Mobile Technology Usage Mediates Gender Differences in Physical Activity

Amy E. Whitehead, Kanayo Umeh, Laura Quayle and Dave Morley

Liverpool John Moores University

Sheffield Hallam University

Author Note

Amy E. Whitehead and Laura Quayle, School of Sport Studies, Leisure and Nutrition, Liverpool John Moores University.

Dave Morley, School of Sport, Sheffield Hallam University.

Kanayo Umeh, School of Natural Science and Psychology, Liverpool John Moore University.

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Correspondence concerning this article should be addressed to Amy E. Whitehead, School of Sport Studies, Leisure and Nutrition, Liverpool John Moores University, IM Marsh Campus, L17 4LH. E-mail: A.E.Whitehead@ljmu.ac.uk

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Abstract

Gender differences in how technology is used to facilitate physical activity engagement was examined. 578 adults completed a survey assessing gender, mobile device usage, stages of change in physical activity based on the transtheoretical model of behaviour change (TTM) and relevant covariates. Data analysis revealed that both cumulative device types and cumulative reasons for using devices mediated gender differences in stage membership for physical activity. Females used fewer devices and reported fewer reasons for using such devices than male participants. These dispositions predicted a reduced probability of achieving action/maintenance stages for physical activity. Females used fewer mobile devices and perceived fewer incentives for using such devices. As a result they are less likely to enter the action/maintenance stages of physical activity. Interventions to promote female participation in physical activity need to recognise gender differences in the use of mobile technology.

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Rates of obesity, diabetes, and cardiovascular disease (CVD) have continued to rise across populations in many Western countries and other parts of the world (Chiu, Maclagan, Tu, & Shah, 2015; Du et al., 2014; Samaranayaka & Gulliford, 2013; Saydah et al., 2014). Previous literature reports a higher rate of obesity in females (Kanter & Caballero, 2012) and, therefore, subsequent research has focused its attention on gender differences in physical activity (Spencer, Rehman, & Kirk, 2015). Moreover, findings from other research suggests females are less physically active than males (Brand et al., 2016; Bronikowski, Laudanska-Krzeminska, Tomaczak, & Morina, 2016; Caperchione, Chau, Walker, Mummery, & Jennings, 2015; Kelly, Edney, Moran, Srikanth, & Callisaya, 2016; Magoc, Tomaka, Shamaley, & Bridges, 2016; McLaughlin, Connell, & Janevic, 2016; Viciana, Mayorga-Vega, & Martinez-Baena, 2016). For example, Brand et al. (2016) found that even amongst adolescents judged to engage in ‘high’ levels of moderate-to-vigorous physical activity (i.e., classified as exercising for 7 hours or 421 minutes per week), males were more physically active, reporting an average of 1091.02 minutes/week of activity, compared to 922.78 minutes/week of activity for females.

The reported deficit in physical activity in females has been attributed to a range of social and cultural factors including the complex relationships between physical activity, feminine ideals, and body-image factors (Spencer et al., 2015). Further research by Martins, Marques, Sarmento, and da Costa (2015) has identified how the majority of studies that have looked at the perceptions of physical activity have focused on adolescent females. Their systematic review concluded that the main barriers to physical activity were attitudes toward physical activity; motivation; perceptions of competence and body image; fun; influence of friends, family and physical education teachers; and environmental physical activity opportunities. Fun was the most frequently cited reason for female physical activity enegagament in most studies within the review (Martins et al., 2015) and elsewhere (Yungblut, Schinke, & McGannon, 2012), however, when searcing for further meaning around this variable it is important to consider participants' percpetions of fun. For example, research has found that fun is related to the specific physical activity (e.g. yoga) (Azzarito & Hill, 2013). Furthermore, it is important that the activity is challenging yet not competitive (Brooks & Magnusson, 2007), with autonomy (Yungblut et al., 2012), social support from family members and a high perception of competence being important (Azzarito & Hill, 2013).

Although recent research has implicated a newly-found barrier to physical activity participation – the use of electronic devices (Pawlowski, Tjornhoj-Thomsen, Schipperijn, & Troelsen, 2014) there is uncertainty regarding the role of mobile technology and the extent to which it mediates gender differences in physical activity. Research has shown gender differences in the use of mobile devices such as smart phones and tablets (Baron & Campbell, 2012). For example, researchers exploring the use of video gaming technology have reported technology being specially designed for the needs of male gamers (Ivory, 2006). Rehbein, Kliem, Baier, Mößle, and Petry (2015) found significantly higher gender differences amongst a large German adolescent sample, suggesting that boys were involved in 162 minutes of gaming per day compared to the girls' gaming time of 27 minutes. Additionally, research suggests mobile devices can offer incentives that affect levels of physical activity (Pawlowski et al., 2014), whereby access to particular fitness apps have encouraged an active lifestyle (Direito et al., 2014). By contrast, excessive dependence on mobile technology (e.g., for gaming, social networking) can precipitate a sedentary lifestyle (Lepp, Barkley, Sanders, Rebold, & Gates, 2013). Therefore, device use may operate as both a barrier (e.g. enourgaing sedentary living through gaming) and a facilitator (e.g. through sharing exercise results with others). Given that previous research has found more males use technological devices in comparison to females, there does seem to be a potential gender barrier.

Despite evidence linking mobile technology to variable usage related to both gender and physical activity, no study has examined the extent to which the use of mobile technology mediates (i.e., explains) the physical activity deficit in females, using appropriate analytic protocols (e.g., bootstrapping) (Hayes, 2013). Research in this area will have implications for the development of interventions to promote physical activity in females. Previous research has used behaviour change models such as the transtheoretical model (TTM) proposed by Prochaska and Velicer (1997) to understand gender differences in physical activity and possible mediating factors. According to this model, behaviour change unfolds through five distinct stages: precompemplation (no intention to engage in physical activity), contemplation (the intention to engage in activity within the next 6 months), preparation (preparing to engage in the next 6 months), action (engaging in physical activity but for less than 6 months) and maintenance (engaging in physical activity for 30 or more minutes a day on 5 or more days per week for more than 6 months). Studies have found significant gender differences in stages of change for physical activity (Garber, Allsworth, Marcus, Hesser, & Lapane, 2008).

The aim of this study was to assess the direct relationship between gender and stages of change in physical activity, and also the extent to which this association is *indirect*, mediated by the use of mobile devices. The following hypotheses were tested:

a) There are gender differences in stages of change for physical activity, with males more likely to achieve action/maintenance stages

b) Gender differences in stages of change for physical activity are mediated by individual differences in the use of mobile devices.

Methods

Participants

Surveys were completed by a range of participants (n=578, 301 males and 277 females) from across the United Kingdom. The age of respondents was 16-25 years (n=140), 26-34 years (n=101), 35-44 years (n=136), 45-54 years (n=127), 55-64 years (n=56), 65+ years (n=18). The only eligibility criteria specified was that all respondents had to be over the age of 16 years.

Materials and Procedure

The web-based survey was created using Bristol Online Survey (BOS) software (BOS, 2016) and captured data related to stages of change in technology use, physical activity participation, type of device used and perceived benefits of the device. The survey was disseminated via local sports networks and web-based social media for a period of eight weeks (December – January, 2015). The host institution granted ethical approval and participants gave informed consent on-line prior to completing the questions.

Stages of Change

The Transtheoretical model of behaviour change (Prochaska & Velicer, 1997) uses 5 stages to represent an individual's behaviour in a given domain; these stages are (i) pre-contemplation, (ii) contemplation, (iii) preparation, (iv) action and (v) maintenance. Using National Health Service (2015) guidelines, respondents were classified into one of these stages of change, based on their response to the following question: 'Do you currently engage in any form of sport or physical activity?:

'*I do not participate in sport or physical activity in any way and I do not intend to do so in the future'* (Pre-contemplation)

'*I have been thinking about participating in sport and physical activity but I have not done any yet'* (Contemplation)

'*I have started preparing to engage in sport or physical activity but I am not yet active'* (Preparation)

'*I am engaging in sport or physical activity on a regular basis (30 or more minutes a day on 5 or more days per week) and have been doing so for less than six months'* (Action)

'*I am engaging in sport or physical activity on a regular basis (30 or more minutes a day on 5 or more days per week) and have done so for the last six months or more* (Maintenance)'

Consistent with previous research using this model, in which progression into the Action/Maintenance for physical activity (and other behaviours) depicts successful behaviour change (Johnson et al., 2008; Prochaska et al., 2005), participants in the present study were dichotomised into two stages: pre-Action/Maintenance (coded 0) and post-Action/Maintenance (coded 1).

Type of device

The type of device being used by particpants was assessed by asking respondents what sort of technology they used (sports coach UK, 2016). Participants responded by ticking one or more items from a list of up to six items: *Applications downloaded onto a smart phone or tablet, Online web-based information, GPS-enabled devices, Social media, wearable technology, and ‘other’* (please specify). Each ticked item was coded as ‘1’. The total number of items ticked was then summed to generate an index, with scores ranging from 0 to 6; the higher the score, the greater the number of device types used.

Reasons for device use

Following the question about technology types, participants were asked to identify their motivations (i.e., reasons) for device use, using a previously used conceptual framework (op den Akker, et al., 2013). In response to the question 'What do you use the technology for?', a list of items was provided, including '*Collect physical data on myself'* Yes(1)/No(0) , '*Compare my results with others*' Yes(1)/No(0), '*As a tool to motivate myself'* Yes(1)/No(0), '*As a group training tool'* Yes(1)/No(0), '*For fitness purposes'* Yes(1)/No(0), '*Communicate with a coach/instructor'* Yes(1)/No(0), 'Other' Yes(1)/No(0). Responses to these items were summed to generate a 'reasons for tech use' index (scores ranging from 0 to 7 – a higher scored indicated more reasons or greater motivation for technology use).

Covariates

A number of factors may confound gender differences in physical activity including age (Molanorouzi, Khoo, & Morris, 2015), perceived incentives in use of technology use (Yau & Cheng, 2012), coaching (Etnier, 2011), and participation in organised sporting activity (e.g., club-based events) (Vilhjalmsson & Kristjansdottir, 2003). Thus, the following variables were treated as potential confounding factors in this study: age, exposure or access to a coach ('Are you currently being coached either individually or in a team setting?' 'Yes – I'm being coached' (1) or 'No – I'm not being coached' (0)), and organising participation in sporting activities ('Please indicate who organises this [list of various sporting events provided] and whether it is competitive or recreational?' 'Club' Yes(1)/No(0), 'Another organisation but not a sports club'

Yes(1)/No(0), ‘Gym or other health/fitness centre’ Yes(1)/No(0), ‘Myself (I do it on my own)’ Yes(1)/No(0), ‘With friends’ Yes(1)/No(0). Responses to these organisational items were totalled to give an ‘organisation’ index (scores ranging from 0 to 4, with a higher score denoting more organising activity). Another covariate was the perceived benefits of technology use (‘What do you perceive to be the benefits of using technology to support participation in sports and physical activity? Please select any applicable terms’ – ‘Enhance performance’ Yes(1)/No(0), ‘Provide useful data on performance’ Yes(1)/No(0), ‘Helps with motivation’ Yes(1)/No(0), ‘None’, ‘Other’. Responses to the first three benefit items were summed to produce a ‘perceived benefits’ index (scores ranged from 0 to 3 – the higher the score, the greater the perceived benefits of technology use.

Statistical analysis

The direct and indirect effects of gender on stages of change for physical activity were assessed using a bootstrapping SPSS dialogue (Hayes, 2009; Hayes, 2013). Mediation analysis involves testing the significance of three key regression pathways (see *Figures* 1 & 2); (i) relationship between variable X (predictor) and variable M (mediator), known as *path a*; (ii) relationship between variable M (mediator) and variable Y (outcome), called *path b*; (iii) direct relationship between variable X (predictor) and variable Y (outcome), or *path c*.

Gender was treated as variable X (predictor), while stage membership (pre- versus post action/maintenance) for physical activity was evaluated as variable Y (outcome). Cumulative (i.e., total number of) device types used and cumulative reasons (i.e., total number of incentives or motivations) for using mobile devices were both treated as variables M (mediators). Additionally, age, receiving coaching, organisation of sporting events, and perceived benefits of technology use, were treated as covariates. The bootstrapping strapping SPSS dialogue allowed for the inclusion. Unadjusted bootstrapping models were first generated, in which covariates were excluded. Bootstrapping was then repeated adjusting for the various covariates.

Results

Descriptive statistics

The vast majority of respondents (72.3%) were in the Maintenance stage of change for physical activity, followed by Action (1.9%), Preparation (2.7%), Contemplation (2.1%), and Pre-contemplation (0.5%). The remaining 20.5% participants were categorised as non-responders (i.e., missing data) and excluded from subsequent data analysis. On average, respondents used about two (M = 1.75, SD = 1.65) different types of technological devices, with a maximum of 6 and a minimum of zero. The most frequently cited reasons or motivations for device use were to collect physical or performance data (36.9%) and compare results with others (36.7%), followed by motivating oneself (31.6%), physical fitness (24.8%), communication with coach (10.7%), training tool (9.7%), and finally 'other' (3.6%). Of three possible benefits of using technology, respondents cited an average of two (M = 1.98, SD = 1.05). The most commonly cited benefit was receiving 'useful feedback' (74.4%), followed by 'motivates me' (66.4%), and finally 'enhance performance' (57.8%). The most frequently used specified technology was mobile apps (44.9%), followed by GPS (41%), wearable devices (32.5%), online websites (30%), and finally social media (24.6%). Just under 3% of respondents used 'other' (i.e., unspecified) forms of technology.

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Insert Table 1 about here

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Mediating effect of cumulative device types used

Results are shown in *Table* 1. Gender predicted cumulative device use, with females using fewer device types. Cumulative device type, in turn, predicted stage membership for physical activity, with use of more device types predicting a higher probability of action/maintenance stage membership. Contrary to what was hypothesised, gender did not directly predict stage membership for physical activity. However, as hypothesised, there was a significant indirect effect, whereby cumulative device use mediated the effects of gender on stage membership; females used fewer technological devices, which in turn meant a reduced likelihood of being in the action/maintenance stages of physical activity (*Figure* 1). This indirect effect persisted after controlling for age (older respondents were less likely to be in the action/maintenance stages for physical activity), but was no longer significant after accounting for coaching, followed by other covariates.

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Insert Table 2 about here

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Mediating effect of cumulative reasons for device use

Results are shown in *Table* 2. In the initial bootstrapping model, prior to accounting for covariates, gender showed a near-significant association with cumulative perceived benefits for using mobile devices (p = 0.05), with females reporting fewer reasons for using mobile devices in the context of physical activity. In turn, cumulative reasons for using devices predicted stage membership for physical activity, with a higher number of reasons denoting an increased probably of action/maintenance stage membership. Gender did not directly predict stage membership. As expected, a significant indirect effect emerged (*Figure* 2), whereby cumulative reasons for using technological devices mediated the relationship between gender and stage membership; females reported fewer reasons for using mobile devices in the context of physical activity, a disposition that in turn denoted a reduced probability of action/maintenance stage membership. This mediator effect remained significant after adjusting for age differences in stage membership, but was nullified after adjusting for coaching, and other covariates.

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Insert Figure 1 about here

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Discussion

This study aimed to assess the direct relationship between gender and stages of change in physical activity, and also the extent to which this association is indirect, mediated by the use of mobile devices. Interestingly, and in contravention of our first hypothesis, gender did not predict stage membership. This finding contradicts much of the literature surrounding physical activity and gender differences, however the majority of this research has been focussed on adolescent females (Martins et al., 2015). The majority of the participants within this study were over the age of twenty five and our understanding of the factors associated with physical activity in this specific population is limited (Booth, Owen, Bauman, Clavisi, & Leslie, 2000). Furthermore, within the present study those who may have completed the survey may have had an interest in physical activity (Berry & Spence, 2006), leading to bias and the potential reason why gender difference was not found. Whilst gender did not predict stage membership, males used more device types than females and had more reasons for using technology, which in turn may have had a positive impact on male physical activity, as demonstrated by the prominent positioning of males in the action/maintenance stage of the TTM (DiClemente & Prochaska, 1998; Prochaska & Velicer, 1997). Females used technology less than their male counterparts and this could have a negative consequence on their physical activity levels. Given the proliferation of technology in everyday life (Walshaw, 2015; Wang, Xiang, & Fesenmaier, 2016), it is interesting to note that gender differences in technology use may affect the physical activity behaviours of individuals. Whilst previous research has highlighted both negative (Lepp et al., 2013) and positive effects (Direito et al., 2014) of technology on physical activity and lifestyles, results from this study suggest the patterns of behaviour are more complex and gender differentiated.

The finding that technology positively mediates physical activity is an indication that the use of technology could play a critical part in the way that interventions are established to motivate participants to become, and remain, physically active. It is, perhaps, not surprising that technology may affect male participation in this way, as the majority of technology is situated in male dominated environments (Garber et al., 2008; Johnson et al., 2008). Therefore, this provides an explanation as to why males may be more confident in the use of technology, which may be transferring into physical activity app based technology use.

Results within the current study suggest that technology may positively influence male physical activity, due to males using a larger range of devices and having more reasons for using technology in comparison to females. Females are motivated differently than males, in relation to physical activity. Generally speaking, females are less ego and mastery-oriented than males, therefore caring less about their performance in relation to others (Egli, Bland, Melton, & Czech, 2011; Su, McBride, & Xiang, 2015). Their goals in relation to physical activity are more aligned to overall health, appearance and physical attractiveness (Chowdhury, 2012; Molanorouzi et al., 2015; Morris, Clayton, Power, & Han, 1995). Therefore, as the majority of mobile technology is predominantly geared towards incentivising participants through demonstrating individual standing in relation to peers, vis-a-vie enhancement of performance, females may be less likely than males to be motivated by this function. Subsequently, there is a need for technology designers to further personalise and provide incentives for individual progress, particularly for females, irrespective of peer-performance.

Wider evidence suggests that early structured physical activity experiences for girls, such as school-based Physical Education, fails to provide adequate levels of PA, or develop self-regulatory skills and habits that would enable them to continue physical activity through their transition into adulthood (Hobbs, Daly-Smith, Morley, & McKenna, 2014; Knuth & Hallal, 2009). When research has evidenced the link between intrinsic motivation and self-regulation in physical activity in general (Teixeira, Carraça, Markland, Silva, & Ryan, 2012), and specifically female physical activity (Lauderdale, Yli-Piipari, Irwin, & Layne, 2015), it is crucial that mobile technology is tailored effectively to meet the gender-specific demands of its users. op den Akker, Jones, and Hermens (2014) provide a series of tailoring concepts for designing physical activity apps that could readily be used, as one such solution.

It is interesting that age predicted stage membership for physical activity, but nevertheless failed to negate the direct or indirect contribution of gender (albeit noting that gender did not directly predict stage membership in the context of perceived benefits). It follows that although younger respondents were more likely to achieve the action/maintenance for physical activity (Dumith, Gigante, & Domingues, 2007; Garber et al., 2008) female respondents were nevertheless still less likely than males to have achieved such stage membership, which may be due to the underlying technology-related mediating factors (e.g., females used fewer devices). In other words, the role of mobile technology in explaining gender differences in physical activity isn’t necessarily diminished by age; older adults, who presumably are less active, may still potentially achieve action/maintenance for physical activity if they perceive sufficient reasons for using mobile technology. If so, this may have significant implications for the use of mobile technology to boost activity levels in (otherwise less active) older adults; particularly males.

It is important to acknowledge the limitations within this study. Firstly, the sample consisted of a small number of participants in the pre-contemplation, contemplation and preparation stages of change. Over 70% or respondents had achieved Action/Maintenance, suggesting, as a sample, an existing motivation to the use of technology to facilitate an active lifestyle. A problem with survey research design is the possible non-response bias, which may have occurred within this study, where there are different rates of responses between study participants and some of those who were invited to complete the survey but did not respond (Drivsholm et al., 2006; Grotzinger, Stuart, & Ahern, 1994; Holle et al., 2006). More specifically, those who may have completed the survey may have an interest in physical activity, which could result in bias. Non-response bias within physical activity research should be acknowledged as a limitation, reducing the final sample size and generalisability of a population through potential under-reporting of a specific group (Berry & Spence, 2006; Lahaut, Jansen, Van de Mheen, & Garretsen, 2002). Furthermore, the study did not control for previous history of technology use or other variables such as current BMI, health status or body image and it is plausible to suggest that these factors had an influence on the use of health and sport apps. It is therefore suggested that future research takes into account these variables, to provide a wider understanding of the motives behind health and sport technology engagement.

Another limitation that should be acknowledged is the terminology for those participants in the action and maintenance stage. When answering this question participants were guided by the sentence which specified that they are to select the action stage if they engage in physical activity for 30 or more minutes a day on 5 or more days per week for less than six months and the maintenance stage if they engage in physical activity for 30 or more minutes a day on 5 or more days per week and have done so for the last six months or more. This definition was taken from NHS (2015) guidelines, however it is important to state that there are alternative guidelines provided by both the NHS (NHS, 2015) and the American physical activity guidelines advisory committee report (US Department of Health and Human Services, 2008). These guidelines also offer more detail and different alternatives to the recommended physical activity guidelines based around individuals participating in 150 minutes of physical activity per week but in different forms (e.g. different levels of intensity, strength exercises and a mix of moderate and vigorous aerobic activity). For simplicity, this study chose to use 30 minutes, five times per week; future research should take these guidelines and the implications of asking these questions in a certain manner into consideration. Finally, the measure of perceived benefits of technology use was arguably perfunctory. It focused on generic concepts, notably ‘enhancing performance’, ‘providing useful feedback’, and ‘motivating me’. These domains may exclude other perceivedadvantages of technology use, such as goal setting.

The fact that the majority of participants in the present study were physically activity seems to support the premise that new technologies may facilitate physical activity behaviours in a variety of settings and environments. However, gender differences are clearly evident in behaviours associated with technology use and physical activity. Males see more reasons or motivations for using this type of technology, which may explain why they use more types of devices and are more physically active. Females use fewer technological devices and see fewer reasons or incentives in technology use than their male counterparts. This study is the first step in probing the use of technology to facilitate physical activity behaviour and gender differences associated with this. Further research, therefore, needs to develop this work by understanding the mechanisms and the sociocultural factors that cause these gender differences. Understanding this could support technology manufacturers and national initiatives to improve physical activity levels and, in turn, create a healthier population.

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Table 1 – ***Mediating effect of cumulative device types on gender differences in stages of change for physical activity, before and after adjusting for selected covariates.***

Variables	***Path a*** **(Gender → Cumulative device types)**	***Path b*** **(Cumulative device types → A/M Stages for Physical Activity)**	***Path c*** **(Gender → A/M Stages for Physical Activity)**	***Path a*b*** **or Indirect effect (Gender → Cumulative device types→ A/M Stages for Physical Activity)**
Unadjusted	-0.36 (-0.63, -0.09)[a]	0.43 (0.17, 0.68)[a]	0.06 (-0.59, 0.72)	-0.15 (-0.39, -0.042)[a]
Adjusted for age range	-0.36 (-0.64, -0.09)[a]	0.43 (0.17, 0.70)[a]	-0.03 (-0.70, 0.63)	-0.16 (-0.39, -0.03)[a]
Adjusted for Age range, and Coaching (*Yes/No*)	-0.38 (-0.66, -0.09)[a]	-0.05 (-0.57, 0.45)	-1.05 (-2.79, 0.69)	0.02 (-0.43, 0.37)
Adjusted for Age range, and Coaching (*Yes/No*), Organising index score (*Organising Myself + With my friends + Club + Gym*)	-0.36 (-0.64, -0.07)[a]	-0.07 (-0.58, 0.44)	-1.07 (-2.84, 0.68)	0.02 (-0.42, 0.56)
Adjusted for Age range, and Coaching (*Yes/No*), Organising index score (*Organising Myself + With my friends + Club + Gym*), Perceived benefits (*Enhance performance + Provides useful feedback + Motivates me*)	-0.20 (-0.47, 0.05)	-0.14 (-0.72, 0.44)	-1.05 (-2.83, 0.71)	0.03 (-0.16, 0.53)

[a]$p<0.05$ or CI range excludes '0'. The table does not include the *direct* effect of variable *X* (gender) on variable *Y* (stages of change for physical activity), unadjusted for variance attributable to the mediator variable (cumulative device types).

Table 2 – ***Mediating effect of cumulative reasons for device use on gender differences in stages of change for physical activity, before and after adjusting for selected covariates.***

Variables	***Path a*** **(Gender → Cumulative perceived reasons for device use)**	***Path b*** **(Cumulative perceived reasons for device use → A/M Stages for Physical Activity)**	***Path c*** **(Gender → A/M Stages for Physical Activity)**	***Path a*b*** **or Indirect effect (Gender → perceived reasons for device use → A/M Stages for Physical Activity)**
Unadjusted	-0.27 (-0.54, 0.00)	0.57 (0.29, 0.84)[a]	0.07 (-0.59, 0.73)	-0.15 (-0.39, -0.02)[a]
Adjusted for age range	-0.28 (-0.55, -0.00)[a]	0.57 (0.29, 0.85)[a]	-0.02 (-0.69, 0.65)	-0.16 (-0.38, -0.01)[a]
Adjusted for Age range, and Coaching (*Yes/No*)	-0.33 (-0.62, -0.04)[a]	0.14 (-0.37, 0.66)	-0.97 (-2.71, 0.76)	-0.04 (-0.99, 0.05)
Adjusted for Age range, and Coaching (*Yes/No*), Organising index score (*Organising Myself* + *With my friends* + *Club* + *Gym*)	-0.30 (-0.59, -0.01)[a]	0.13 (-0.39, 0.66)	-0.99 (-2.74, 0.76)	-0.04 (-0.81, 0.06)
Adjusted for Age range, and Coaching (*Yes/No*), Organising index score (*Organising Myself* + *With my friends* + *Club* + *Gym*), Perceived benefits (*Enhance performance* + *Provides useful feedback* + *Motivates me*)	-0.16 (-0.44, 0.10)	0.11 (-0.44, 0.68)	-0.97 (-2.73, 0.78)	-0.02 (-0.79, 0.04)

[a]$p<0.05$ or CI range excludes ‘0’. The table does not include the *direct* effect of variable *X* (gender) on variable *Y* (stages of change for physical activity), unadjusted for variance attributable to the mediator variable (cumulative reasons for using technology).

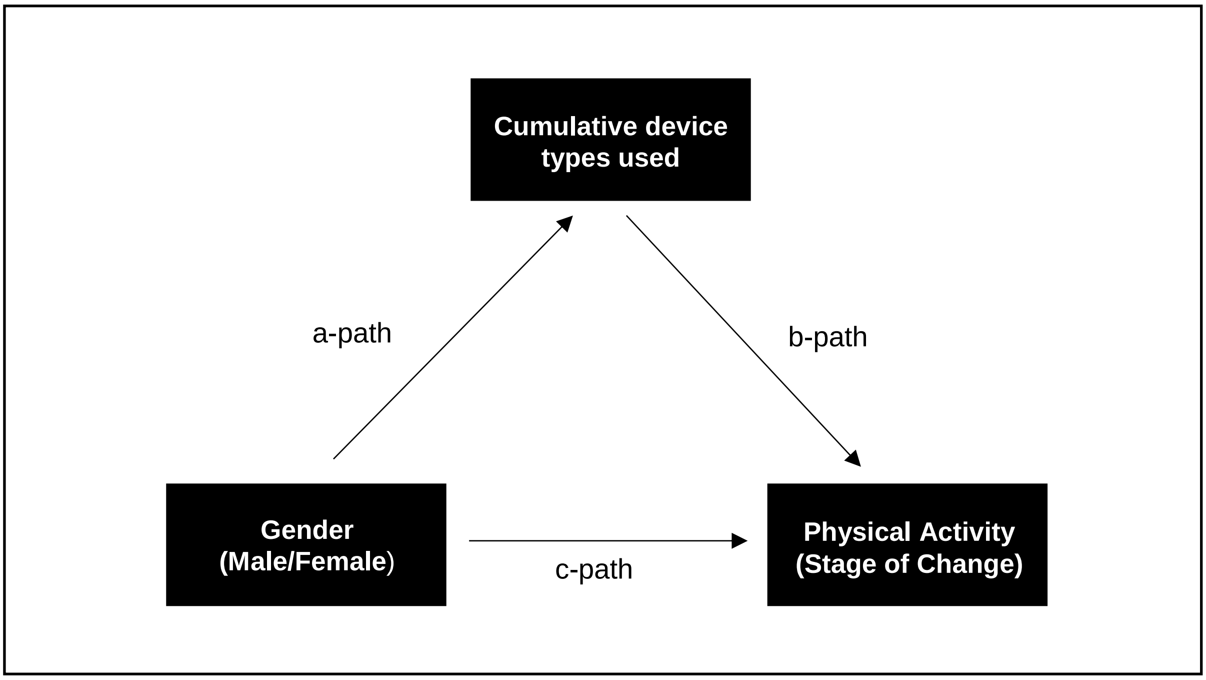

Figure 1: Mediating effect of cumulative device types on relations between gender and stages of change in physical activity (Pre/Post Action & Maintenance)

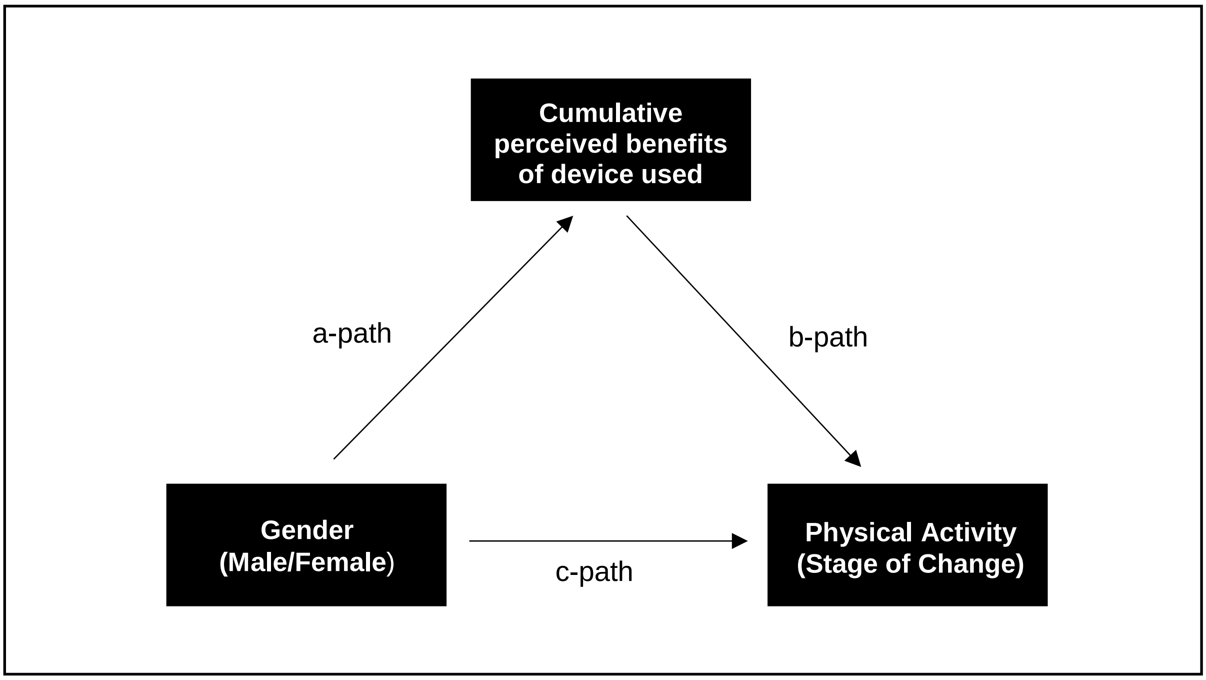

Figure 2 Mediating effect of cumulative perceived benefits for device use on relations between gender and stages of change in physical activity (Pre/Post Action & Maintenance)