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Development of a Concourse for Two Q-Method Studies Exploring Perspectives of Patients with Multiple Sclerosis and Healthcare Professionals on the Use of Wearable Technology-Lessons Learnt

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Abstract. This paper presents the generation of a Q-set for two Q studies investigating the perspectives of (1) patients with multiple sclerosis and (2) their healthcare professionals on the use of wearable technology. It describes the adopted Q methodology and how it was applied in different phases. The concourse is derived from the relevant literature, based on the unified theory of acceptance and use of technology (UTAUT2) model, with privacy as a moderator, and Hofstede's "Cultural Dimensions" framework, incorporates statements drawn from the concourse following review by experts This is followed by a pilot study involving 4 stakeholders to improve the relevance and quality of the research. A 43-statement Q-sample was developed for the first Q study, and a 32-statement Q-sample was developed for the second Q study. This preliminary study reported the development of a legitimate and reliable concourse in a transparent and comprehensive manner. The lessons learnt from developing the concourse in this study could be beneficial for future research when conducted in a similar digital healthcare context and in the context of MS where individuals often experience symptoms related to vision, sensation, coordination, and movement.

Keywords. healthcare technology, multiple sclerosis, wearable technology, Q-methodology

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1. Introduction

Health monitoring and tracking are in demand globally to understand how users move and act in different environments and optimize healthcare resources. The global wearable medical device market will be worth USD 52.57 billion by 2025, driven by patient and provider adoption of technological solutions [1]. While wearable technologies ("wearables") can give basic feedback in the form of reminders and encourage users to walk or stand more, other wearable devices can give personalized wellness information and advice to help users to reach their health and fitness goals [2]. Data from wearables can help healthcare professionals (HCPs) evaluate the long-term progression of diseases to facilitate prompt therapies, especially in relapsing remitting multiple sclerosis (MS) [3].

It is crucial to explore the perspectives and needs of patients and HCPs concerning the use of new technologies, as their acceptance reflects clinical efficacy and affects the success of implementation [4]. Research lacks evidence on whether wearable devices are acceptable to people with MS, potentially undermining their effectiveness in promoting behavior change [5]. In this regard, Q methodology offers a panoramic and diverse way to consult a range of opinions on a topic, focusing on how and why people believe a certain way, rather just how many of them think a specific way [6]. Q-methodology as a research method was initially formulated by William Stephenson in 1935 as a combination of qualitative and quantitative research techniques, enabling the systematic study of subjective phenomena [7]. This paper focuses on the developing a concourse and statements for two Q-method studies: Study 1, of people with MS (PwMS), and Study 2, of their HCPs. The focus is to provide a guide to develop a concourse and Q-set for other studies looking into subjectivity in a similar context. This will be achieved through the lessons learnt in developing the concourse and Q-set for the current Q-method study. **Study objectives**: 1- To describe the creation of statements (the Q-set) for a Q-method study on how PwMS and HCPs in Saudi Arabia (SA) perceive wearable technology use. This study aims to address a lack of user perspectives on wearables for MS management in SA. The choice of the data collection setting was made based on socio-cultural context and the number of PwMS (approximately 500 patients) treated in the setting. 2- To create a concourse and statements from the literature on wearables in healthcare, UTAUT2 with privacy as moderator, and Hofstede's "Cultural Dimensions" framework.

2. Methodology

A concourse and statements for Q-method studies must represent a range of viewpoints, perspectives, and attitudes on the research topic. The prerequisite phases as applied in this study's concourse development are explained below, for the two Q studies undertaken from March to September 2023.

Phase One: Concourse Development: Q-methodology begins with a set of statements (the Q-set) considered to represent the "universe of viewpoints" on a certain topic [7]. In the current study, the concourse was derived from the relevant literature and the findings from the conducted scoping review on the use of wearables among PwMS and HCPs, as well as literature around technology adoption in MS, and managing other long-term conditions [8]. The UTAUT2, with privacy as moderator, and Hofstede's "Cultural Dimensions" provide the theoretical frameworks to identify the themes for the

Q-sets for this study. The UTAUT2 is widely used to study technology acceptance in healthcare, but despite being a very comprehensive model, it does not have the ability to answer all the research questions and explain all causal relationships between variables [9]. Another model adopted to explore the cultural aspect of adopting a new technology is Hofstede's "Cultural Dimensions" framework [10]. Researchers and developers of new technologies use the eponymous cultural dimensions of "individualism-collectivism, uncertainty avoidance, power distance, masculinity/femininity, and long/short-term orientation" to understand culturally conditioned user preferences, habits, and expectations [11].

Phase Two: Generating Initial Statements List: All potential statements related to the adoption of wearables in managing health from the literature were identified for inclusion in the concourse with a focus on English language sources. During Study 1 a total of 104 statements were retrieved from the literature around the patient perspectives, and in Study 2 a total of 43 statements were retrieved from the literature around HCPs' perspectives. The researchers followed an iterative process to evaluate the statements. Statements numbers were reduced with criteria such as readability, repetitiveness, and clarity of statement. They then linked the statements to the theoretical frameworks (UTAUT2 and Hofstede's "Cultural Dimensions"), ensuring that all themes were represented by the statements. This aided in formulating the concourse's structure, and rendered data analysis more robust during the Q-sorting.

Phase Three: Face Validity/ Stakeholder Involvement: The final set of statements were reviewed by stakeholders, including HCPs and patients, as well as experts in digital health and Q methodology. The reviewers evaluated the items' validity, ensuring the quality of items and their relevance to the study scope. Feedback received from the reviewers was considered by the researchers where suitable. Study 1 statements were translated into Arabic by a professional translator, then a bilingual expert in both Arabic and English independently translated these versions back into English. The back-translated English version then compared to the original text by the researchers, to assess and amend differences between the two versions.

Phase Four: Pilot Testing Statements: A pilot study was conducted with two participants for each study (i.e., Study 1 and Study 2), to assess the statements' clarity, comprehensibility, and content validity. The researchers recruited participants for this pilot study using their personal contacts and pre-existing social networks of MS patients and HCPs.

Phase Five: Finalizing Concourse: After receiving comments from the pilot test and conducting an in-depth review, participants utilized the following criteria: all items should be clear, concise, and relevant to the concept of using wearables in MS. We then made the final selection of statements for the concourse. These statements were chosen to accurately represent a wide range of opinions on the research issue. As a result, minor modifications were made to three statements.

3. Findings

From the PwMS (Study 1) a total of 43 statements were included in the final version statements, while from the HCPs (Study 2) a total of 32 statements were included in the final version statements. We believe this relatively small number of statements is due to the limited concourse related to the perspectives of HCPs around the use of wearables.

Figure 1 shows the process of the development of a concourse for the two Q-Method studies.

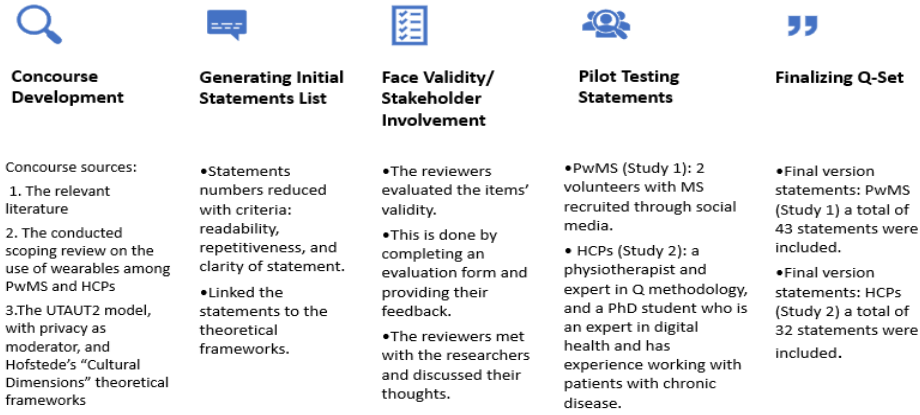

Figure 1. The process of concourse and Q-set development included five phases.

Table 1 shows an example of the final version of some statements that linked into thematic categories or dimensions based on the adopted theories.

Table 1. Example of developed statements linked to themes.

Themes/dimensions	Study 1 (PwMS)	Study 2 (HCPs)
Performance expectancy	Using wearables would increase daily physical activities (e.g., walking, biking).	Using wearables would increase patients daily physical activities (e.g., walking, biking).
Effort expectancy	Learning how to use wearables is straightforward for me.	Learning how to use wearables would be easy for my patients.

Collaborating with stakeholders enables us to understand and address their requirements by including their viewpoints in the study. This enhances the relevance of the study and minimizes any complications in its application. Another lesson derived from the study on individuals with multiple sclerosis (PwMS) is the importance of dedicating additional work into simplifying the items and designing the cards and grid, and estimating how long it will require to complete the study on average, considering the MS participants' characteristics such as visual impairments, fatigue, and impaired hand mobility.

4. Discussion and Conclusions

Stakeholder involvement in research design provided valuable insights and increased the study's relevance and applicability, yet there were drawbacks. We could not engage a larger number of PwMS study due to a limited number of volunteers at the development phase. Although choosing items from prior studies or developing new items based on theoretical principles strengthens the findings of this study, the pre-structured Q sort of the Q studies without further evaluation may limit the significance, reliability, and validity of representing the intended concepts [12]. Therefore, we sought to reduce

selection bias by reaching participants who had similar characteristics as we could in both groups, PwMS and HCPs. The concourse development process is not a well-established process, and despite some suggestions [13] this work complements the efforts towards more detailed steps of the activities needed for the concourse and Q-set development. Given the importance of the concourse and Q-set in Q-methodology, we argue that clearer reporting of concourse development and a standardized methodology for the development of the Q-set is required.

This preliminary study transparently and exhaustively documented the establishment of a valid and reliable concourse for the Q-method study, but most importantly proposed a development methodology for the concourse and Q-set alongside discussing the lessons learnt.

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