The Methodological Approach in Developing Interactive Mobile Devices for Geriatric Persons (Geriatric Person-Centered Methodology)

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Summary

The graying population, in the recent past, has become an area of interest in developing countries. While many studies have explored the needs of older adults, tools and techniques engaged produce solutions less substantial in the psychosocial well-being of geriatric persons. The roles the older adults had in traditional society are amiss in modern society, depriving them of self-worth and a sense of belonging in a world fully engulfed in modern technology. This prompted the researchers to explore how modern technology can continue these roles that hold an intrinsic value for the older population. To achieve this, the researchers conducted an exploratory qualitative study to give an in-depth knowledge of the psychosocial needs of geriatric persons, therefore contributing to the methodology by using a series of time orders, giving a clear and in-depth understanding of the underlying issue of modern technology use.

Keywords: Geriatrics, Mobile Devices, Methodology

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Introduction

The graying population over the years is taking an upward trajectory as special care and innovations through modern technology are increasingly being appreciated; for example, Ambient Assisted Living (AAL). Aging technologies have majorly been used to keep the geriatric population physically and psychologically fit. The significant advancements of modern technology have proliferated the physical well-being of geriatric persons as it enables monitoring (1–4), appointment reminders (5,6), medicine schedule reminders (7–10), exercise (10–14), etc., especially in developed countries. This research observes that modern technology for the psychosocial well-being of geriatric persons in both developed and developing countries is underexplored.

In the traditional society, older persons were known for various roles such as mentorship, mediators, and storytellers of historical events or inspirational stories. These roles were impactful as the younger generation were keen and gleaned to the advice given by the geriatric persons. The communal culture ceased as modernisation paved the way for the younger generation to venture into the urban cities for employment, therefore contributing to these roles not being adequately carried out (15). These roles were essential to the geriatric persons as it commanded respect for them,

were seen as a higher authority, and therefore having a sense of belonging because of their worth to society. Therefore, modern society has limited these roles, disengaging the geriatric persons from society and left to live an isolated and depressed life. This prompted the researchers to examine how modern technology can bridge the physical distance between the geriatric population and the younger generation to continue these roles that hold an intrinsic value for the older population.

To achieve this, the researchers carried out an exploratory study and qualitative data was collected as it gave in-depth knowledge of the psychosocial needs of the geriatric persons. The methodological process is elaborated herein. As a research methodology; the research design, the data collection tools, and analysis considered while carrying out an underexplored topic on modern technology use are the impetus to the psychosocial satisfaction of the graying population.

Research design

In choosing the research methodology, Singh (16), quoting Atieno, states that the paradigms give a researcher a firm understanding of the philosophical underpinning of their research in consideration of the underlying assumptions on ontology, epistemology, methodology, methods, and source. This shows the interrelationship between the building blocks of research, as shown in **Figure 1**
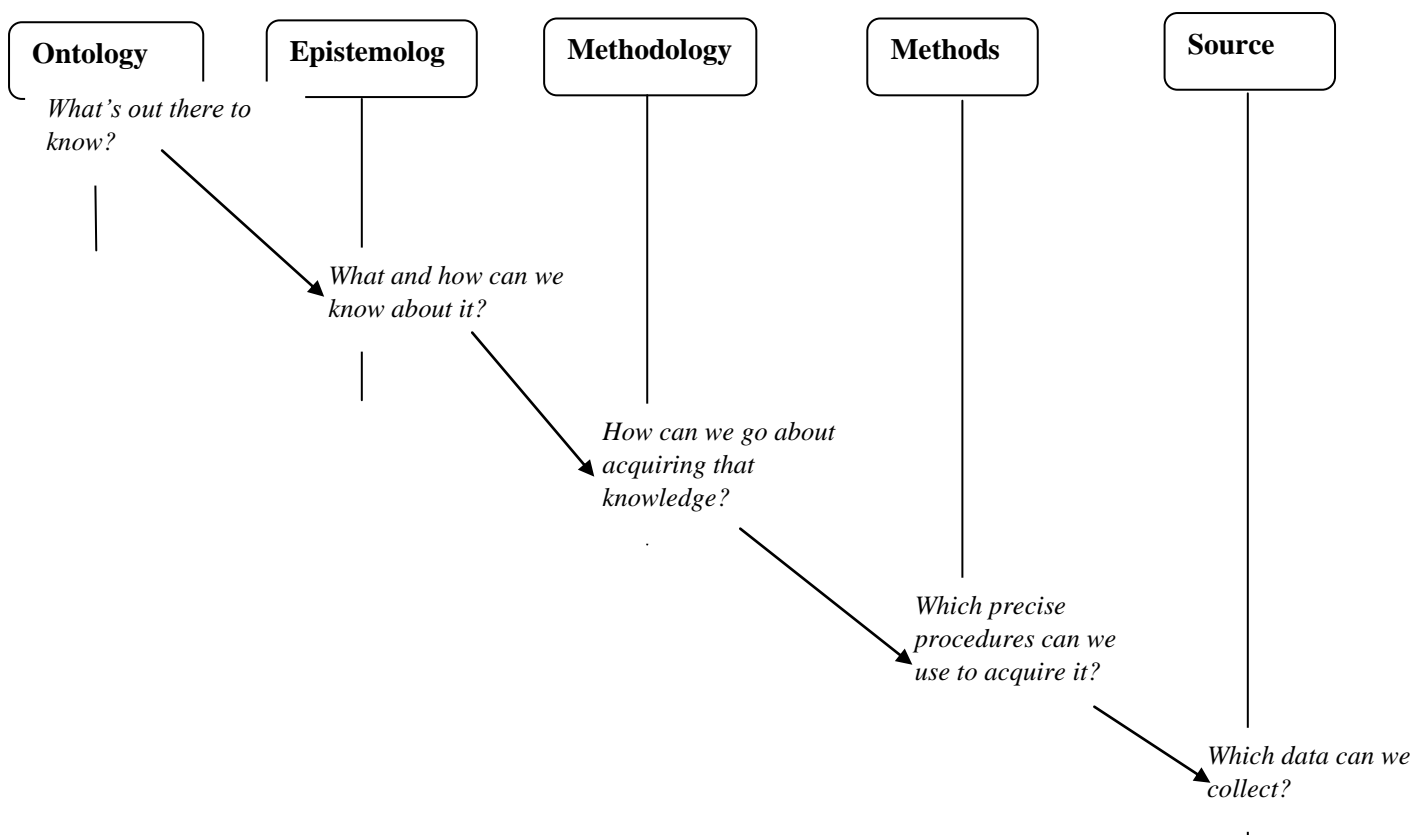

Figure 1:Interrelationship between the building blocks of research. Source: (16)

The researchers achieved in-depth knowledge through the pragmatism paradigm that gave knowledge on the user behaviours, shared beliefs, and the human experiences on modern technology and psychosocial well-being. This is in line with the pragmatic ethics stating that the more we understand relevant aspects of the lives of older persons, the better we will be able to predict their needs and ambitions and supply the answering technologies for enhancing their quality of life (17). The ontological assumption of the pragmatism paradigm is that the reality is ambiguous based on the subjects' culture, language, and history (18), therefore, taking up a relativism approach in accepting the multiple realities considering the different contexts. It dictates an emic relationship between the researcher and the participants in gaining knowledge of their reality regarding the respect of culture, language, and related beliefs in a society.

In adopting the empiricism epistemology, through the case study methodology, the researchers immersed into a social group of geriatric persons to have a contextual understanding (the reality) in the viewpoint of the subjects. The precise procedure for acquiring this knowledge was through interviews and observations, which yielded qualitative data. The researchers used an inclusive design using the design for delight (D4D) principles to acquire the knowledge as shown herein to ensure that products and services are designed to target geriatric persons' needs.

i. Principle #1: Deep Empathy:

The researcher would join the geriatric persons in their groups and help with soap making and hold talks that they would initiate. The talks were informative, like historical events and how they participated in events like the MauMau freedom movement, the trending news in the society or the political arena, and so on. These sessions later evolved to the usage of modern technology and how it has impacted their day to day lives. The outcome of this session was the component of the emotional experience that is missing in modern technology.

ii. Principle #2: Going Narrow:

The outcome of the empathy stage inspired the thoughts on proposing a design that evokes the emotional experience of the geriatric persons on modern technology; usage of the modern technology to inspire, for story-telling, for eMentoring, etc., for the geriatric person to feel still valued in a highly tech-savvy society. The outcome here was a selection of two interventions; senior games and an application that enables synchronous communication between the participants and four volunteers from a local university

iii. Principle #3: Experiments

We selected two applications; (i) senior games downloaded from the play store included; Reasoning games, rolling balls, fruit legend, and balloon shooter (bow and arrow), (ii) the second intervention was an interactive session through a video call where they interacted with psychology students from a local university. The purpose of the lessons was as follows; (a) To engage cognitively, (b) To explore the mobile interface to spark curiosity on other features of the touch interface and (c) To be able to interact through cross-platform messaging and Voice over IP service by engaging the younger generation.

These two applications have broader acceptability and a positive user experience for use by the geriatric persons in our research as they tested psychological and psychosocial fitness. These interventions had an app rating of >4.5 and >3000 reviews in the play store. The uniqueness of these apps is that they are user-friendly, simple, and exciting to the different users, as shown in the app reviews. Therefore, senior games are specifically

designed for older adults, considering their deteriorating health like poor eyesight, more prominent icons, etc. For the social communication platform, WhatsApp was used by the participants because of its minimised procedure and secondly, they have seen their close family member interact through it; therefore, we assumed ready to support just in case they got stuck.

Criteria for validating research located in the pragmatism paradigm

Kivunja & Kuyini (18) elaborates on the different criteria for validation of data and data analysis for qualitative studies. In quantitative studies, four validations: internal validity, external validity, reliability, and objectivity ensure sound research. Conversely, in qualitative studies, four validations ensure the trustworthiness of research. The validations are; credibility, dependability, confirmability, and transferability.

First, credibility is described as the ability for a researcher to map their findings to the participants' realities. The overall outcome of this research was the identification of psychosocial usability heuristics through a preliminary study that satisfies the participants' emotional need. Secondly, dependability is defined as observing similar findings under the same circumstances (18). While researching two centres, the findings were similar though variations on the learning curve were evident as the participants varied in education, former professions, health, family set-up, etc. Thirdly, transferability is when researchers ensure that they provide enough contextual data for other researchers to relate those findings in their contexts. This research will provide the Institution of study with the research data (raw data in audio format and transcribed notes), which other researchers can infer for contextualisation and replicability

purposes. Lastly, confirmability ensures that the researcher minimises biases to ensure that the results are experiences of the participants. The research reports verbatim quotes from the participants, therefore, eliminating subjectivity to ensure that the findings are mapping to the realities of the needs expounded by the participants.

Ethical considerations

While dealing with human factors, a researcher should consider ethical permissions from the relevant authorities. A renewed research protocol P219/03/2016 was obtained from Kenyatta National Hospital-University of Nairobi Ethical Research Committee (KNH-UoN ERC) that enabled the research to be carried out in two centres in Nairobi and Kiambu counties in Kenya for pre-research and the main study. The management of these centres further gave consent, and before carrying out the training, the participants gave verbal consent. The researchers ensured anonymity, and therefore pseudonyms used in reporting their response. The researchers did not assure the participants of data confidentiality because the researchers used the data to report the research findings.

Data collection and analysis

The research was based on an exploratory qualitative case study methodology on the pragmatic paradigm. Compared to quantitative methods, qualitative research explores the beliefs, values, and motives that explain why a behaviour occurs rather than focusing on the frequency, intensity, or duration of behaviour (19). In justifying the need for qualitative research in gerontology, Phoenix (20), in quoting Warren-Findlow, states that the potential strengths of high-quality qualitative research allow a scholar to learn about marginalised persons' voices and understand the thoughts and processes that people engage within their

everyday lives. This is best communicated through detailed examples and rich narratives (21) by the ones who directly experience the phenomenon. This is achieved by recognising the value of participants' unique viewpoints that can only be fully understood within the context of their experience and worldview (19), therefore being difficult to measure.

The case study is an increasingly popular approach among qualitative researchers (22). Pragmatism claims that the reality is ambiguous and based on culture, language, etc., (16,18), define the context of the participants being studied. Kivunja & Kuyini (18) recognise the participants' importance as their experience (reality) is built for. A collective instrumental case was appropriate to consider "how" psychosocial well-being impacts the design of modern technology. The unit of analysis was derived from the question of what the research analysed; for this case, the emotional experience of geriatric persons while using modern technologies. We placed boundaries on the case by identifying and using touch technology; the participants used social networking app and game app.

Baxter & Jack (23) state that the hallmark of a case study research is using multiple data sources that converge the data to illuminate the case, enhancing data credibility. The research used two primary data sources; the interview and observation (as we investigated a natural setting). It enabled the researchers to gain insight into the underlying issues that geriatric persons hold towards modern technology use, whose data was later analysed using a preferred CAQDAS.

Data collection

A multi-source for data; interviews and observations were used to gain insights from the two centres, which were heterogeneous as the participants context varied in terms of education, former employment, family set-up, modern technology use, etc. These variations determined the learning curve of the case groups where the privileged to education and employment were conversant with the touch technology either by using it or have seen someone using it.

The interview guide was pre-tested to clarify the simplicity of language and the questions' objective when testing the instruments. Individual interviews at first were not yielding much until we changed the strategy and had a focus group discussion (FGD) where the participants were more comfortable. The FGD gave detailed narrations as the participants would add more to what the previous participant said. In the subsequent data points of the three specified time orders, the participants were comfortable to engage in an individual interview as the confidence of using the touch technologies started building up. Geriatric persons are already intimidated by modern technology; therefore, strategies must be developed to ensure their confidence grows with time. This is why the FGD was the choice at first, affording us later a comfortable, face-to-face interview as they shared what they can and cannot do without being intimidated.

In administering the data instrument, the research followed the considerations by (24) to successfully implement the tool. The sites were selected, a sampling strategy identified, and the research assistants trained. The sites for research were two centres, one that is a daycare for the community dwellers and the other being a resident for the older people. A convenience strategy was used to identify these centres as they were conveniently reachable by the researchers, the caregivers, and the research assistants, therefore easy follow-up. The sampling strategy was purposive; therefore, the inclusion criteria of anyone above 65 years, free from neurological conditions, cognitive

and motor impairment, and having some knowledge of mobile usage. The duration of the research guided this inclusion clause for participation. The eight participants were each provided an A-Tab A8+ (7", Android) touch technology during the 10 weeks duration of the study.

The research was carried out in four subsequent data points indexed in time order T_0-T_3 and took 10 weeks where eight geriatric persons participated. The duration between the time orders and overall timeline was determined through a trial timeline that enabled the research to gather meaningful information. The duration of ten (10) weeks was appropriate to observe the behavioural change of the participants as they interacted with the mobile interface. The research assistants recorded the observations, and after two weeks each (total of 10 weeks), information was gathered from the participants .

through interviews by the lead researcher. The observation and the interviews were consented to by the management and the participants. During the interviews, the participants agreed to audio recording, enabling the interviewer (researcher) to observe any non-audible gestures.

However, many excellent qualitative studies (25) have not ascribed to using strategies that outline the underlying issues. These studies seek to improve the geriatric persons daily living yet insufficiently dealing with their emotional experience, especially in the case of modern technology use. This is why the strategy/procedure used in this research brings forth a methodological contribution in using a series of time orders that gave a clear and in-depth understanding of an underlying issue that geriatric persons have on modern technology use
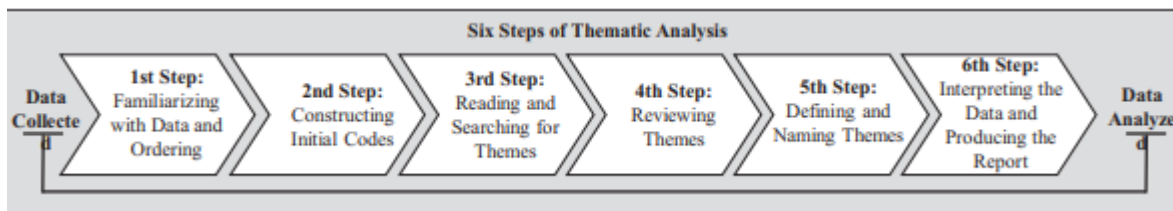

Figure 2: Data Analysis Steps of Thematic Analysis. Source(28)

Data analysis

For qualitative data analysis, different Computer-Aided Qualitative Data Analysis Software (CAQDAS) are available, considering the preference of the analyser. For this research, Atlas.ti was preferred; student license was affordable, and support from my colleagues was readily available for a better understanding. The student license would cost over $1,000 (more than Kshs 100,000) for Nvivo compared to $10 (Kshs, 10,000) for Atlas.ti.

Thematic Analysis (TA) was used for the qualitative analysis, as illustrated in **Figure**

2. It's a descriptive method that reduces the data in a flexible way that dovetails with other methods (19). The interest in TA in our research was discovering patterns that identified the psychosocial needs that would fulfil the emotional experience of an interactive geriatric interface. The content analysis did not fit this research as it assumed a hypothesis/themes (pre-defined) therefore looking for the theme in the data (26) rather than letting the data speak for itself as grounded theory depicts. Grounded theory, though close to TA, its output is forming a theory (27), which was not the case for this qualitative research.
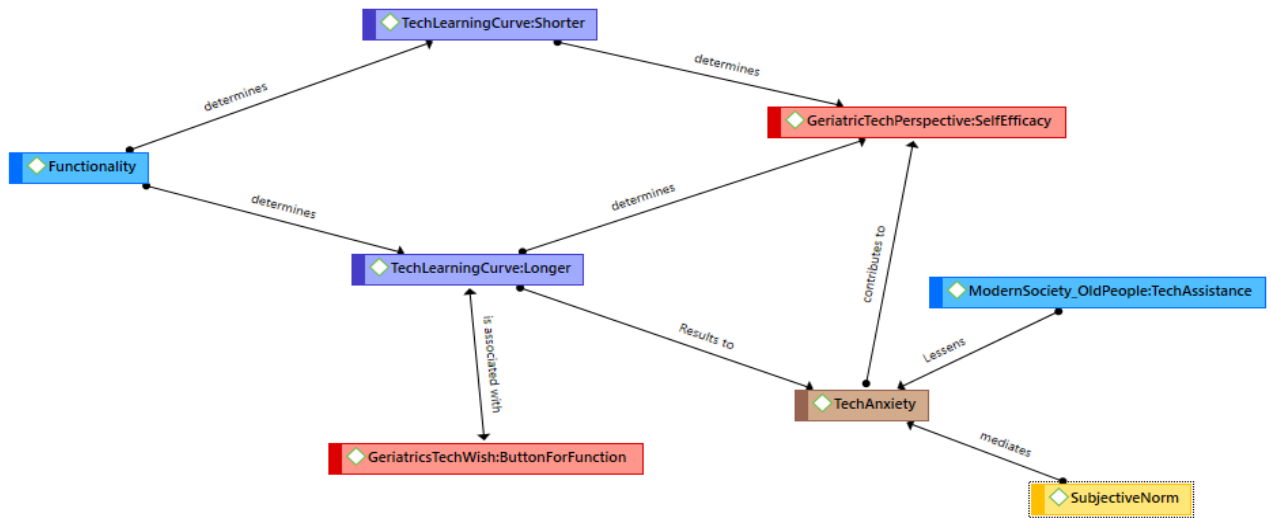
Figure 3:Atlas.ti Visual Representation of Concepts Relationship

Like any other CAQDAS, the raw recorded data was transcribed in word processor software and fed into Atlas.ti for coding and interpretation of data using the 6 phase steps by Braun and Clarke (29). A visualisation from the Atlas.ti software is shown in **figure 3** as it depicts the relationships between concepts that later were used to form the different themes. These concepts were derived from coding the voices of the informants. With the help of Gioia methodology, the researcher, as the knowledgeable agent, was able to review and define the themes, as shown in **figure 4.**
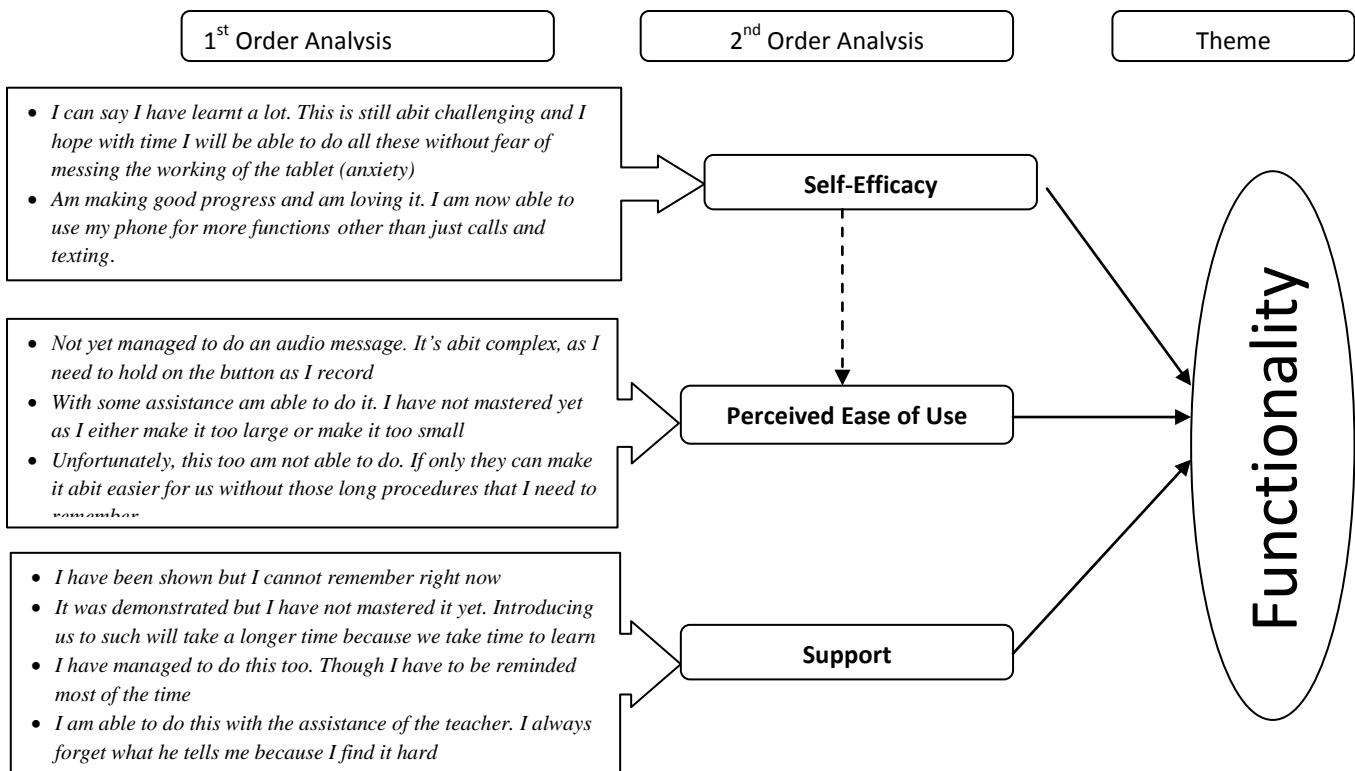

Figure 4:Gioia Methodology Presentation

Conclusion

The graying population is undoubtedly increasing and so is the modern technology that aids them in their day to day activities. These modern technologies have largely been developed for physical and psychological well-being while emotional experience that brings about psychosocial wellness is underexplored. This was achieved through qualitative research rather than quantitative research since it considers the underlying issues facing the concerned group, therefore being case-oriented rather than variable oriented. This research has identified this need and has gained an in-depth understanding through exploratory qualitative research to understand the interactive mobile interface and the psychosocial involvement of the geriatric persons.

The pragmatism paradigm gave a firm understanding of the philosophical underpinning in consideration of the ontology, epistemology, methodology, methods, and source to implement in the research. An inclusive design using the design for delight principles was used along with the case study methodology. A case study methodology, adopting the interviews and observations as the methods of collecting data, enabled the involvement of the participants who are experiencing this phenomenon in giving us an understanding from their viewpoints and worldviews. The data collected was analyzed using Atlas.ti which was affordable compared to the alternate, Nvivo.

This being a methodological paper, it outlines the process that the research took towards understanding the user behavior of modern technology and the psychosocial effect on interactive interfaces for geriatric persons. Through the process, this research contributes to methodology in using a series of time orders which gave a clear and in-depth understanding of an underlying issue that the geriatric persons have on modern technology use.

Data Availability

The researchers cannot share the raw and processed data to reproduce these findings at this time, as the data is part of ongoing research in establishing psychosocial usability heuristics for an interactive mobile interface for geriatric persons.

Conflict of Interest

The authors declare that they have no conflict of interest.

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