also, I would be very curious to see whether the VoPE scale score correlates with some sociodemographic determinants (e.g., with age or education level)? Also, have authors considered adjusting the models predicting physical activity levels for some of these relevant sociodemographic factors?

3- The network analyses are fascinating and I was glad to learn more about that. However, I also think that a "basic" correlation table could also be added (maybe in the Supplementary material) to facilitate comparisons with existing literature (e.g., with the Physical Effort Scale, Cheval et al., 2023)?

Discussion

I have really enjoyed reading the Discussion section and I have a few comments/questions.

1- Authors state that "Boredom is a value-based experience (Martarelli et al., 2023), which makes it plausible that people get bored by sports and exercise because they ascribe little value to the physical effort involved". From my naive understanding, boredom constitutes an unpleasant experience in which people perceive time as passing slowly, and feeling restless, trapped unchallenged, and perceiving the situation as meaninglessness (see https://doi.org/10.1177/10888683211010297 for a review). Following this definition, can allocating a high effort to a certain task lead to boredom (i.e., little challenge for example)? From my opinion, assigning a low value to effort may rather overlap with effort-based amotivation (e.g., 10.1111/j.1559-1816.1999.tb00122.x). Maybe that a stronger rationale or a more nuanced explanation could be proposed here to discuss the link between the VoPE score and boredom in sports.

2- Authors highlight that "the VoPE scale explained little variance of mild forms of exercise and activities, which might be due to its focus on sports rather than on physical activity." This result is not only consistent with the findings regarding the PES (Cheval et al., 2023), but it also suggests that beyond a certain level of perceived effort (e.g., standing, walking), the valuation of physical effort may not be as relevant as to predict more vigorous activities. Maybe that finer-grained measures (e.g., accelerometry, ecological momentary assessment) are in fact needed to better investigate this question and overcome social desirability biases that might blur these associations. Overall, I think that the self-reported nature of the physical activity data should be mentioned as a limitation from the current findings.

3- Finally, I think that readers (be they researchers or practitioners) may enjoy finding the full version of the scale somewhere, with a manual providing all the instructions and scoring procedure. Maybe that authors could consider adding this manual as a supplementary material?

Again, I want to congratulate authors for their hard work and I wish them the best of luck with their ongoing and future projects.

Silvio Maltagliati

Reviewed by **Erik Bijleveld**, 31 May 2024

I have read and understood the manuscript titled ”Development and validation of the Value of Physical Effort (VoPE) scale”, which was submitted to PCI Health & Movement Sciences. The paper reports three studies that assess the psychometric properties of a new 4-item scale to measure the value of physical effort. I should note that I am not an expert on psychometrics and scale development, so I cannot assess whether the authors empirical work meets all relevant methodological standards. That said, I can see that this new scale could be useful to the research community, and – to the best of my assessment – the empirical work appears thorough. I also appreciate the completeness and clarity of the OSF repository. I have no objections to this work being published, but I do have two comments:

1) Physical exercise is associated with many different potential rewards. For some people, exercise may come with social rewards (e.g., having pleasant social interactions during or after the exercise; the pleasure of scoring a goal or a point) or mastery-related rewards (i.e., the pleasant experience of getting better at something). For others, exercise is experienced as progress towards a valued goal (e.g., related to health, fitness, appearance). Still others reward themselves after exercise (e.g., by allowing themselves to use their favorite bath salt). I agree that the prospects of obtaining tangible rewards may often be neglible (p. 2), but my point is that non-tangible rewards may of course have substantial subjective value as well. Against this background, there seem to be two possibilities:

– A) Physical effort is aversive, but it can readily be offset by all the rewards mentioned above. This is why people may choose to engage in exercise, and this is why they may enjoy activities that involve exercise (e.g., gym visits). However, the effort itself remains aversive. People engage in sports and exercise despite the physical effort.

– B) Physical effort is, for some people, pleasant in itself. This is indeed akin to what Cacioppo argued for mental effort: Some people like to think hard. By extension, some people may just like the exercise hard. People engage in sports and exercise because of the physical effort.

In the introduction, the authors seem to double down on mechanism (B). But can they really exclude A? In my view, these two perspectives are hard to disentangle. More concretely, if someone scores high on the VoPE, can the authors be really sure this person enjoys effort per se? Or do they just enjoy going to the gym, for example, because this allows them to also be around their friends? I would welcome a more nuanced perspective about this issue: when people score high on the VoPE, what exactly do they enjoy or value, and how do the authors know this?

Note: I put some thought in this issue myself, and – for mental effort – my co-authors and I came to the opposite conclusion (written up in David et al., 2022, which the authors cite; we will post an update in June 2024). But as mentioned, I think the two options are hard to dissociate definitively, and I think there is ample room for different intepretations, especially since the authors’ rationale specifically focuses on physical effort.

2) I think it would be worthwhile to know a bit more about how the authors went from 10 items (which they apparently deemed relevant a priori) to 4 items. Specifically, by removing these 6 items, does the measure still capture the full breadth of the construct? I am not saying it doesn’t, but the paper would be stronger if the authors more clearly justify the choices to keep vs. delete items.