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Designing effective interventions to encourage older adults participate in physical activity and promote sustainable behaviour change

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Physical inactivity among older adults is a global health concern, necessitating effective interventions to promote physical activity and improve health outcomes. Literature related to intervention is reviewed and key elements including theoretical foundations, scope, behaviour change strategies, and measurement methods were discussed. An intervention design proposal has been made that aims to encourage older adults proactively participate in physical activity and promote sustainable behaviour change. The intervention follows a bottom-up approach, incorporating participatory design principles and leveraging the social-cognitive theory. Design plays a significant role in the intervention design in order to make it more effective and sustainable. Future intervention design can follow a similar method to have a greater social impact.

Keywords: physical activity; intervention design; older adults; sustainable behaviour change

1 Introduction

Physical activity (PA) has been proven that it is positively related to health status, especially for older adults (Daskalopoulou et al., 2017). However, the number of people being inactive is still high. According to the data from World Health Organisation, approximately 1 in 4 adults worldwide is physically inactive (WHO, 2022). Older adults tend to be less active compared to younger individuals due to a combination of physical, psychological, and social factors that can affect their ability and motivation to engage in physical activity (Audickas, 2017).

More effort should be made to encourage older adults to be more physically active, which will contribute to healthier lifestyles and fewer chronic diseases. Intervention could help people change their behaviour. An effective intervention should not only work during the intervention period but also have long-term effects. Only when a sustainable behaviour change is formed, then older adults can benefit from the intervention.

It is common to design an intervention to address a specific health issue, and it is usually effective. But the number of older people that can benefit from it is limited. Considering that more countries are moving to an ageing society, interventions that can reach a wider audience are needed. However, older adults have very different lifestyles and needs (Aunger et al., 2018; Janols et al., 2022). Thus, intervention design from a physiotherapy point of view can be difficult and less effective. Design research can contribute to this topic by making the intervention more motivational and enjoyable in order to increase adherence. Increasing the number of individuals who benefit from interventions can lead to greater social impact.

2 Literature review of intervention design

Literature related to intervention design was reviewed in order to make the intervention effective and sustainable. The key components of intervention design were discussed, including theoretical foundation, scope, behaviour change strategy, and measurement.

2.1 Theoretical foundation

The theoretical foundation of interventions includes behaviour change technique taxonomy (v1) (Janols et al., 2022), self-determination theory (Janols et al., 2022; Lewis et al., 2016), empowerment theory (Chang et al., 2013), social cognitive and behavioural choice theories (Gardiner et al., 2011), health action process approach and a habit dual-process framework (Maher et al., 2017), habit-formation model (Matei et al., 2015), behaviour change wheel framework (Powell & Thomas, 2023). Although the above-mentioned theories are common in intervention design, social-cognitive theory (SCT) is a foundation of common behaviour change theories (Lachman et al., 2018).

SCT is a psychological theory that emphasizes how individuals learn and develop their own behavioural patterns through observation and imitation of others' actions. It was an extension of social learning theory, which shows a direct correlation between a person's perceived self-efficacy and behavioural change (Bandura, 1977). SCT is applied by current interventions to increase physical activity (Freigoun et al., 2017). According to SCT, there is a triadic reciprocal causation between cognition, environment, and behaviour (Bandura, 1986). Thus, people's cognition will change when any other's behaviour is observed, or the environment is changed, and the change in cognition will lead to behaviour change.

When a person believes that their capability is enough for a behaviour, they are more likely to perform the behaviour, i.e., self-efficacy. Self-efficacy has been used to evaluate health-related behaviour, and it was proven related to increasing physical activity (French et al., 2014). Interventions that 'force' people to change behaviour are likely to fail, or the behaviour change is unlikely to be sustainable. It is better to focus on perceived self-efficacy than the behaviour itself since higher self-efficacy may lead to proactively and sustainable behaviour change. As stated by Lachman and colleagues (2018), the increase in self-efficacy and control will lead to effective behaviour change.

Intervention design refers to the use of behaviour change strategies designed and implemented in a particular environment to influence individuals' behaviour and achieve predetermined goals. According to SCT, individuals can learn not only from their own experiences but also from observing others' behaviours and outcomes. Therefore, intervention design can utilize this learning mechanism to help individuals change their thought and promote behavioural changes.

2.2 Scope

The scope of an intervention needs to be defined before designing the intervention. It is common for interventions to focus on disabled people, community-drawing older adults, and people living in care homes (Olanrewaju et al., 2016; Doorn-van Atten et al., 2018). As those interventions have a clear target audience and specific issues to address, they are more effective compared with interventions for the general public. Interventions from the public policy level usually come from government or international organisations, for example, the UK Chief Medical Officers' physical activity guidelines and the World Health Organisation (WHO) guidelines on physical activity and sedentary behaviour. It can be popularised by the vast majority of the population. However, intervention at this level will be much more general and may not directly influence the users. People cannot have step-by-step guidance from the guidelines, which makes it less effective. An intervention design needs to identify the target user group and provide suitable support in order to be effective and sustainable.

2.3 Behaviour change strategy

Behaviour change strategy is necessary to make the intervention more effective. Useful behaviour change strategies include goal setting, behaviour demonstration, behaviour practice/rehearsal, graded tasks, action planning, prompts/cues, problem-solving, providing social support, and self-rewarding (Ory et al., 2018; Howlett et al., 2019). Participatory design with older people for a mobile health solution, such as creating motivational profiles, tools for goal setting, and tools for self-monitoring, can make the intervention that involves technology more acceptable (Janols et al., 2022). As the digital divide still exists in most countries, intervention through non-technical approach is also common among old adults. For example, an information booklet based on the habit-formation model, including risks of sedentary behaviour and benefits of PA, tips and rationale for undertaking PA, and tick-sheets to record adherence was used to reduce sedentary behaviour for older adults (Matei et al., 2015). It is important to have behaviour change strategies that are suitable for the target users and the type of intervention.

Evidence showed that intervention could fit in with pre-existing routines, i.e., lifestyle, is more effective (Warner et al., 2022). Texercise Select, a training programme aimed at promoting healthy lifestyles, was proved effective by improving self-efficacy and providing social support (Ory et al., 2015, 2018). Incorporating PA into daily life can make it more purposeful and less monotonous. Combining PA with the activity of daily living (ADL) can make it easier to form sustainable behaviour change. For example, when a person gets used to walking to grocery shopping instead of driving, they will walk regularly because grocery shopping happens every week. After the ADL is finished, self-efficacy and social participation can be improved, which all contribute to behaviour change. In this case, ADL can also act as a trigger to remind people to be more active. When older adults plan for their future daily activities, they can take PA into consideration as well and they will know how many benefits they can get from that activity if clear guidance is provided.

2.4 Measurement method

Another essential part is the measurement method which could prove the effectiveness of the intervention design. It is common to use self-reported questionnaires such as International Physical Activity Questionnaire (IPAQ) to measure PA levels (Chang et al., 2013; Matei et al., 2015). Lower cost and technical barriers make the self-reported method popular in social science research. However, the response bias and information bias might influence the result and it cannot be avoided. On the

other hand, more researchers use accelerometers in order to get more accurate and objective results (Gardiner et al., 2011). However, this method may have problems with heterogeneity which means studies that used different devices, such as accelerometer or inclinometer do not have complete cross-comparability. Also, the result of such studies might be obfuscated depending on what statistical analysis method they use and how the outcome is reported (Aunger et al., 2018). Standardisation of PA measurement would be beneficial so that evidence from different fields could be compared and discussed (Howlett et al., 2019).

2.5 Reflection on Intervention Design

The first step of intervention design is to determine the scope and target user. Then the aim of the intervention should be made after the target group is confirmed. The next step is to select a suitable behaviour change strategy and appropriate technology level for older adults. Behaviour change strategy should be chosen based on SCT to enhance their cognition of PA and increase self-efficacy. Appropriate technology usage can make the intervention more interesting and social. For example, a WhatsApp group that allows people to share their experiences can motivate others and improve social participation. However, inappropriate usage may have a counterproductive effect on older adults who are not familiar with the technology. Interventions that fit PA with pre-existing routines could be more effective, social, and sustainable. For example, a calendar is helpful for older adults since it can make the event more intuitive. User engagement and proactivity are critical to intervention success. However, the common intervention especially the government project generally follows a top-down approach. For example, the participants need to follow the schedule, such as joining educational sessions, workshops, and structured PA exercises for the Texercise Select project. Meanwhile, the face-to-face workshops have capacity limitations and trained leaders are required during the intervention which means it can be difficult to benefit the general public. The top-down intervention pattern can be effective as a community-level intervention, but it is hard to promote to more people unless they have more funding and human resources. Compared with the bottom-up approach, the top-down approach is more difficult to promote people's intrinsic motivation which is more related to sustained behaviour change. Participatory design with target users can improve their motivation and make the intervention more accessible since their requirements can be heard during the intervention design process. Finally, a new measurement method which could reduce self-reported bias and make the result comparable cross studies is needed. It can not only validate the study but also increase its academic impact.

3 Intervention design

An intervention design proposal has been made to encourage older adults proactively participate in physical activity and promote sustainable behaviour change. It is part of an ongoing design-related PhD research project.

3.1 Aim and objectives

The aim of this intervention is to enhance the motivation of older adults doing PA, thereby facilitating behavioural changes, and increasing their PA levels.

The objectives of this study include:

- Enhancing participants' knowledge of PA.

- Enhancing participants' willingness and motivation for PA.
- Participants' PA levels increase during the intervention.
- Behaviour changes or behavioural intention after the intervention.

3.2 Intervention procedure

The first stage of the intervention aims to enhance participants' knowledge of PA, including information on the benefits of PA, types of PA, and how to exercise to manage current medical conditions. A workshop will be organised at the beginning of the intervention, during which the study will be explained in detail. During the workshop, a reference book will be provided with information from authorities including World Health Orginasion (WHO), National Health Service (NHS), and UK Chief Medical Office (CMO). The authorities provide information related to PA and healthy ageing using academic language which is difficult for older adults to understand and follow. The reference book will summarise the guidelines using plain language, and it will be reviewed by an expert in sports and older adults research area and co-designed with older adults. Five participants will be recruited for a pilot session. They will be asked to read and provide feedback about the intervention procedure and the reference book design. Final adjustment will be made to make sure the book is safe, accurate, effective, and understandable. Participants should have a clear understanding of their current level of PA after reading the reference book. For example, whether they meet the recommended PA level, how they compare to their peers in terms of PA level, whether they engage in all types of exercise, and areas where they need improvement. Participants need to set their own goals and make their own plans based on the above information and their personal situation, as well as their expectations for the intervention, such as relieving pain, improving physical fitness, or making new friends through social exercise.

The second stage is to establish a baseline of PA level and motivation to evaluate the effectiveness of the intervention. Participants need to fill out the Physical Activity Scale for the Elderly (PASE) and e related to their current PA level and motivation of doing PA. The PASE is a popular academic scale used to assess PA level and specifically designed for older adults (Washburn et al., 1993) and the TSRQ is to assesses motivation for a specific behaviour change (Levesque et al., 2007). There will be a post-test using same scale after the intervention.

The third stage, i.e., the implementation stage, will last for 10 weeks. It is divided into two phases: a strong-intervention phase for the first 8 weeks, followed by a weak-intervention phase for the remaining 2 weeks. In the first phase, assistance will be provided, and participants will be asked to follow their own PA plan strictly. Participants will be asked to self-record their PA experience, called 'the diary', including the content of PA, length, intensity, changes in emotions, and other noteworthy matters. During this stage, participants can join an optional WhatsApp group, where researchers will regularly post reminders and PA-related information. Participants can also communicate with each other and organise events by themselves using the online chat group. After 8 weeks, participants will be informed that the strong-intervention phase has ended. During the following 2 weeks of the weak-intervention phase, participants are encouraged to continue following their PA plan. However, they are not required to self-record, and they will not receive and reminder from the researcher. The WhatsApp group will still be available to facilitate communication between participants. If they have any questions or emergencies during this period, they can still contact the researchers until the end of the 10-week intervention.

Finally, a semi-structured interview will be conducted to discover topics related to changes in PA knowledge, motivation, and behaviour, as well as feedback on the intervention study and potential improvements.

3.3 The role of design

The intervention is designed from the perspective of design disciplines which makes it different from a common physiological intervention. According to the social-cognitive theory, the intervention will not be conducted in a laboratory environment so that the participants can be influenced by other people and the environment. Participants are encouraged to join a WhatsApp group to update their progress and organise activities by themselves. It is expected that this group can become a small community when the intervention finish so that participants can be more socially active as well which is helpful for sustained behaviour change. The intervention follows a bottom-up approach, participants will be involved in all stages of the intervention design and implementation. Older adults will be invited to a participatory design workshop to improve the design of the handbook so that their opinions can be incorporated before the intervention. During the intervention, participants will make their own PA plan based on their current functional capability and needs instead of being told what they need to do. The personalised method can increase intrinsic motivation which is more likely to form behaviour change. The intervention will use a unique method to measure participants' PA levels, i.e., the diary. Participants will be provided with a well-designed calendar for self-recording their everyday activities. The diary can be used not only as a PA measurement method but also as a reminder and a motivator for their future activity. The design of the calendar helps fitting PA to participants' current lifestyle and it is proven an effective way of promoting behaviour change (Warner et al., 2022). To sum up, a unique intervention design that aims to lead to sustainable behaviour changes was proposed, and design plays a significant role in its development.

4 Conclusion

Promoting physical activity among older adults is crucial for their health and well-being. Considering the fact that the number of older adults being inactive is still high, intervention design that could facilitate sustainable behaviour change is needed. By reviewing the literature related to intervention, key elements of intervention design were discussed, including theoretical foundations, scope, behaviour change strategies, and measurement methods. An intervention design proposal was made utilising participatory design principles, bottom-up approaches, and personalised methods, to encourage older adults to proactively participate in PA and promote sustainable behaviour change. This paper suggests that interventions can be made more effective and sustainable by applying design principle. It is aimed that by applying this method, older adults who participate in the intervention can sustain behaviour change when the intervention finishes. Furthermore, researchers and designers can apply a similar design principle when doing other intervention designs. Overall, it is expected that the integration of design principles in intervention design can contribute to increasing the number of individuals benefitting from interventions and achieving greater social impact.

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