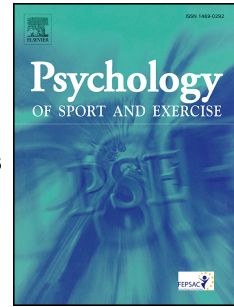


# Accepted Manuscript

Equal Prioritisation Does Not Yield Lower Levels of Participation in Physical Activities than Higher Prioritisation

Nikos L.D. Chatzisarantis, Vasilis Barkoukis, Sami Yli-Pipari, Cecile Thorgensen-Ntoumani, Nikos Ntoumanis, Sarah Hardcastle, Martin S. Hagger



PII: S1469-0292(15)00079-5

DOI: [10.1016/j.psychsport.2015.07.001](https://doi.org/10.1016/j.psychsport.2015.07.001)

Reference: PSYSPO 1019

To appear in: *Psychology of Sport & Exercise*

Received Date: 2 December 2014

Revised Date: 29 June 2015

Accepted Date: 8 July 2015

Please cite this article as: Chatzisarantis, N.L.D., Barkoukis, V., Yli-Pipari, S., Thorgensen-Ntoumani, C., Ntoumanis, N., Hardcastle, S., Hagger, M.S., Equal Prioritisation Does Not Yield Lower Levels of Participation in Physical Activities than Higher Prioritisation, *Psychology of Sport & Exercise* (2015), doi: 10.1016/j.psychsport.2015.07.001.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Equal Prioritisation Does Not Yield Lower Levels of Participation in Physical Activities than Higher Prioritisation

Nikos L. D. Chatzisarantis<sup>1</sup> and Vasilis Barkoukis<sup>2</sup>

Sami Yli-Pipari<sup>3</sup>

Cecile Thorgensen-Ntoumani<sup>1</sup>

Nikos Ntoumanis<sup>1</sup>

Sarah Hardcastle<sup>1</sup>

&

Martin S. Hagger<sup>1</sup>

Author Note

<sup>1</sup>Department of Psychology and Speech Pathology, Curtin University, Australia, email: [nikos.chatzisarantis@curtin.edu.au](mailto:nikos.chatzisarantis@curtin.edu.au) (corresponding author is Nikos Chatzisarantis), [martin.hagger@curtin.edu.au](mailto:martin.hagger@curtin.edu.au), [Nikos.ntoumanis@curtin.edu.au](mailto:Nikos.ntoumanis@curtin.edu.au), [c.thorgensen@curtin.edu.au](mailto:c.thorgensen@curtin.edu.au), [sarah.hardcastle@curtin.edu.au](mailto:sarah.hardcastle@curtin.edu.au) <sup>3</sup>Department of Physical Education, University of Memphis, USA, email: [srylppri@memphis.edu](mailto:srylppri@memphis.edu); <sup>2</sup>Department of Physical Education and Sport Science, Aristotle University of Thessaloniki, Greece email: [bark@phed.auth.gr](mailto:bark@phed.auth.gr). Correspondence regarding this manuscript should be addressed to Nikos L. D. Chatzisarantis, school of Psychology and Speech pathology 6003, Email: [nikos.chatzisarantis@curtin.edu.au](mailto:nikos.chatzisarantis@curtin.edu.au)

## Abstract

**Objectives:** This study examined whether individuals who assigned equal priority to physical activity and an alternative activity exhibited lower levels of participation in physical activities than individuals who assigned higher priority to physical activity than an alternative activity. In addition, we examined whether a measure of prioritisation derived from an algebraic difference index provided a rigorous test of prioritisation effects.

**Design.** We employed a two-wave prospective design that aimed to predict physical activity participation.

**Method.** Prioritisation, intentions and perceptions of control were measured at the first wave of data collection. After five weeks, we administered follow-up measures of behavioural conflict and physical activity participation.

**Results.** A hierarchical regression analysis showed that although the algebraic difference index was positively associated with measures of physical activity participation, equal prioritisation did not yield lower levels of physical activity participation than high prioritisation.

**Conclusions.** Findings suggest that equal prioritisation is not a less optimal self-regulatory strategy than high prioritisation in the domain of physical activity. Regression coefficients associated with algebraic difference indexes should be interpreted with caution and consider analyses that examine effects of component measures of prioritisation on physical activity participation.

**Keywords:** Prioritisation, algebraic difference index, behavioural conflict, physical activity

## Equal Prioritisation Does Not Yield Lower Levels of Participation in Physical Activities than Higher Prioritisation

Despite positive intentions and attitudes toward physical activity, two-thirds of the adult population do not meet recommended activity levels (Cavil, Kahlmeier, & Racioppi, 2006). One reason for low levels of physical activity is that other behaviours and roles that individuals enact in their daily lives conflict with physical activity participation (Presseau, Sniehotta, Francis, & Gebhardt, 2010; Presseau, Tait, Johnston, & Sniehotta, 2013; Riediger, & Freund, 2004). As a result, individuals continually re-allocate personal resources such as time, effort or energy from physical activity to other activities to ensure that moving toward one goal does not impede progress at another goal (Austin & Vancouver, 1996). The process of deciding how much to invest in which behaviours is termed prioritisation.

By definition, the construct of prioritisation assumes that individuals order a set of behaviours according to their importance. As a result, the process of prioritisation is assumed to yield different prioritisation states that denote individuals' tendencies to allocate more resources to one activity over another activity. Studies conducted in laboratory settings have focused on two distinct prioritisation states (Carver & Scheier, 1982; Powers, 1992). There is a state of high prioritisation whereby individuals allocate more resources to a target behaviour than an alternative behaviour. Important to note is that high prioritisation of a target behaviour implies low prioritisation of the alternative behaviour. There is also a state of equal prioritisation where individuals decide to allocate large and equivalent amounts of resources to a target behaviour and an alternative behaviour (Austin & Bobko, 1985; Austin & Vancouver, 1996).

To date, the experimental literature has documented that when individuals are asked to pursue two conflicting goals or acts, equal prioritisation yields lower levels of commitment

than high prioritisation of one behaviour over the other (i.e., Fitzsimons & Fishbach, 2010; Geers, Wellman, & Lassister, 2009; Louro & Zeelenberg, 2007; Schmidt & DeShon, 2007). For example, Locke, Smith and Erez (1994) demonstrated that participants instructed to pay equal attention to both “product quality” and “product quantity” produced products that were of lower quality than participants who were instructed to pay more attention to product quality than quantity. This evidence is consistent with models of self-regulation that assume personal resources for time, effort or energy to be limited (Carver & Scheier, 1982; Powers, 1992). This is because it should be virtually impossible to successfully pursue two goals because, under the assumption that self-regulatory resources are limited, resources expended toward the alternative activity will “drain” or “deplete” resources that one can devote to another activity.

Although laboratory studies have confirmed differential effects of equal prioritisation and high prioritisation on behavioural measures of goal commitment, only a small number of studies have examined an analogous hypothesis in the domain of physical activity. Li and Chan (2008) did not find main effects of indirect measures of prioritisation on physical activity participation. Rather, their results seemed to suggest that goal conflict yielded higher levels of physical activity participation when individuals were in a state of prioritisation than when they were not. However, it is important to note that Li and Chan (2008) employed an indirect measure of prioritisation that indicated intention instability rather than a measure that captured prioritisation states analogous to high or equal prioritisation. In a similar vein, studies that targeted other health-related behaviours have not been consistent in demonstrating effects of prioritisation on measures of behaviour (Abraham, Sheeran, Norman, Conner, de Vries, & Otten, 1999; Masuda & Sortheix, 2012). Given these findings, the purpose of the present study was to re-examine the link between prioritisation and physical activity participation.

One reason for which previous studies have been inconsistent in observing effects of prioritisation on health behaviours may be related to the operation definition of prioritisation. Specifically, in some studies the construct of prioritisation was measured through an algebraic difference index (Abraham et al., 1999). Calculation of the algebraic difference index involves two steps. First, researchers ask participants to compare importance, attitudes or intentions towards a target activity and an alternative activity (Ajzen & Fishbein, 1969; Locke et al., 1994; Masuda & Sortheix, 2012). Second, researchers calculate an algebraic difference index by subtracting responses to comparative measures of intentions toward the alternative activity from responses to comparative measures of intentions toward the target activity (Abraham et al., 1999). However, a limitation of the algebraic difference index is that regression coefficients or correlations associated with this index are difficult to interpret (Edwards, 1994, 2001; Griffin, Muray, & Gonzalez, 1999; Johns, 1981).

Formally, relations between the algebraic difference index and behaviour can be described by the following regression equation (see Edwards, 1994, 2001):

$$B = b_0 + b_1(CI - AI) + e \quad (1)$$

where B represents a measure of behaviour such as physical activity, CI represents comparative measures of intentions towards physical activity, AI is a comparative measure of individuals' intentions towards an alternative act, (CI - AI) is the algebraic difference index,  $b_0$  is the intercept of the regression equation,  $e$  represents residual variance and  $b_1$  is a regression coefficient that describes effects of the algebraic difference index on physical activity participation.

Intuitively, the algebraic difference index appears to be a good measure of prioritisation. This is because it assigns high (positive) numerical values to high prioritisation states that indicate stronger comparative intentions than alternative intentions. In addition,

subtraction locates states analogous to equal prioritisation on the middle of the scale. This is because subtraction yields values around zero for individuals who exhibit similar comparative intentions and alternative intentions. Given that this index assigns lower numerical values to equal prioritisation than high prioritisation, a positive regression coefficient (in Equation 1) can be easily taken to mean that equal prioritisation yields lower levels of physical activity participation than high prioritisation. However, the effects associated with the algebraic difference index can be misleading. Expanding Equation 2 yields (see Edwards, 1994, 2001):

$$B = b_0 + b_1(CI) - b_1(AI) + e \quad (2)$$

Equation 2 represents a class of statistical models that are termed additive models because it assumes that participation in physical activities is function of physical activity intentions and alternative intentions. The expansion also shows that the effect of the algebraic difference index (in Equation 1) is somehow linked to the two main effects associated with the two separate measures of intentions that make up the algebraic difference index (in Equation 2). If the effects of physical activity intentions are positive and statistically significant and the effects of alternative intentions are negative and statistically significant then the regression coefficient of the algebraic difference index will be positive. In this case, the positive regression coefficient of the algebraic difference index will indicate that equal prioritisation yields lower levels of physical activity participation than high prioritisation. However, the converse is not true. It is possible the regression coefficient of the algebraic difference index to be positive and statistically significant (in Equation 1), but empirical data to not support lower effects of equal prioritisation (as opposed to higher prioritisation) if in

Equation 2, the effects of alternative intentions on behaviour are not statistically significant (Edwards, 1994, 2001; Griffin et al., 1999)<sup>1</sup>.

Figures 1 and 2 present two hypothetical data sets that have been analysed by ways of fitting an additive model (see also Griffin et al., 1999 for similar examples). In both data sets, the correlations between the algebraic difference index and behaviour are statistically significant. However, in Figure 1, equal and high prioritisation yield equivalent levels of behaviour because intentions toward the alternative act are not associated with behaviour. In contrast, in Figure 2, equal prioritisation yields lower performance levels because intentions toward the alternative act are negatively associated with behaviour. In other words, one has to formally confirm that intentions toward the alternative act are negatively associated with physical activity participation in order to verify core findings observed in the experimental literature that predict equal prioritisation constitutes a less optimal form of self-regulation than high prioritisation.

Studies conducted in the physical activity domain have not employed the algebraic difference index to examine effects of prioritisation on physical activity participation. Nonetheless, there is a growing body of literature that examined effects of separate measures of physical activity intentions and alternative intentions on physical activity participation (Chatzisarantis & Hagger, 2007; Hagger, Chatzisarantis & Biddle, 2002; Rhodes & Blanchard, 2008; Salmon, Owen, Crawford, Bauman, & Sallis, 2003). However, in those studies, measures of intentions were proxy measures of prioritisation because participants were not asked to rank or compare their multiple intentions. Despite this, results from these studies have been consistent in demonstrating positive effects of physical activity intentions

---

<sup>1</sup>The expansion also shows that the absolute value of regression coefficients is identical in Equation 2. This constraint is not important in the context of prioritisation research because the regression equation still supports differential effects of equal prioritisation and high prioritisation on behaviour even if the absolute values of regression coefficients are not equal.



on physical activity behaviour (Hagger, Chatzisarantis, & Biddle, 2002). However, studies have been less consistent in demonstrating effects of alternative intentions on physical activity participation. For example, although Rhodes and Blanchard (2008) documented that intentions to watch TV were negatively associated with physical activity participation, intentions to engage in other hobbies were not associated with physical activity participation. Likewise, Chatzisarantis and Hagger (2007) did not observe a negative relationship between intentions to consume alcohol and physical activity participation.

### **Hypotheses**

The purpose of the present study was to examine differential effects of equal prioritisation and high prioritisation on physical activity participation. In addition, we examined the meaning of effects associated with the algebraic difference index in the context of physical activity. To address these objectives, we measured prioritisation using an instrument that prompted participants to compare their physical activity intentions with their intentions toward an alternative act (or a set of alternatives) that participants deemed to conflict with physical activity participation (Ajzen & Fishbein, 1969; Sheppard, Hartwick & Warshaw, 1988). Hence, our measures of alternative intentions are expression of intentions toward conflicting acts. We targeted conflicting alternatives in order to be consistent with previous experimental studies that induced goal conflict in testing effects of equal and high prioritisation on goal commitment.

We addressed the objectives of the present study by conducting an initial hierarchical regression analysis that estimated effects of the algebraic difference index on physical activity behaviour. In accordance with previous research (Ajzen & Fishbein, 1969; Abraham & Sheeran, 2003), we expected the algebraic difference index to be positively associated with physical activity behaviour. However, because effects associated with the algebraic

difference index may be misleading, we also conducted a second regression analysis that predicted physical activity behaviour from component measures of prioritisation. We reasoned that if equal prioritisation yielded lower levels of physical activity participation than high prioritisation then effects of comparative measures of intentions towards physical activity on measures of physical activity participation will be positive and statistically significant whereas corresponding effects of intentions toward conflicting acts would be negative and statistically significant ( $H_1$ ). Support of this hypothesis will also entail that the algebraic difference index provides a good test of differential effects of equal prioritisation and high prioritisation on physical activity participation provided that the algebraic difference index is positively associated with physical activity participation.

Alternatively, we reasoned that if equal prioritisation and high prioritisation yielded equivalent levels of physical activity participation, then the effects of comparative measures of intentions toward physical activity on measures of physical activity participation will be positive and statistically significant whereas corresponding effects of intentions toward conflicting acts would not be statistically significant ( $H_2$ ). Support for this second hypothesis would provide evidence that the effects of the algebraic difference index do not provide a rigorous test of differential effects of equal prioritisation and high prioritization in the domain of physical activity.

We also measured a number of additional variables in order to statistically control for their effects on physical activity participation or clarify prioritisation effects further. As we previously mentioned, we target alternative acts that participants deemed to be conflicting with physical activity participation in the current study. Hence, it is important to measure goal conflict in order to examine whether intentions toward alternative acts are associated with high levels of goal conflict. In addition, our statistical analysis controlled for two variables contained in Ajzen and Driver's (1992) theory of planned behaviour, namely,

intentions and perceived behavioural control. We statistically controlled for perceptions of control because previous research has shown this variable to be positively correlated with prioritisation (Ajzen & Fishbein, 1969; Sheppard, Hartwick & Warshaw, 1988). We also measured intentions from the theory of planned behaviour because prioritisation was assessed through items that indicated intentions. Moreover, according to Ajzen and Fishbein (1969) both perceptions of control and comparative intentions are antecedents of intentions from the theory of planned behaviour. Hence, it may be prudent to include a measure of intentions in our analysis so that we control for effects that this variable exerts on physical activity participation or common method variance. However, it is important to note that intentions that were measured at the level of prioritisation were comparative in nature because participants were asked to compare their physical activity intentions against an alternative intention. In contrast, intentions from the theory of planned behaviour were not comparative in nature because participants were not asked to compare them against alternative intentions.

## Method

### Participants and Design

Participants were secondary-school students ( $N = 244$ ; Male = 104, Female = 140, Age = 14.83,  $SD = .95$ ) recruited from a government-run school. The research protocol was approved by the human research ethics committee of a University. We employed a prospective design that measured intentions and perceptions of control from the theory of planned behaviour and component measures of prioritisation at the first wave of data collection. After five weeks, we measured goal conflict and physical activity behaviour at the second wave of data collection. Two hundred and thirty-five students voluntarily participated in the second wave of data collection (Male = 100, Female = 135, Age = 14.89,  $SD = .96$ ).

The low attrition rate (3.69%) was due to the fact that attendance of secondary school was compulsory.

## **Procedure**

Participants completed the first and second surveys in quiet classroom settings with less than 25 students. The second survey was short and aimed to assess behavioural conflict retrospectively and frequency of physical activity participation the previous five weeks. We measured behavioural conflict retrospectively because Presseau et al. (2013) demonstrated that retrospective measures of goal conflict that indicated time-spent in pursuing conflicting acts were better predictors of physical activity participation than measures of expected goal conflict.

The first and second surveys defined physical activity as participation in vigorous-intensity physical activities for at least 4 days per week and for at least 45-minutes each time, during leisure-time. Participants were also informed that we were not interested in the physical activities they engaged in during school time (e.g., physical activity in physical education classes and during recess or break periods) but only their physical activities outside schools during their leisure-time. Participants were also provided with examples of leisure-time physical activity. In keeping with Ajzen and Fishbein's (1980) principle of correspondence, intentions and perceptions of control corresponded with measures of physical activity behaviour in terms of "action" (physical activity), "target" toward which action was directed (for at least 45 minutes, 4 times per week), "time" (over the next 5 weeks) and "context" (during leisure time). All participants and their parents completed consent forms after they had been provided with information sheets that described characteristics of the current study.

## **Measures**

**Theory of planned behaviour constructs.** We followed the procedures recommended by Ajzen and Fishbein (1980), Ajzen and Madden (1986), and Chatzisarantis and Hagger (2005) in the development of items tapping perceptions of control and intentions from the theory of planned behaviour. Intentions were measured through three items on a seven-point scale anchored by “strongly agree” (7) to “strongly disagree” (1). An example item was “I intend to engage in vigorous physical activities for at least 45 minutes, four days per week, over the next five weeks, during my leisure-time”. Perceived behavioural control was assessed through three items. An example was: “How much control do you believe you have over engaging in vigorous physical activities for at least 45 minutes, four days per week, over the next five weeks, during your leisure-time?” This item was measured on a seven-point scale ranging from “no control” to “complete control” (Ajzen & Madden, 1986). The alpha coefficients for intentions ( $\alpha = .89$ ) and perceptions of control ( $\alpha = .70$ ) were satisfactory.

**Prioritisation (comparative intentions).** We employed Ajzen and Fishbein’s (1969) method to measure prioritisation (see also Sheppard et al., 1988). Specifically, participants were asked first to report a behaviour or a set of behaviours that they predicted to prevent them from engaging in vigorous physical activities for at least 45 minutes, four days per week, over the next five weeks, during their leisure-time. Next, participants were asked to report and compare their physical activity intentions with their intentions toward the self-reported conflicting acts. Comparative intentions toward physical activity and conflicting acts were measured through three items each, and on seven-point scales ranging from “not at all” (1) to “very much” (7). An example item for comparative intentions toward the conflicting acts was: “To what extent do you intend to engage in the alternative behaviour over the next five weeks, during your leisure-time?” An example item measuring comparative intentions toward physical activity was: “Comparing to your intentions to engage in the alternative

behaviour, by how much more or less do you intend to engage in vigorous physical activities over the next five weeks, during your leisure time?" The alpha coefficients for comparative measures of intentions ( $\alpha = .90$ ) and intentions toward conflicting acts ( $\alpha = .92$ ) were satisfactory (see Appendix for complete description of items).

**Algebraic difference index.** This index was calculated by subtracting responses to comparative intentions toward conflicting acts from comparative intentions toward physical activity.

**Behavioural conflict.** This variable was measured using two items in the survey administered at the second wave of data collection in which participants were asked to indicate the frequency with which the conflicting act prevented physical activity participation. Specifically, participants were asked first to report a behaviour or a set of behaviours that actually prevented them from engaging in vigorous physical activities for at least 45 minutes, four days per week, the last five weeks, during their leisure-time. Next, participants were instructed to report frequency with which the alternative act interfered with physical activity participation (see Ajzen & Madden, 1985). The first item for behavioural conflict was: "In a typical week, how often did the alternative behaviour prevent you from engaging in vigorous physical activities for at least 45 minutes, the last five weeks, during your leisure-time?" This item was measured on a seven-point scale ranging from "not at all" (1) to "most days of the week" (7). The second item for behavioural conflict read: "In a typical week, to what extent did the alternative behaviour prevent you from engaging in vigorous physical activities for at least 45 minutes, the last five weeks, during your leisure-time?" This item was measured on a seven-point scale ranging from "not at all" (1) to "very much" (7). The correlation between the two items measuring goal conflict was satisfactory ( $r = .71$ ).

**Physical activity.** We used an item from Godin and Shephard's (1985) leisure-time exercise questionnaire to measure vigorous-intensity physical activity at follow-up (see also Li & Wang, 2008). Independent evaluations of this questionnaire found it to be valid, reliable, easy to administer, and to display concurrent validity with objective activity, and fitness indexes (Jacobs, Ainsworth, Hartman, & Leon, 1993). The questionnaire asked participants to think of a typical week from the previous five weeks and then report how often they engaged in vigorous-intensity physical activity for at least 45 minutes during their leisure time over previous five weeks with responses ranging from zero to seven days<sup>2</sup>.

## Results

### Preliminary Analysis

Table 1 presents descriptive statistics and correlations between psychological variables. Correlations revealed statistically significant and positive relationships between measures of physical activity behaviour with the component measures of prioritisation, perceptions of control or intentions from the theory of planned behaviour. Further, in accordance with our expectations, there were positive, large, and statistically significant correlations between component measures of prioritisation and intentions or perceptions of control. These correlations support our decision to control for effects of intentions and perceptions of control in estimating effects of prioritisation on physical activity behaviour.

Correlations also indicated a positive relationship between the algebraic difference index and physical activity behaviour. Given that the algebraic difference index yields lower scores when individuals' response patterns reflect a state of equal prioritisation than when their response patterns reflect a favourable prioritisation, this correlation could be easily

---

<sup>2</sup>In the current study, we also measured past physical activity behaviour and other variables contained in the theory of planned behaviour such as attitudes and subjective norms. We decided to not include these variables in the analysis because they did not change results of the study. However, for completion we have reported results from a full model that controlled for variables from the theory of planned behaviour and past behaviour in an Appendix.

interpreted as indicating that equal prioritisation yielded lower levels of physical activity participation than high prioritisation. However, a closer look at the correlation matrix does not support this conclusion. This is because the correlation between intentions toward conflicting alternatives and physical activity was positive rather than negative. Further, the correlation between intentions toward conflicting acts and behavioural conflict was negative rather than positive – a finding that suggests strong intentions toward conflicting acts do not yield high levels of behavioural conflict. This pattern of findings, therefore, provides preliminary support for our second hypothesis that equal prioritisation does not yield lower levels of physical activity participation than high prioritisation.

### **Main Analysis**

Tables 2 and 3 present results from the two separate regression analyses that examined effects of the algebraic difference index or component measures of prioritisation on physical activity behaviour. Consistent with our preliminary analysis, the algebraic difference index explained 2% of variance in physical activity participation after controlling for behavioural conflict, perceived behavioural control and intentions (see Table 2). However, analysis of physical activity participation on the basis of component measures of prioritisation did not support differential effects of equal prioritisation and high prioritisation on physical activity participation (see Table 3). This conclusion is based on the fact that although the second step of analysis indicated that comparative intentions improved the predictive validity of the model by 6%, the beta coefficient describing effects of intentions toward conflicting acts was not statistically significant in the third step of the analysis. In addition, the third step of the regression analysis, in which we included intentions toward



conflicting acts, did not add to the prediction of physical activity over and above a model that included comparative measures of intentions (see Figure 3)<sup>3</sup>.

## Discussion

The purpose of the present study was to test the differential effects of equal prioritisation and high prioritisation on physical activity participation. In addition, we examined the meaning of effects associated with the algebraic difference index in the domain of physical activity. In accordance with expectations, the regression analysis demonstrated positive effects of the algebraic difference index on physical activity behaviour. However, these positive effects observed for the algebraic difference index did not reflect lower effects of equal prioritisation (as opposed to high prioritisation) on physical activity participation. This is because the second hierarchical regression analysis did not support negative effects of alternative intentions on physical activity participation. Hence, the current study suggests that caution should be exercised in using and interpreting correlations between difference score indexes and physical activity participation.

A reason for which the algebraic difference index does not provide a rigorous test of differential effects associated with different prioritisation states is that it masks main effects of physical activity intentions and alternative intentions – a problem that is commonly known as the “confounding of difference scores with their constituents” (Edwards, 1994, 2001; Griffin et al. 1999). Using and interpreting difference score correlations alone is analogous to interpreting an overall *F*-statistic in a one-way ANOVA and neglecting to consider the levels

---

<sup>3</sup>It can be argued that effects of equal prioritization can be modelled through hierarchical regression analysis that examines effects of interaction (product term) between alternative intentions and comparative intentions (comparative intentions x alternative intentions). Although some researchers have argued against this method (Edwards, 2001), we tested these interactions in the present study for completion. Results did not reveal statistically significant effects ( $\Delta F = .01, p = .96$ ). In addition, regression analysis did not support statistically significant interactions between comparative intentions and behavioural conflict (comparative intentions x goal conflict;  $\Delta F = .15, p = .70$ ) or between alternative intentions and behavioural conflict (alternative intentions x behavioural conflict;  $\Delta F = .49, p = .48$ ) after controlling for main effects of intentions, perceptions of control, behavioural conflict, alternative intentions and comparative intentions.

of physical activity participation that are associated with intentions towards physical activity and intentions towards conflicting acts. The present study demonstrated that this problem can be overcome by conducting regression analyses in which the main effects of component measures of prioritisation on physical activity participation are estimated.

Specifically, in the present study the effects of the algebraic difference index were positive because high prioritisation yielded higher levels of physical activity than low prioritisation – a state that combined weak intentions toward physical activity and strong intentions toward the alternative acts. This can be easily seen in Figure 2 in which the average levels of physical activity participation were much higher for individuals who assigned high priority to physical activity ( $M = 1.38$ ) than individuals who assigned low priority to physical activity ( $M = .62$ ). However, it is important to emphasise that a positive relationship between the algebraic difference index and outcome measures should not always be taken to mean that it reflects differential effects of high versus low prioritisation states. It is possible that, in other behavioural domains, a positive relationship between the algebraic difference index and measures of behaviour to be driven by other prioritisation states such as states that indicate equal prioritisation. Hence, we recommend that researchers using difference score correlations should test additive models that estimate main effects of component measures of prioritisation on physical activity participation. With this information at hand, researchers can then determine whether their interpretations of statistical coefficients associated with the algebraic difference index are valid.

Our findings invite consideration of effectiveness of other models and measures of prioritisation that have been used in the literature. Specifically, a number of researchers have proposed that measures of temporal stability of intentions indicate prioritisation because, by definition, prioritisation processes involve changes in intentions or behaviour (Abraham & Sheeran, 2003; Li & Chan, 2008). In other words, fluctuations in intentions over time that

reflect imperfect temporal stability indicate changes of priorities whereas perfect stability (inertia) of intentions indicates no change of priorities. In addition, it has been proposed that the temporal stability of intentions can be calculated by taking the sum of absolute differences between intention items at two points in time. High scores on this absolute difference index reflect changes of priorities whereas low scores indicate no-change of priorities.

There are a number of issues that researchers need to consider in interpreting absolute difference indexes. First, the absolute difference index is a 'directionless' measure of prioritisation as it "returns" the same positive values to response patterns that indicate an equivalent amount of increase and decrease in intentions over time. This property of the absolute difference index is not trivial because if it does not hold, or is not statistically controlled for in regression analyses, then it is difficult to "gauge" whether main or moderating effects of the absolute difference index are due to instability, or an increase or decline in intentions over time (Edwards, 1994, 2001). Ideally, researchers using absolute difference scores should statistically control for direction of temporal change in regression analyses by estimating main effects of dummy-coded variables that indicate increases or decreases in intentions over time (Edwards, 1994).

Apart from clarifying the conceptual meaning of difference score correlations, the present study raises important questions related to generality of experimental findings to physical activity settings. As we mentioned previously, the experimental literature shows that equal prioritisation yields lower levels of commitment than high prioritisation (Fitzsimons & Fishbach, 2010; Geers, Wellman, & Lassister, 2009; Louro & Zeelenberg, 2007; Schmidt & Deshon, 2007). Contrary to these findings, the present study demonstrates that in the domain of physical activity equal prioritisation cannot be considered as being a non-optimal self-regulatory strategy because it yields the same levels of physical activity participation as high

prioritisation. This conclusion is also reinforced by other studies that did not use an algebraic index in evaluating effects of multiple intentions on physical activity participation.

Specifically, as we have already mentioned in the introduction, whereas Rhodes and Blanchard (2008) documented effects of intentions on physical activity participation, intentions to engage in other hobbies were not associated with physical activity participation. Results such as those are a step forward in current theorising and raise a number of questions related to generality of experimental findings to the physical activity domain.

One possible reason why current results do not corroborate experimental findings is that experimental settings do not closely resemble physical activity settings. Specifically, in experimental settings researchers have a tendency to set goal conflict at a very high level. For example in a study conducted by Schmidt and Deshon (2007), only 14% of participants could successfully meet their goals. In contrast, in physical activity settings, experienced goal conflict should be much lower and more variable. This may be particularly germane for adolescents whose responsibilities and roles in life are considerably fewer than responsibilities and role of adults. Analogously, alternative acts may also facilitate physical activity participation. In accordance with this proposition, Pesseau et al. (2013) found that individuals spend a considerable amount of time pursuing alternative acts that facilitate and impede physical activity participation – a finding that corroborates the view that physical activity settings resemble resource-rich environments in which alternative acts may also assist physical activity participation.

In addition, participants acting in laboratory settings are seldom provided with the opportunity to engage in preparatory actions, such as planning, that enable them to manage goal conflict or enact multiple intentions (Abraham & Sheeran, 2003; Abraham, Sheeran, Norman, Conner, de Vries & Otten, 1999; Hagger & Luszczynska, 2014). This is because experimental settings demand participants pursue multiple goals immediately after they have

been instructed to prioritise goals. In contrast, evidence suggests that in physical activity settings, young people can and often do engage in planning or other preparatory actions that enable them to pursue multiple goal intentions and that measures of spontaneous planning predict physical activity participation over and above physical activity intentions (Brickell, Chatzisarantis, & Pretty, 2006; Chatzisarantis, Hagger, & Wang, 2010; Rhodes, Blanchard, Matheson, & Coble, 2006; Trinh, Plotnikoff, Rhodes, North, & Courneya, 2012).

Finally, it will be remiss of us to not mention some limitations of the present study. The sample of the present study comprised young students. In addition, our measure of physical activity was not objective but self-report. Hence, it may be important to replicate current findings in a different population and by using more objective measures of physical activity participation. Further, alternative intentions might have not predicted physical activity participation because the items measuring comparative intentions might have been difficult to respond to. Hence, it may be important to replicate current findings by using other measures of prioritisation. In addition, we did not examine why participants chose to assign equal priority to physical activity and conflicting acts. A possible reason is that young people chose to do so when they believe that conflicting acts also facilitate physical activity behaviour. Hence, it may be prudent to evaluate effects of goal facilitation and prioritisation on physical activity in the future.

Overall, results of the present study suggest that in the domain of physical activity, a positive relationship between the algebraic difference index and physical activity participation does not mean that equal prioritisation yields lower levels of physical activity participation than high prioritisation. As a consequence, it is proposed that researchers should interpret correlations between algebraic difference indexes and physical activity participation with caution and in light of component measures of prioritisation. The theoretical implication of the present study is that tendencies to assign equal priority to physical activity and

conflicting alternatives do not yield lower levels of physical activity participation than tendencies to prioritise physical activity over conflicting alternatives.

ACCEPTED MANUSCRIPT

## References

- Abraham, C., & Sheeran, P. (2003). Implications of goal theories for the theories of reasoned action and planned behaviour. *Current Psychology, 3*, 264-280.
- Abraham, C., Sheeran, P., Norman, P., Conner, M., De Vries, N., & Otten, W. (1999). When good intentions are not enough: Modelling postdecisional cognitive correlates of condom use. *Journal of Applied Social Psychology, 29*, 2591-2612.
- Ajzen, I., & Fishbein, M. (1969). The prediction of behavioural intentions in a choice situation. *Journal of Experimental Social Psychology, 5*, 400-416.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. New Jersey: Prentice Hall.
- Ajzen, I., & Madden, T. J. (1986). Prediction of goal directed behavior: Attitudes, intentions and perceived behavioural control. *Journal of Experimental Social Psychology, 22*, 453-474.
- Ajzen, I., & Driver, B. L. (1992). Application of the theory of planned behavior to leisure choice. *Journal of Leisure Research, 24*, 207-224.
- Austin, J. T., & Bobko, P. (1985). Goal-setting theory: Unexplored areas and future research needs. *Journal of Occupational Psychology, 58*, 289-308.
- Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process and content. *Psychological Bulletin, 3*, 338-375.
- Brickell, T. A., Chatzisarantis, N. L. D., & Pretty, G. M. (2006). Using past behaviour and spontaneous implementation intentions to enhance utility of the theory of planned behaviour in predicting exercise. *British Journal of Health Psychology, 11*, 249-262.

- Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behaviour*. New York: Cambridge University Press.
- Cavil, N., Kahlmeier, S., & Racioppi, F. (2006). *Physical activity and health in Europe: Evidence for action*. WHO regional office in Europe.
- Chatzisarantis, N. L. D., & Hagger, M. S. (2005). Effects of an intervention based on the theory of planned behaviour on leisure-time physical activity. *Journal of Sport and Exercise Psychology*, *27*, 470-487.
- Chatzisarantis, N. L. D., & Hagger, M. S. (2007). Mindfulness and the intention-behavior relationship within the theory of planned behaviour. *Personality and Social Psychology Bulletin*, *33*, 663-676.
- Chatzisarantis, N. L. D., Hagger, M. S., & Wang, C. K. J. (2010). Effects of implementation intentions and self-concordance on behaviour. *British Journal of Psychology*, *101*, 705-718.
- Edwards, J. R. (1994). The study of congruence in organisation behaviour: Critique and a proposed alternative. *Organisational Behavior and Human Decision-Making Processes*, *58*, 51-100. doi: 0749-5978/94.
- Edwards, J. R. (2001). Ten difference score myths. *Organisational Research Methods*, *3*, 265-287.
- Fitzsimons, G. M., & Fishbach, A. (2010). Shifting closeness: Interpersonal effects of personal goal progress. *Journal of Personality and Social Psychology*, *4*, 535-549. doi: 10.1037/a0018581.



Geers, A. L., Wellman, J. A., & Lassiter, G. D. (2009). Dispositional optimism and engagement: The moderating influence of goal prioritisation. *Journal of Personality and Social Psychology, 4*, 913-932. doi:10.1037/a0014830.

Godin G., & Shephard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Science, 10*, 141-146.

Griffin, D., Murray, S., & Gonzalez, R. (1999). Difference score correlations in relationship research: A Conceptual Primer. *Personal Relationships, 6*, 505-518. doi: 1350-4126/99.

Hagger, M., Chatzisarantis, N., Biddle, S., & Orbell, S. (2001). Antecedent of children's physical activity intentions and behavior: Predictive validity and longitudinal effects. *Psychology and Health, 16*, 391-407.

Hagger, M., Chatzisarantis, N., & Biddle, S. (2002). A meta-analytic review of the theories of reasoned action and planned behavior: Predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology, 24*, 3-32.

Hagger, M. S., & Luszczynska, A. (2014). Implementation intention and action planning interventions in health contexts: State of the research and proposals for the way forward. *Applied Psychology: Health and Well-Being, 6*, 1-47. doi:10.1111/aphw.12017.

Jacobs, D. R., Ainsworth, B. E., Hartman, T. J., Leon, A. S. (1993). A simultaneous evaluation of 10 commonly used physical activity questionnaires. *Medicine and Science in Sports and Exercise, 25*, 81-91.

Johns, G. (1981). Difference score measures of organisation behaviour variables: A critique. *Organisational Behaviour and Human Performance, 27*, 443-463.

Li, K. K., & Chan, D. S. (2008). Goal conflict and the moderating effects of intention stability in the intention-behavior relations: Physical activity among Hong Kong Chinese.

*Journal of Sport and Exercise Psychology*, *30*, 39-55.

Locke, E. A., Smith, K. G., Erez, M., Chah, D. O., Schaffer, A. (1994). The effects of intraindividual goal conflict on performance. *Journal of Management*, *1*, 67-91.

Louro, M. J., Pieters, R., & Zeelberg, M. (2007). Dynamics of multiple-goal pursuit. *Journal of Personality and Social Psychology* *2*, 174-193. doi: 10.1037/022-3514.93.2.174.

Masuda, A. D., & Sortheix, F. M. (2003). Work-family values, priority goals and life satisfaction: A seven year follow-up of MBA students. *Journal of Happiness Studies*, *13*, 1131-1144. doi: 10.1007/s10902-011-9310-6.

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin*, *124*, 54-74.

Powers, W. T. (1992). *Living control systems*. Gravel Switch, KY: Control Systems Group.

Preseau, J., Sniehotta, F. F., Francis, J. J., & Gebhardt, W. A. (2010). With a little help of my goals: Integrating intergoal facilitation with the theory of planned behaviour to predict physical activity. *British Journal of Health Psychology*, *15*, 905-919. doi: 10.1037/a0029430.

Preseau, J., Tait, R., Johnston, D. W., & Sniehotta, F. F. (2013). Goal conflict and goal facilitation as predictors of daily accelerometer-assessed physical activity. *Health Psychology*, *12*, 1179-1187.

Rhodes, R. E., & Blanchard, C. M. (2008). Do sedentary motives adversely affect physical activity? Adding cross-behavioural cognition to the theory of planned behaviour. *Psychology and Health, 7*, 789-805.

Rhodes, R. E., Blanchard, C. M., Matheson, D. H., & Coble, J. (2006). Disentangling motivation, intention and planning in the physical activity domain. *Psychology of Sport and Exercise, 7*, 15-27.

Riediger, M., & Freund, A. M. (2004). Interference and facilitation among personal goals: Differential associations with subjective well-being and persistent goal pursuit. *Personality and Social Psychology Bulletin, 30*, 1511-1523.

Salmon, J., Owen, N., Crawford, D., Bauman N., & Sallis, F. J. (2003). Physical activity and sedentary behaviour: A population-based study of barriers, enjoyment, and preference. *Health Psychology, 2*, 178-288.

Schmidt, A. M., & DeShon, R. P. (2007). What to do? The effects of discrepancies, incentives, and time on dynamic goal prioritisation. *Journal of Applied Psychology, 4*, 928-941. doi: 10.137/0021-9010.92.4.98.

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: a meta-analysis of past research with recommendations for modification and future research. *Journal of Consumer Research, 15*, 325-343.

Trinh, L., Plotnikoff, R. C., Rhodes, R. E., North, S., & Courneya, K. S. (2012). Correlates of physical activity in a population-based sample of kidney cancer survivors: an application of the theory of planned behaviour. *International Journal of Behavioral Nutrition and Physical Activity, 6*, 1-12.

Table 1

*Descriptive Statistics and Correlations Between Psychological Measures*

	M	SD	1	2	3	4	5	6	7
1.Physical activity behaviour	4.01	1.51	1.0						
2.Intentions	4.75	1.63	.56*	1.0					
3.Perceptions of control	4.51	.92	.43*	.41*	1.0				
4.Behavioural conflict	3.02	1.75	-.06	.01	.14	1.0			
5.Comparative intentions	4.86	1.46	.59*	.59*	.42*	-.11	1.0		
6.Intentions toward conflicting acts	4.93	1.63	.38*	.49*	.28*	-.16	.59*	1.0	
7.Algebraic difference index	-.08	1.40	.20*	.06	.12	-.08	.37*	-.54*	1.0

*Note.* Parameters with an asterisk are statistically significant at  $p < .05$  level. Measures of physical activity ranged from 0 to 7. All other measures ranged from 1 to 7.

Table 2

*Effects of Algebraic Difference Index on Physical Activity Behaviour*

Steps	Variables entered	Beta	
		Model 1	Model 2
1	Intentions	.45*	.45*
	Perceptions of control	.26*	.24*
	Goal conflict	-.10	-.08
3	Algebraic difference index		.12*
	$R^2$	.36	.38
	$\Delta F$	44.54*	5.22*

Note. Parameters with an asterisk are statistically significant at  $p < .05$  level

Table 3

*Effects of Component Measures of Prioritisation on Physical Activity Behaviour*

Steps	Variables entered	Beta		
		Model 1	Model 2	Model 3
1	Intentions	.45*	.32*	.22*
	Perceptions of control	.26*	.19*	.19*
	Goal conflict	-.10	-.12*	-.12*
3	Comparative intentions		.30*	.30*
4	Intentions toward conflicting act			.01
	$R^2$	.36	.42	.42
	$\Delta F$	44.54*	23.20*	.01

*Note.* Parameters with an asterisk are statistically significant at  $p < .05$  level

Figure captions.

*Figure 1.* A regression model that supports effects of the algebraic difference index but not effects of alternative intentions.

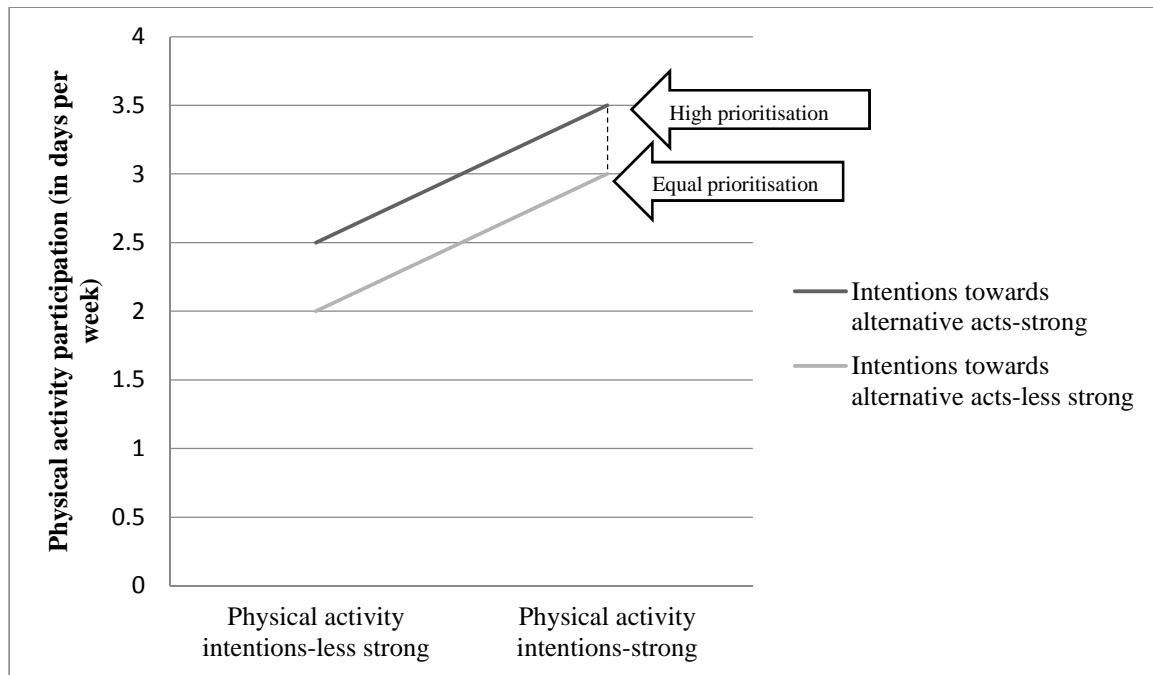
*Note.* The correlation between the algebraic difference index and behaviour is .40. Strong intentions towards the target act combined with strong alternative intentions reflect equal prioritisation. Strong intentions towards the target act combined with weak alternative intentions reflect high prioritisation. The dashed line that connects the two parallel lines represents main effects of alternative intentions and differential effects of equal versus high prioritisation. The longer the dashed line the stronger the main effect for alternative intentions. The data are simulated and used only for illustrative purposes ( $N = 121$ ).

*Figure 2.* A regression model that supports effects of the algebraic difference index and effects of alternative intentions.

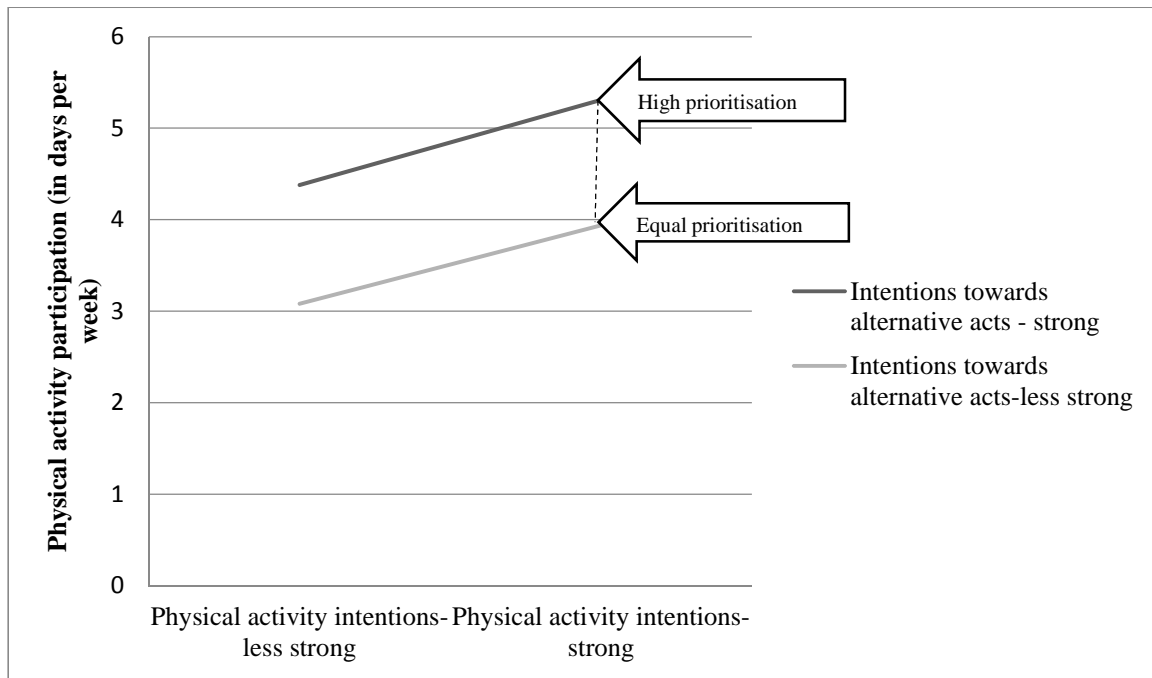
*Note.* The correlations between the algebraic difference index and the outcome measure is .59. Strong intentions towards the alternative act combined with strong alternative intentions reflect equal prioritisation. Strong intentions towards the target act combined with weak alternative intentions reflect high prioritisation. The dashed line that connects the two parallel lines represents main effects of alternative intentions and differential effects of equal versus high prioritisation. The longer the dashed line the stronger the main effect for alternative intentions. The data are simulated and used only for illustrative purposes ( $N = 121$ ).

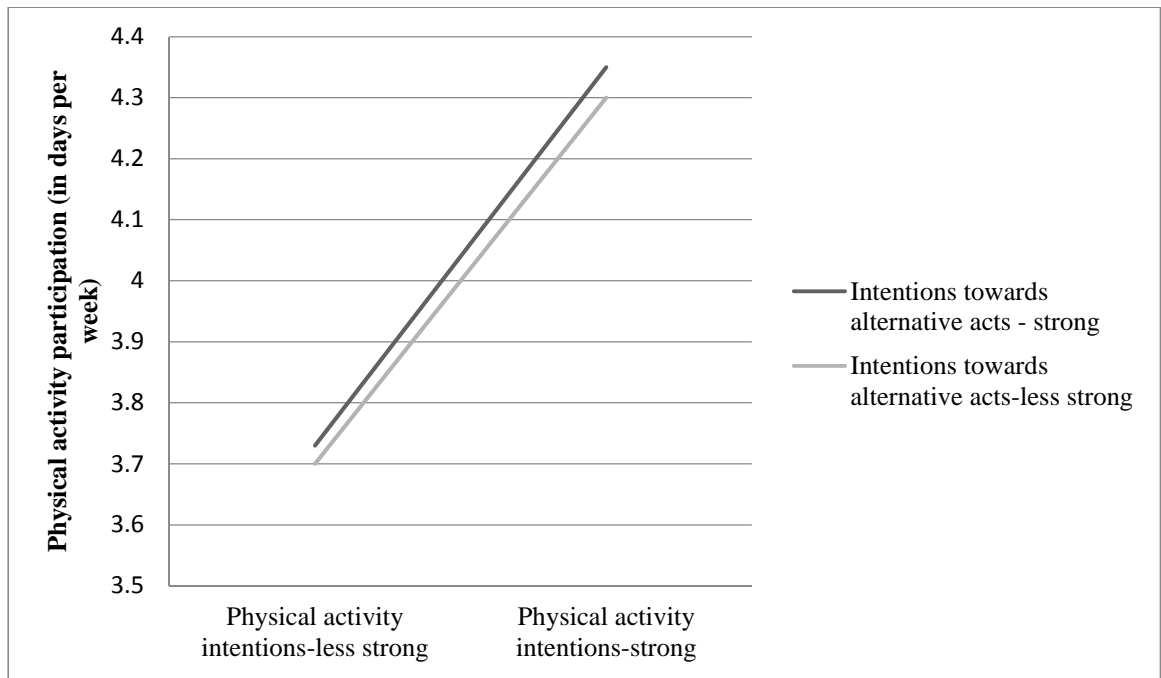
*Figure 3.* Main effects of component measures of prioritisation on physical activity participation.

*Note.* Strong physical activity intentions combined with strong alternative intentions reflect equal prioritisation. Strong physical activity intentions combined with weak alternative intentions reflect high prioritisation.









## Appendix

### Measures of alternative intentions

To what extent do you intend to engage in the alternative behaviour over the next five weeks, during your leisure-time?

To what extent are you determined to engage in the alternative behaviour over the next five weeks, during your leisure-time?

To what extent are you willing to engage in the alternative behaviour over the next five weeks, during your leisure-time?

### Measures of comparative intentions

Comparing to your intentions to engage in the alternative behaviour, by how much more or less do you intend to engage in vigorous physical activities over the next five weeks, during your leisure time?

Comparing to your determination to engage in the alternative behaviour, by how much more or less are you determined to engage in vigorous physical activities over the next five weeks, during your leisure time?

Comparing to your willingness to engage in the alternative behaviour, by how much more or less are you determined to engage in vigorous physical activities over the next five weeks, during your leisure time?

*Effects of Algebraic Difference Index on Physical Activity Behaviour*

		Beta			
Steps	Variables entered	Model 1	Model 2	Model 3	Model 4
1	Intentions	.44*	.13*	.13*	.13*
	Perceptions of control	.24*	.15*	.16*	.15*
2	Attitudes		.13*	.13*	.13*
	Subjective norms		.15*	.14*	.13*
	Past behaviour		.50*	.50*	.50*
3	Goal conflict			-.06	-.05
4	Algebraic difference index				.11*
	$R^2$	.34	.59	.59	.61
	$\Delta F$	62.39*	49.06*	2.05*	6.42*

*Note.* Parameters with an asterisk are statistically significant at  $p < .05$  level

*Effects of Component Measures of Prioritisation on Physical Activity Behaviour*

		Beta				
Steps	Variables entered	Model 1	Model 2	Model 3	Model 4	Model 5
1	Intentions	.44*	.13*	.13*	.03	.03
	Perceptions of control	.24*	.15*	.16*	.11*	.11*
2	Attitudes		.13*	.13*	.09*	.10*
	Subjective norms		.15*	.14*	.13*	.12*
	Past behaviour		.50*	.50*	.50*	.50*
3	Goal conflict			-.06	-.08*	-.08*
4	Comparative intentions				.26*	.27*
5	Intentions toward conflicting act					-.01
	$R^2$	.34	.59	.59	.64	.64
	$\Delta F$	62.39*	49.06*	2.05	31.22*	.05

*Note.* Parameters with an asterisk are statistically significant at  $p < .05$  level

Highlights

Equal prioritisation does not yield lower levels of participation than high prioritisation

Correlations with algebraic difference indexes should be interpreted with caution

Researchers should use additive models of prioritisation

ACCEPTED MANUSCRIPT