Author’s response to reviews

Title: "OPTImAL": an ontology for patient adherence modeling in physical activity domain

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We would like to thank the reviewers for their constructive comments and suggestions. Below we provide our answers to each point raised.

Zhe He (Reviewer 1): The authors have adequately addressed my comments in the last round. The only one suggestion I have for this version is to replace the citation [32] with the following paper: Ochs, C., Geller, J., Perl, Y. and Musen, M.A., 2016. A unified software framework for deriving, visualizing, and exploring abstraction networks for ontologies. Journal of Biomedical Informatics, 62, pp.90-105. http://www.sciencedirect.com/science/article/pii/S153204641630051X

Citation [32] was replaced with the paper proposed by the Reviewer. See References, page 20, line 24.
Juan Antonio Lossio-Ventura, Ph.D (Reviewer 3): This paper describes the construction of an ontology related to cardiovascular patient adherence to physical activities. This work is well detailed, clear, and organized. The motivation is very well explained too. I have a few concerns:
- How many published studies did the authors use to develop the ontology?

The developed ontology is based on 41 studies selected through the literature review described in the manuscript. The number of studies was added to the Methods section. See Methods, Elicitation of domain knowledge, page 6, line 40 (“The ontology is based on 41 published studies”).

- Why did not the authors take as seed the ontology proposed by Kostopoulos et al [21]? This ontology seeks to propose exercise plans for individual suffering heart diseases. So, could have this ontology been enriched with the other lacking aspects?

We recognize the ontology proposed by Kostopoulos et al. (in the development of which, co-authors of the current paper were involved) as being related to the same domain with the OPTImAL. The ontology by Kostopoulos et al. aimed to support a personalized exercise prescription. The concepts of the framework include patient’s anthropometric (e.g., BMI), physiological parameters (e.g., blood pressure), and preferences (e.g., preferred exercise type) to propose the exercise that the patient is recommended follow. OPTImAL is an evidence-based ontology focusing on physical-activity-related adherence of patients. It is built upon research results regarding patient adherence to physical activity and exercise in different settings so that the medical professional can use the tool based on the results of the medical studies to understand the influence of various factors on the adherence of a patient. The concept of adherence – which is central in OPTImAL – is missing in the ontology proposed by Kostopoulos et al. Moreover, we did not find the other concepts that could support the interpretation the relationships of factors influencing adherence to physical activity-related adherence in different settings. In other words, the ontological concepts and focus used for the Kostopoulos’s et al. ontology differ majorly. Due to that, OPTImAL was designed from scratch. We extended the sentence explaining our decision to develop a new ontology. See Background, Research data reusability through ontologies and related work, page 4, line 28, the change is in line 31(“... or other concepts that could support the interpretation of the relationships between the adherence and patient-related factors”).

- Do not need to cite in every sentence, for instance, citation [21].

One of the citations [21] was removed as proposed. See Background, Research data reusability through ontologies and related work, page 4, line 20.
- Table 1, Bickmore & Schulman [21] is a wrong citation, it must be [19].

The citation of the ontology presented by Bickmore & Schulman in Table 1 was replaced with citation [19]. See Background, Research data reusability through ontologies and related work, page 4, line 7.

- Table 2, "Target users" may be rephrased as: The primary target users are healthcare professionals working with cardiac patients, aiming to (User 1) recommend or (User 2) coach them on physical activity and exercise. Another group of target users (User 3) is professionals involved in the development of software solutions to support physical activity and exercise performance of patients. Target users: User 1 - Cardiologist User 2 - Cardiac rehabilitation program trainer User 3 - Software developer or researcher working in the domain related to CVD patient adherence in physical activity domain.

A part of the sentence was rephrased as follows “…aiming to recommend (User 1) or coach them (User 2) on physical activity and exercise. Another group of target users (User 3) is professionals involved in the development of software solutions to support physical activity and exercise performance of patients…”. See Methods, Ontology development, Ontology specifications, page 6, line 8.

- Section "Ontology individual" has a repetition of paragraphs.

The repeated sentence was deleted. See Results, Description of the developed ontology, Ontology individuals, page 12, line 16.

Misspellings: - In this study, we introduce OPTImAL, a reusable ontology model focusing on physical-activity-related adherence of patients with heart disease is proposed -> delete "is proposed".

The phrase “is proposed” was deleted. See Background, Rational, our aim and contribution to the field, page 5, line 8 (“In this study, we introduce OPTImAL, a reusable ontology model focusing on physical-activity-related adherence of patients with heart disease”).
Paul Taylor, Ph.D. (Reviewer 4): The section titled 'Rational' should be 'Rationale'.

The word “rational” in the title “Rational, our aim and contribution to the field” was replaced with “rationale”. See Background, page 4, line 34 (“Rationale, our aim and contribution to the field”).

"We comprised a combination of patient factors (e.g., age, motivation, lifestyle, etc.) and factors related to a particular type of adherence and its quality under a specific kind of physical fitness and their settings (e.g., independent physical activity, an exercise in CRP, etc.)." I'm not sure what this means, I don't think 'comprised' is the right verb.

The verb “comprise” was replaced with “outlined.” The sentence is modified as “Based on the literature analysis, we outlined patient-related factors (e.g., age, motivation, lifestyle, etc.) associated with a particular type of adherence, its quality under a specific kind of physical fitness and settings (e.g., independent physical activity, an exercise in CRP, etc.)”. See Background, Elicitation of domain knowledge, page 4, line 36.

"The respective individuals include patients with depression; female and male population; Jew, Arab, and Jordanian population; study participants after cardiac surgery, heart transplantation, and (acute) myocardial infarction; patients with a history of heart failure and uncomplicated myocardial infarction, and patients with heart transplants.” These classifications do not seem to be universally helpful, that of 'Jew, Arab, and Jordanian population' seems particularly inappropriate outside of a single geographic setting. This seems an interesting challenge to the method. Perhaps worth discussing?

We agree that the instances of this particular class (i.e., StudiedPopulation) seem semantically heterogeneous, given that they may reflect information concerning ethnicity or even a geographic setting. The instantiation of the StudiedPopulation class originated from the data contained in the medical studies that OPTImAL relied on and our main aim was to incorporate these data as accurately as possible in the OPTImAL. Although we explored the potential to link these data with relevant ontologies (e.g., the Ethnicity Ontology, available from https://bioportal.bioontology.org/ontologies/EO/), this was not straightforward as a process. In the revised manuscript, we clarify that: "We found it to be relevant to capture particular patient characteristics of the studied populations in the class StudiedPopulation, which mainly supports an additional description of the patient profile in our ontology."