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RUNNING HEAD: TYPOLOGIES OF GREEK INACTIVE OLDER ADULTS

Typologies of Greek inactive older adults based on reasons for abstaining from exercise and  
conditions for change

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Abstract

The main purpose of the study was to examine typologies of non-exercisers based on reasons for physical inactivity and conditions reported to be necessary to change exercise behaviour. These typologies were then compared on psychological variables of interest and exercise history. Questionnaires were distributed to Greek older adults aged 60 and above who were recruited from social clubs and city cafés. Only individuals engaging in no regular exercise were chosen ( $N = 188$ ). The results of hierarchical and k-means cluster analyses revealed two clusters for males (“approachable” and “unconvinced”), and three for females (“unconcerned”, “approachable”, and “unconvinced”). The clusters differed significantly on psychological variables not used in the cluster solution. Exercise history distinguished between clusters only in the male sample. The results reveal that physically inactive older adults are not a homogeneous group of individuals. Implementers of physical activity interventions should probably use a range of strategies that will take into consideration that some sedentary older adults are more amenable to consider taking up exercise than others.

Key words: physical inactivity, amotivation, cluster analysis, exercise

## 1 Introduction

2 Regular physical activity is particularly beneficial for the elderly population, as it may  
3 delay the onset or reduce the severity of a range of chronic diseases (National Institute of  
4 Aging, 2001), and improve emotional, cognitive, social and perceived physical functioning  
5 (Taylor, Cable, Faulkner, Hillsdon, Narici, & van der Bij, 2004). Despite this, older adults are  
6 one of the least active segments of the population (Jones, Ainsworth, Croft, Macera, Lloyd, &  
7 Yusuf, 1998). Cross-national differences in activity levels of older adults have been  
8 documented with southern Europeans being less physically active than northern Europeans  
9 (Vaz de Almeida, Grac, Afonso, D'Amicis, Lappalainen, & Damkjaer, 1999). The decline in  
10 physical activity levels with age is partly a biological phenomenon and has been observed in  
11 many other species (Sallis, 2000). However, psychological, social, and environmental  
12 variables also play an important role in this decline. In this study we focus on some of the  
13 psychological factors associated with lack of physical activity and attempt to identify  
14 typologies of non-exercisers in a sample of Greek older adults.

15 Although much is known about why people choose to exercise (e.g., Kolt, Driver, &  
16 Giles, 2004), less is known about why people do not exercise. In older adults, researchers  
17 have suggested that injury, poor health (Booth, Bauman, Owen, & Gore, 1997), lack of time  
18 (Lian, Gan, Pin, Wee, & Yi, 1999), and perceptions of lack of skill (Craig, Russell, Cameron,  
19 & Beaulieu, 1998) are some salient barriers to exercise. However, little is known about  
20 differences in the reasons given for inactivity between groups of sedentary adults, as well as  
21 what might encourage them to become more physically active. Physical activity campaigns  
22 tend to group sedentary adults into one homogenous group. However, some sedentary adults  
23 are more amenable to behavioural change than others. Although the widely used  
24 Transtheoretical Model (Prochaska & Velicer, 1997) groups physically inactive individuals  
25 into "precontemplators", "contemplators" and "preparers", there is evidence to suggest that

1 physically inactive groups should be even further differentiated. For example research has  
2 identified different clusters of precontemplators (Dijkstra & De Vries, 2000; Richards Reed,  
3 1999) and contemplators (Gorely & Bruce, 2000). Thus, targeting sedentary individuals for  
4 physical activity interventions is complex as different factors and considerations need to be  
5 taken into account (King *et al.*, 2006).

6       The heterogeneity of motivation in sedentary adults was evidenced in a theory-driven  
7 study by Vanden Auweele, Rzewnicki, and Van Mele (1997), which constructed typologies of  
8 physically inactive middle-aged Belgian adults based on reported reasons for not exercising  
9 and conditions of change. The authors identified five dimensions of physical inactivity which  
10 emerged from factor analysis: exercise as “Not Relevant”, “Unnecessary”, “Negative  
11 Feelings” about exercise, exercise as “Too Risky”, and exercise requiring “Too Much Effort”.  
12 In terms of the conditions that could prompt the participants to start exercising, the authors  
13 found two factors; The first referred to intending to adopt exercise if their health was  
14 threatened (“Health Threat”), and the second one referred to participants’ willingness to  
15 exercise if they received an appropriate offer, such as exercising with family or friends  
16 (“Appropriate Offer”).

17       The aforementioned reasons for inactivity and conditions of change were subjected to a  
18 cluster analysis, which resulted in two typologies or clusters for males. The first ( $n=80$ ) was  
19 labelled the “unconcerned” or indifferent toward exercise and included those who had low  
20 scores on all reasons for inactivity and conditions of change. The second ( $n=31$ ) was labelled  
21 the “accountants” and incorporated those who had higher scores on the reasons for inactivity  
22 as well as on conditions for change, that is, these individuals would consider taking up  
23 exercise if their health was under threat or if an appropriate offer was made. The typologies  
24 for females revealed a different pattern to those for males. Specifically, females were grouped  
25 into the “unconcerned”, the “opposed” and the “approachable” clusters. Similar to the

1 namesake male cluster, the "unconcerned" ( $n=78$ ) had low to moderate scores on all variables.  
2 The "opposed" ( $n=14$ ) had moderate to high scores on all variables, whereas the  
3 "approachable" ( $n=22$ ) had more favourable responses with low scores on the reasons for  
4 inactivity and higher scores on conditions for change.

5         The results of Vanden Auweele *et al.*'s (1997) study suggest that some sedentary  
6 adults are more amenable to change than others. This might have practical implications for the  
7 design of physical activity interventions. However, whether the results of that study are  
8 applicable to other age and cultural groups is as yet unknown. Furthermore, although Vanden  
9 Auweele *et al.* compared the cluster groups in terms of age and sports history, the authors did  
10 not contrast their clusters on psychological variables associated with exercise intention or  
11 behaviour. In the present study, we first examined whether Vanden Auweele *et al.*'s  
12 typologies can be generalised to an older sample from a different culture (Greek). We then  
13 compared the clusters on variables that have been shown to be associated with exercise  
14 involvement. Some of these variables are attitudes to exercise and perceived behavioural  
15 control, taken from the Theory of Planned Behaviour (Ajzen & Madden, 1986). Unlike  
16 subjective norms, attitudes and perceived behavioural control are related to exercise intentions  
17 and exercise behaviour change (e.g., Courneya, 1995; Hagger, Chatzisarantis, & Biddle,  
18 2002).

19         Another psychological variable we considered in our study was self-efficacy,  
20 sometimes operationalised as barrier efficacy, because it is one of the most consistent  
21 predictors of physical activity behaviour among older adults (Rhodes, Martin, Taunton,  
22 Rhodes, Donnelly, Elliot, 1999; Stevens, Lemmink, de Greef, & Rispen, 2000). For example,  
23 in a cross-sectional study with older sedentary individuals, Stevens *et al.* (2000) found that  
24 barrier and task efficacy scores clearly distinguished between the precontemplation and  
25 contemplation/preparation stages, suggesting that those who are less inclined to participate in

1 physical activity (i.e. the precontemplators) are less efficacious than those who are  
2 considering changing their behaviour (contemplators/preparers). Exercise amotivation might  
3 be another distinguishing factor between the clusters, with those not intending to change  
4 having higher amotivation scores. According to Self-Determination Theory (Deci & Ryan,  
5 2000), amotivation is characterised by the lack of value for an activity, or the belief that the  
6 activity will not result in desired outcomes. In the exercise setting, amotivation has been  
7 found to be a negative predictor of intentions to exercise (Chatzisarantis, Hagger, Biddle,  
8 Smith & Wang, 2003; Thøgersen-Ntoumani & Ntoumanis, 2006).

9 We also included physical self-perceptions as a fifth distinguishing factor. These  
10 perceptions are an important outcome and antecedent of physical activity in older adults (e.g.,  
11 Taylor & Fox, 2005), but they can also be an antecedent of it (Fox, 1997). Lastly, we also  
12 included the trait measure labelled resistance to change, which refers to an individual's  
13 dispositional inclination to resist changes (Oreg, 2003). This variable has been found to  
14 predict lack of voluntary changes in the academic schedules of university students.

15 Vanden Auweele *et al.* (1997) identified that in their sample of middle-aged Belgian  
16 adults “never-exercisers” were more likely to report that exercise was “irrelevant” and  
17 “unnecessary”, suggesting that these individuals had more intransigent attitudes towards  
18 exercise. In contrast, Vanden Auweele *et al.* indicated that ex-exercisers might be more  
19 receptive to changing their physical activity patterns as they tended to report that an  
20 “appropriate offer” could help them change. Thus, in the present study, we examined potential  
21 differences in the exercise histories of participants in the cluster typologies.

22 We aim to extend the work carried out by Vanden Auweele *et al.* (1997) on typologies  
23 of non-exercisers by using a sample that was older and from a different culture (Greek). In an  
24 attempt to externally validate the clusters, they were then compared on measures of attitudes  
25 to exercise, perceived behavioural control, barrier efficacy, exercise amotivation, resistance to

1 change and physical self-worth. Finally, they were also compared on exercise history. Based  
2 on Vanden Auweele *et al.*'s (1997) findings, we hypothesized that for both males and  
3 females, at least one cluster would emerge of individuals unconcerned/opposed to change, and  
4 at least one other cluster would emerge which would include older adults more approachable  
5 to change. Second, these cluster groups (for males and females) would differ significantly on  
6 all validation variables. Specifically, we hypothesised that individuals more amenable to  
7 behavioural change would have more favourable attitudes and physical self-perceptions,  
8 higher perceived behavioural control, barrier efficacy, lower amotivation and less resistant to  
9 change, compared to those who were unconvinced or opposed to change. Finally, it was  
10 hypothesised that significant differences would also exist between clusters in exercise history,  
11 with cluster(s) more amenable to change consisting of a significantly larger number of ex-  
12 exercisers than never-exercisers compared to clusters of those unconcerned/opposed to  
13 change. The latter cluster(s) would consist of a significantly larger number of never-  
14 exercisers.

## 15 Method

### 16 *Participants*

17 One hundred and eighty eight physically inactive Greek adults ( $n=90$  males and  $n=98$   
18 females) volunteered to take part in the study. Their mean age was 70.20 years ( $s=3.66$ ).  
19 Participants were identified as physically inactive based on their scores on the stages of  
20 change-short form (see below).

### 21 *Measures*

#### 22 *Exercise-Related Variables*

23 *Stages of Change-Short Form* (Marcus, Selby, Niaura, & Rossi, 1992).

24 This is a 5-item scale that assesses five stages of exercise behaviour change. The participants  
25 were first given a definition of regular exercise (i.e., any physical activity such as brisk



1 walking, jogging, bicycling, swimming or any other physical activity which made them  
2 breathe moderately fast, adding to a total of minimum 30 minutes on at least five days per  
3 week). They were then asked to indicate whether, according to that definition, they a) did not  
4 engage and did not intend to engage in exercise in the next six months (precontemplation) b)  
5 they did not engage but were thinking of starting exercise in the next six months  
6 (contemplation), c) they did not exercise but were planning to start within the next month  
7 (preparation), d) they engaged in regular exercise but for less than 6 months (action), and e)  
8 they engaged in regular exercise and had done so for more than 6 months (maintenance). The  
9 questionnaire has been shown to relate to objective and self-report measures of physical  
10 activity (e.g., Cardinal, 1997).

### 11 *Exercise History*

12 To examine whether there were any differences between the clusters in exercise history, we  
13 used one item from Marcus and Forsyth's (2003) physical activity history scale. Participants  
14 were asked how long it had been since they had been regularly exercising (according to the  
15 definition provided in the introduction to the stages of change measure). Response options  
16 were "less than six months", "more than 6 months but less than one year", "more than 1 but  
17 less than 2 years", "more than 2 but less than 5 years", "more than 5 but less than 10 years",  
18 "10 years or more", and "I have never been regularly physically active". Due to the small  
19 number of participants reporting that they had been regularly exercising within the past five  
20 years (males  $n = 16$ ; females  $n = 16$ ), we decided to construct a dichotomous variable by  
21 categorising males and females into "ex-exercisers" (males  $n = 48$ ; females  $n = 41$ ) to include all  
22 categories but the last, and "never exercisers" (males  $n = 33$ ; females  $n = 46$ ).

### 23 *Psychological Factors*

#### 24 *Reasons for Inactivity and Conditions for Change*

1 For brevity reasons, we used two items to measure reasons for inactivity from each of the five  
 2 factors identified by Vanden Auweele *et al.* (1997). The items were chosen based on the  
 3 results of a small pilot study that examined their face validity. Example items are “I am not  
 4 interested in exercise” (Not Relevant), “With a healthy, active lifestyle exercise is  
 5 unnecessary” (Unnecessary), “Exercise is too bothersome” (Negative Feelings), “At my age,  
 6 exhausting and forcing myself with exercise cannot be healthy” (Too Risky), and “The  
 7 regularity of exercise needed to get benefits requires too much dedication” (Too Much  
 8 Effort). Also, to measure conditions for change, in other words, factors that may induce future  
 9 exercise involvement, we used three items with high face validity from each of the two factors  
 10 also identified by Vanden Auweele *et al.* (1997). Sample items are “I would start/or resume  
 11 exercising if...I had physical complaints that made me anxious or panicky” (Health Threat),  
 12 and “...There was a health club which offered the kind of exercises I am good at”  
 13 (Appropriate Offer). The items for reasons for inactivity and conditions for change were  
 14 measured on a six-point scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*). We  
 15 conducted two exploratory factor analyses, one for reasons for physical inactivity (5  
 16 subscales) and one for conditions for change (2 subscales). The results showed that the items  
 17 of each subscale loaded together on the same factor. Further, their loadings on that factor were  
 18 substantially higher than their secondary loadings on other factors. The factor loadings  
 19 matrices are available upon request.

## 20 *Attitudes*

21 Attitudes toward exercise were measured with bipolar adjective scales, similar to Courneya  
 22 (1995). The response category ranged from -3 to 3. Participants were given the stem “My  
 23 participating in regular exercise is/would be...”, followed by four items that assessed the  
 24 evaluative dimension of attitude (useful-useless, harmful-beneficial, wise-foolish, bad-good),  
 25 and four items that measured the affective aspect of attitude (enjoyable-unenjoyable, boring-

1 interesting, pleasant-unpleasant, and stressful-relaxing). Previously, researchers have shown  
2 that this type of measure reflects accurately the components of the attitude construct in the  
3 Theory of Planned Behavior (Trafimow & Sheeran, 1998). The alpha reliability coefficient in  
4 the present study was  $\alpha = 0.91$ .

#### 5 *Perceived Behavioural Control*

6 Three items were used to measure perceived behavioural control, as operationalised by Ajzen  
7 and Madden (1986). An example item is “for me to engage in regular exercise is/would be...”  
8 (-3 = extremely difficult; 3 = extremely easy). The internal reliability coefficient of this scale  
9 in the present study was  $\alpha = 0.67$ .

#### 10 *Barrier Efficacy*

11 Also referred to as control beliefs (Courneya, 1995), barrier efficacy was operationalised as in  
12 Ajzen and Madden (1986). The statement “I am confident that I could engage in regular  
13 exercise even if...” was followed by seven commonly reported barriers to physical activity  
14 (e.g., bad weather, too busy, etc.). Responses were measured on a seven-point scale ranging  
15 from -3 (*extremely unlikely*) to 3 (*extremely likely*). In the present study, the alpha reliability  
16 coefficient was  $\alpha = 0.76$ .

#### 17 *Physical Self-Worth*

18 This is a six-item subscale from the Physical Self-Perception Profile (PSPP; Fox & Corbin,  
19 1989). The questionnaire employs a force-choice structured alternative format in order to  
20 minimise socially desirable responses. For each item two alternative statements are provided.  
21 The participants must first decide which of the two statements relates to them best, and then  
22 indicate if the chosen statement is *sort of true* or *really true* for them. An example is “Some  
23 people feel extremely proud of who they are and what they can do physically BUT Others are  
24 sometimes not quite as proud of who they are physically”. The PSPP is a widely used scale  
25 which has been shown to be reliable and valid across a wide range of populations (Byrne,

1 1996). The internal reliability coefficient of the physical self-worth subscale in the present  
2 study was  $\alpha=0.80$ .

### 3 *Resistance to Change*

4 This scale measures an individual's disposition to resist changes (e.g., "I generally consider  
5 changes to be a negative thing"). This 18-item scale has four factors: routine seeking,  
6 emotional reaction, short-term thinking, and cognitive rigidity. For the purpose of the present  
7 study, we used an aggregate measure of resistance to change. The items were measured on a  
8 scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Oreg (2003) found support for  
9 the scale's convergent, discriminant, concurrent and predictive validity across different  
10 contexts. In the present study the internal reliability coefficient was  $\alpha= 0.74$ .

### 11 *Exercise Amotivation*

12 Markland and Tobin's (2004) 4-item amotivation subscale of the Behavioural Regulation in  
13 Exercise Questionnaire-2 was also used. An example item is "I don't see why I should have to  
14 exercise" with responses ranging from 0 (*not true for me*) to 4 (*very true for me*). The alpha  
15 reliability coefficient of the amotivation subscale in the present study was  $\alpha= 0.88$ .

### 16 *Procedures*

17 Participants were recruited from social clubs for the elderly as well as city cafés in and  
18 around Athens, Greece. All participants provided written informed consent. The ethical  
19 guidelines of the American Psychological Association for treating adult participants were  
20 followed throughout the study. The questionnaire administration was supervised by a trained  
21 research assistant. The instruments used in this study were translated from English to Greek  
22 by the second author. In addition, another bilingual person with expert knowledge of both  
23 languages translated the questionnaires back to English. Discrepancies between the two  
24 translations were compared, and the wording was changed where necessary until consensus

1 was reached. The study had the approval of the Ethics Subcommittees of a British and a  
2 Greek University.

### 3 *Data Analysis*

4 In each gender group, a hierarchical cluster analysis was performed followed by a k-  
5 means confirmatory cluster analysis in order to identify distinct profiles based on reasons for  
6 inactivity and conditions for change. In an attempt to validate the cluster solutions,  
7 MANOVA tests were carried out to compare the clusters on variables *not* used to create the  
8 cluster solution.

### 9 Results

10 The distribution of participants across the stages of change was as follows:  
11 precontemplation = 48.30%, contemplation = 10.10%, preparation = 6.30%, action = 13.20%,  
12 maintenance = 22.10%. Non-exercisers were deemed to be those in the first three stages,  
13 whereas exercisers were those in the last two stages. For the purpose of the present study,  
14 only non-exercisers were chosen.

15 Hierarchical cluster analyses were carried out separately for males and females, in line  
16 with the study by Vanden Auweele *et al.* (1997). Prior to the analyses, all multivariate and  
17 univariate outliers were deleted ( $n = 20$ ) and the remaining cases were converted to  $z$  scores  
18 (Hair, Anderson, Tatham, Black, 1998). The Ward method was used as it avoids the problem  
19 of “chaining” associated with other methods (Aldenderfer & Blashfield, 1984). **Other methods**  
20 **provided by SPSS were also explored. In the vast majority of cases, the agglomeration**  
21 **coefficients pointed to the same direction regarding the number of clusters in the two samples.**

22 The similarity measure used was the squared Euclidean distance. To determine the  
23 number of clusters, the agglomeration schedule coefficients were inspected. According to  
24 Hair *et al.* (1988), small coefficients indicate that fairly homogenous clusters are being  
25 merged. Large coefficients indicate that clusters with quite dissimilar members are being

1 combined. To decide the number of clusters in the data, one should look at fairly large  
2 increases in the coefficients between two adjacent sets. Z scores of  $\pm 0.50$  were used as the  
3 criterion for interpreting when the participants in the individual clusters scored relatively high  
4 or low on the variables of interest compared to the participants in the other cluster(s) (see  
5 Weiss, Ebbeck & Horn, 1997). Other criteria also exist to determine the number of clusters in  
6 a solution. In a review of papers in health psychology using cluster analysis, Clatworthy,  
7 Buick, Hankins, Weinman and Horn (2005) reported that the inspection of the agglomeration  
8 coefficients was the most frequently employed criterion in these studies.

9 For the males, examination of the agglomeration schedule coefficients suggested that a  
10 two cluster solution would be the most parsimonious. The two clusters that emerged were  
11 labelled the “approachable” ( $n=37$ ) and the “unconvinced” ( $n=45$ ). The “approachable” had  
12 moderate to low scores on most of the reasons for inactivity and were more likely to start  
13 exercising as a result of future possible deteriorating health. In contrast, the “unconvinced”  
14 had higher scores on the reasons for inactivity, especially in relation to the statement that  
15 exercise requires too much effort, and moderate scores on the conditions for change. Although  
16 this group did not quite oppose the idea of exercise adoption (as their scores on conditions for  
17 change were moderate), equally, they were not contemplating taking up exercise if  
18 circumstances changed in the future. To fine-tune the results of the hierarchical procedure, k-  
19 means clustering was used with the same data. As suggested by Hair *et al.* (1998), the  
20 centroid values obtained from the hierarchical analysis were used as the initial seed values for  
21 the k-means analysis. The results showed that the size of the clusters (k-means:  
22 “approachable”  $n= 40$ ; “unconvinced”  $n= 42$ ) and the final centroid values were quite similar  
23 to those obtained from the hierarchical solution, indicating relative stability of the cluster  
24 solution. Figure 1 graphically displays the cluster solutions for the hierarchical and k-means  
25 analyses.

1 Aldenderfer and Blashfield (1984) suggested the comparison of clusters on variables  
2 *not* used to create the cluster solution. This external validation procedure selects variables of  
3 theoretical and practical importance and uses them as benchmarks for validating the identified  
4 clusters. Six such variables were selected: attitudes to exercise, perceived behavioural control,  
5 exercise amotivation, barrier efficacy, resistance to change, and physical self-worth. A one-  
6 way MANOVA was carried out to examine the differences between the two cluster groups in  
7 these variables. The MANOVA was significant (Pillai's Trace = 0.202;  $F_{6, 74} = 3.12$ ;  $P < 0.01$ ;  
8 partial  $\eta^2 = .20$ ). The univariate tests showed that the "approachable" had significantly more  
9 positive attitudes to exercise, lower exercise amotivation and higher barrier efficacy compared  
10 to the "unconvinced" (see Table 1). No differences were found in the remaining variables.  
11 Unexpectedly, a chi-square analysis revealed a significantly higher number of "never  
12 exercisers" and a significantly lower number of "ex-exercisers" in the "approachable"  
13 compared to the "unconvinced" cluster group ( $\chi^2 = 5.66$ ; d.f. = 1;  $P < 0.05$ ). The effect size  $w$   
14 was small to moderate ( $w = 0.26$ ; see Cohen, 1988).

15 The same procedures were carried out to identify clusters in the female sample. An  
16 examination of the agglomeration schedule coefficients suggested a three cluster solution. The  
17 clusters were labelled the "unconcerned" ( $n=13$ ), the "approachable" ( $n=41$ ) and the  
18 "unconvinced" ( $n=32$ ). The "unconcerned" had the lowest scores on reasons for inactivity  
19 compared to the other two clusters, but they were also not contemplating to change. This  
20 cluster resembled somewhat the "unconcerned" female cluster reported by Vanden Auweele  
21 *et al.* (1997). The "approachable" had moderate scores on the reasons for not exercising and  
22 indicated that they would be more likely to become active as a result of an appropriate offer.  
23 Although they were slightly more negative in terms of their reasons for not exercising  
24 compared to the respective male cluster, they essentially represented the same profile of

1 individuals. The “unconvinced”, similar to the male cluster, had high scores on the reasons for  
2 inactivity and moderate scores on the conditions for change.

3         Subsequent to the hierarchical cluster analysis, a k-means analysis was carried out  
4 with the same data. The size of the groups (k-means: “unconcerned”  $n=14$ , “approachable”  
5  $n=38$ , and “unconvinced”  $n=34$ ) and the final centroid values were very similar to those  
6 obtained from the hierarchical procedure. To validate the cluster solution, the cluster groups  
7 were compared on the same six variables as those used for the males. The one-way  
8 MANOVA was significant (Pillai’s Trace = 0.458;  $F_{12, 158} = 3.91$ ;  $P < 0.001$ ; partial  $\eta^2 =$   
9 0.23). The univariate tests revealed that the “unconcerned” had more positive attitudes to  
10 exercise, lower amotivation and higher barrier efficacy than the other two clusters. In turn, the  
11 “approachable” had more positive attitudes and higher barrier efficacy than the  
12 “unconvinced” (see Table 2). Finally, a chi-square test revealed that there were no significant  
13 differences between the clusters in exercise history ( $\chi^2=4.59$ ; d.f.=2;  $P > 0.05$ ). The effect  
14 size was small to moderate ( $w = 0.23$ ).

## 15 Discussion

16         The present study aimed to examine typologies or clusters of non-exercisers, based on  
17 reasons for not exercising and conditions that might facilitate exercise adoption, separately in  
18 male and female Greek older adults. The cluster solutions were externally validated by  
19 examining differences between the identified clusters in exercise history and psychological  
20 variables not used in the cluster solutions.

21         The findings were largely in agreement with our first hypothesis and only partially in  
22 agreement with the results reported by Vanden Auweele *et al.* (1997). The results suggest that  
23 for both males and females, distinct groups of non-exercisers can be identified, with some  
24 more amenable to change than others. As most of the non-exercisers in the present sample  
25 were precontemplators according to the Stages of Change Model, the identification of two



1 clusters indicates that precontemplators might not be one homogenous group, a suggestion  
2 also made by previous researchers in the area of exercise (Richards Reed, 1999) and smoking  
3 (Dijkstra & De Vries, 2000) although the latter focused on a different age and cultural group.  
4 Specifically, our findings suggest that a sizeable proportion of both male and female older  
5 adults in Greece (i.e., the “approachable” clusters) do not see exercise as being irrelevant, or  
6 requiring too much effort, and do not have negative feelings towards exercise. These  
7 individuals were also more likely to start exercising in the future as a result of either a health  
8 threat (males) or an appropriate offer (females). In contrast to Vanden Auweele *et al.* (1997),  
9 we subjected our cluster solution to a validation procedure in which it was shown that those  
10 groups more amenable to change had more positive attitudes to exercise, higher barrier  
11 efficacy, and lower levels of amotivation (only in the male group) than those not convinced  
12 about the necessity of change. These findings suggest that not all pre-contemplators are “hard  
13 to reach” as some might believe.

14 In males, besides the “approachable”, a second cluster group emerged which was called  
15 the “unconvinced”. This group had high scores on the beliefs that exercise is not relevant and  
16 that it requires too much effort, had negative feelings towards exercise, but only moderate  
17 scores on the conditions for change. We labelled this group as the “unconvinced” because  
18 they had negative beliefs toward exercise and were not convinced that a health threat or an  
19 appropriate offer would be sufficient to make them more active. This group differs from the  
20 “accountant” cluster identified by Vanden Auweele *et al.* (1997), which had relatively high  
21 scores on both the reasons for inactivity and on the conditions for change. The “accountants”  
22 in the Vanden Auweele *et al.* (1997) study were negatively predisposed towards exercise.  
23 However, they engaged in a cost-benefit analysis and were willing to change their behaviour  
24 if necessary, unlike our “unconvinced” cluster. Vanden Auweele *et al.* (1997) also reported a  
25 second cluster, much larger than the first, of “unconcerned” male non-exercisers. These

1 individuals reported relatively low scores on both the reasons for inactivity and the conditions  
2 for change. This cluster did not emerge in our male sample. The difference in the cluster  
3 solutions that emerged between the two studies might reflect age differences. For example,  
4 some older men (the “approachable”) might be less negatively predisposed toward exercise,  
5 perhaps because they are more concerned about their health compared to middle-aged men.  
6 Due to the lack of previous pertinent cross-cultural comparisons, we are not in a position to  
7 infer whether our findings might also reflect cultural differences.

8         In contrast to the two clusters identified for males, three clusters emerged in females: the  
9 “approachable”, the “unconvinced”, and the “unconcerned”. Despite some differences in the  
10 mean scores, the first two clusters had essentially the same pattern of responses to the  
11 namesake clusters identified in the male sample. The fairly large proportion of females in the  
12 “unconvinced” group is perhaps not surprising, as O’Brien Cousins (2000) found in a  
13 qualitative study of women aged 70 years and older that perceived risks of physical activity  
14 outweighed its potential benefits. As expected, compared to the “unconvinced” group, the  
15 “approachable” cluster had more positive attitudes towards exercise and higher barrier  
16 efficacy. A third smaller cluster emerged in the female sample which we called the  
17 “unconcerned”. The females in this group reported low scores on most of the reasons for not  
18 exercising, yet they were not likely to act as a result of either a health threat or an appropriate  
19 offer. In fact, the “unconcerned” individuals had significantly more positive attitudes, higher  
20 barrier efficacy and lower levels of amotivation compared to those in the “approachable”  
21 group. Perhaps the former group represents those women who, although they have reasonably  
22 positive attitudes and beliefs about exercise, they do not prioritise it as highly as other  
23 behaviours in improving their health or lives. It would be interesting if in future researchers  
24 used qualitative methods to examine the reasons why these women are not likely to act as a

1 result of either a health threat or an appropriate offer. Perhaps other conditions for change are  
2 more applicable to this group.

3 Vanden Auweele *et al.* (1997) also identified three clusters in their female sample, two  
4 of which were called “approachable” or “unconcerned” about exercise. The third cluster was  
5 called the “opposed”, however, the individuals in this cluster had moderate to high scores on  
6 all variables, in particular on the two conditions for change. Thus, we feel that the term  
7 “opposed” is not appropriate, because the individuals in this cluster resembled more those in  
8 our “unconvinced” group.

9 We also hypothesised that clusters with individuals more amenable to change would  
10 consist of a higher number of ex-exercisers as opposed to never exercisers, whilst those  
11 unconvinced about change would demonstrate the opposite pattern. In fact, our predictions  
12 were not supported. Most of the male participants who had never been regularly active were  
13 more inclined to change, whereas most of the ex-exercisers were unconvinced about change.  
14 This is surprising given that ex-exercisers, due to their exercise experience, would be  
15 expected to perceive more reasons to exercise, be more accustomed to exercise and thus  
16 perhaps also have higher exercise barrier efficacy, compared to those who have no relevant  
17 experience. Thus, our results are not in agreement with those of Vanden Auweele *et al.*  
18 (1997). Perhaps an explanation for these discrepant findings is that the ex-exercisers in the  
19 present study have had negative experiences with exercise in the past or had not achieved  
20 their exercise goals, and therefore, might have become more amotivated to engage in exercise.  
21 Their relapse into a physically inactive lifestyle could also partly explain why male ex-  
22 exercisers had lower levels of barrier efficacy than those who had not exercised in the past  
23 (and who had therefore not experienced exercise relapse and drop-out). Ex-exercisers  
24 evidently had been unable to resume regular physical activity, and thus may not have been  
25 confident that they could overcome various barriers. In females, no significant differences in

1 exercise history were found between the cluster groups, suggesting that the extent to which  
2 one has been physically active in the past is not salient to Greek older sedentary women's  
3 motivation, thoughts or feelings about physical activity. In future researchers should use  
4 qualitative techniques to examine other factors that might impact upon older women's  
5 cognition, motivation and feelings about physical activity within this culture.

#### 6 *Limitations*

7       Some limitations should be borne in mind when interpreting the findings of this study.  
8 First, we used the stages of change measure to identify physically inactive participants.  
9 Although this measure has been adopted extensively in previous research (Marshall & Biddle,  
10 2001), it is essentially a self-report measure. Thus, it would be interesting to attempt to  
11 replicate our results with more objective measures of exercise behaviour. Further, due to our  
12 cross-sectional design, the stability of cluster membership over time could not be examined.  
13 In addition, the scale used by Vanden Auweele *et al.* (1997) to measure reasons for inactivity  
14 and conditions for change was substantially longer and was developed with middle-aged  
15 adults. Thus our study might not have been able to capture all relevant motives and  
16 facilitating conditions for our targeted population.

#### 17 *Conclusions*

18       In conclusion, the findings of the present study were largely in agreement with our  
19 hypotheses. With regard to the first hypothesis, we identified in both gender groups distinct  
20 typologies representing those older adults who were unconvinced about taking up exercise  
21 and those who were more amenable to change. Further, in the female group there was a  
22 unique cluster representing those who were unconcerned about their current levels of physical  
23 activity. The identified clusters differed significantly on most psychological validation  
24 variables, thus providing partial support to the second hypothesis. Exercise history only  
25 appeared to be pertinent in discriminating between the typologies in older males. Overall, the

1 results of the present study suggest that there is a heterogeneity regarding reasons for  
2 inactivity and conditions that might facilitate change in sedentary Greek older adults.  
3 Implementers of physical activity interventions should target those groups more amenable to  
4 change by making physical activity programmes more accessible and more relevant for Greek  
5 older females, and by educating older Greek men about the risks of a sedentary lifestyle and  
6 the role of physical activity in the prevention of ill health. For those Greek older adults who  
7 are unconvinced about increasing their levels of physical activity, interventions that focus on  
8 changing beliefs about physical activity, for example, by illustrating the modest amount of  
9 exercise that is required to improve health, might be more appropriate.

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Table 1.

*Validation of the K-Means Cluster Solution (Males)*

Validation variables (score ranges)	Cluster 1:			Cluster 2:			<i>F</i>	<i>P</i>	Partial $\eta^2$
	Approachable ( <i>n</i> = 40)			Unconvinced ( <i>n</i> =42)					
	<i>z</i>	<i>Mean</i>	<i>s</i>	<i>Z</i>	<i>Mean</i>	<i>s</i>			
Attitudes to exercise (-3 - +3)	0.32	1.41 <sub>a</sub>	0.17	-0.16	0.87 <sub>b</sub>	0.17	4.79	0.03	0.06
Perceived behavioral control (-3 - +3)	0.43	0.52 <sub>a</sub>	0.18	-0.01	0.02 <sub>a</sub>	0.18	3.80	0.06	0.05
Amotivation (0-4)	-0.42	0.81 <sub>a</sub>	0.14	0.10	1.46 <sub>b</sub>	0.14	11.0	0.001	0.12
Barrier efficacy (-3 - +3)	0.33	-0.19 <sub>a</sub>	0.17	-0.15	-0.70 <sub>b</sub>	0.16	4.76	0.03	0.06
Resistance to change (1-7)	-0.13	4.21 <sub>a</sub>	0.14	-0.04	4.45 <sub>a</sub>	0.14	1.56	0.22	0.02
Physical self-worth (1-4)	0.25	2.77 <sub>a</sub>	0.10	0.05	2.54 <sub>a</sub>	0.10	2.43	0.12	0.03

*Note.* Subscripts with the same letter in the same row do not differ at  $P < 0.05$

Table 2.

*Validation of the K-Means Cluster Solution (Females)*

Validation variables (score ranges)	Cluster 1:			Cluster 2:			Cluster 3:			<i>F</i>	<i>P</i>	Partial $\eta^2$
	Unconcerned ( <i>n</i> = 14)			Approachable ( <i>n</i> = 38)			Unconvinced ( <i>n</i> = 34)					
	<i>z</i>	<i>Mean</i>	<i>s</i>	<i>z</i>	<i>Mean</i>	<i>s</i>	<i>z</i>	<i>Mean</i>	<i>s</i>			
Attitudes to exercise (-3 - +3)	0.98	2.29 <sub>a</sub>	0.32	-0.04	0.99 <sub>b</sub>	0.19	-0.64	0.23 <sub>c</sub>	0.20	14.99	0.000	0.27
Perceived behavioral control (-3 - +3)	0.04	0.05 <sub>a</sub>	0.33	-0.24	-0.24 <sub>a</sub>	0.20	-0.21	-0.27 <sub>a</sub>	0.21	0.34	0.71	0.01
Amotivation (0-4)	-0.88	0.52 <sub>a</sub>	0.24	0.17	1.42 <sub>b</sub>	0.14	0.47	1.77 <sub>b</sub>	0.15	10.04	0.000	0.20
Barrier efficacy (-3 - +3)	0.36	-0.17 <sub>a</sub>	0.29	0.14	-0.36 <sub>a</sub>	0.18	-0.59	-1.16 <sub>b</sub>	0.19	6.51	0.002	0.14
Resistance to change (1-7)	0.25	4.53 <sub>a</sub>	0.21	-0.10	4.32 <sub>a</sub>	0.12	0.22	4.57 <sub>a</sub>	0.13	1.01	0.37	0.02
Physical self-worth (1-4)	0.36	2.80 <sub>a</sub>	0.17	-0.26	2.41 <sub>a</sub>	0.09	-0.19	2.45 <sub>a</sub>	0.11	2.20	0.12	0.05

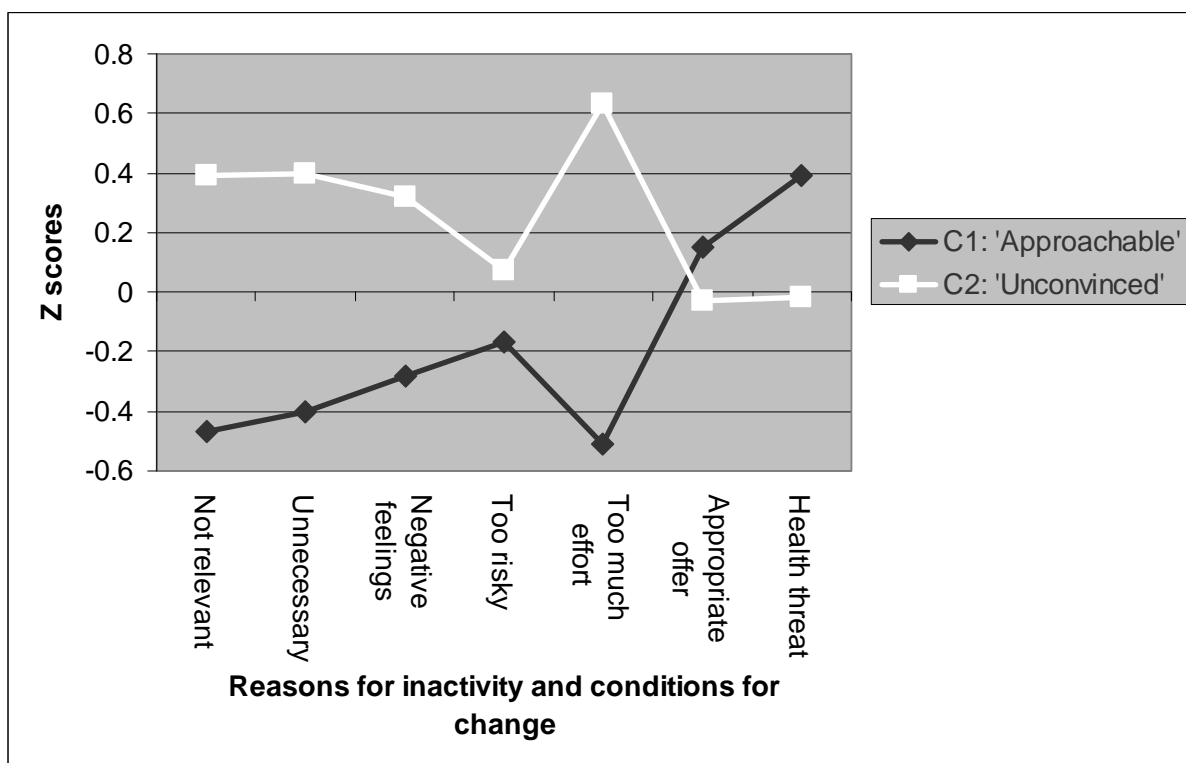
*Note.* Subscripts with the same letter in the same row do not differ at  $P < 0.05$

Figure Captions

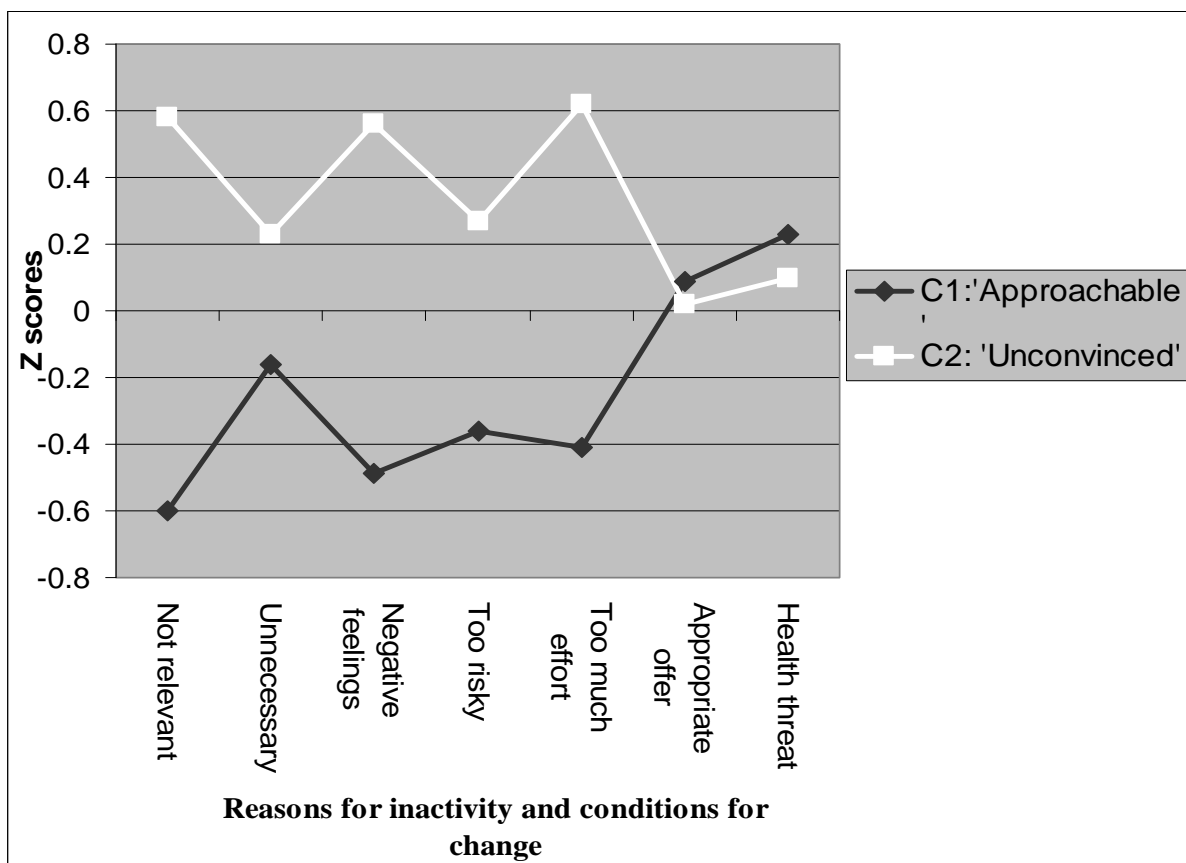
*Figure 1.* Cluster analysis on reasons for not exercising and conditions for change in males

*Figure 2.* Cluster analysis on reasons for not exercising and conditions for change in females

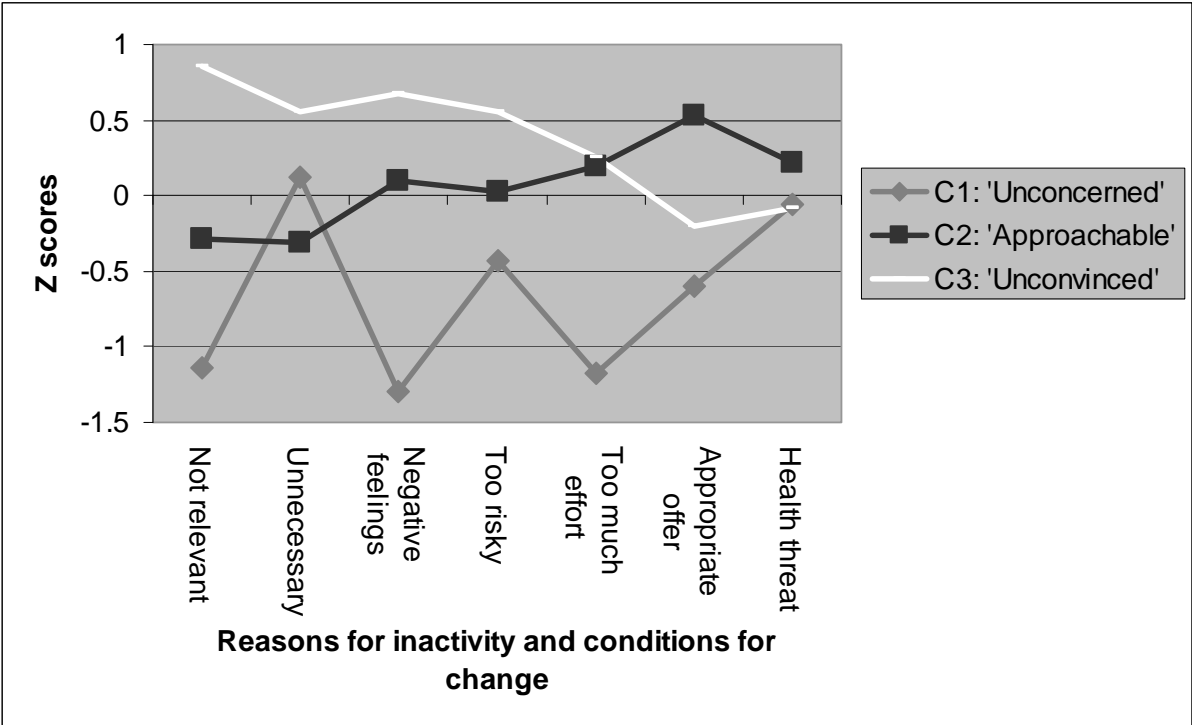
Hierarchical analysis



K-means analysis

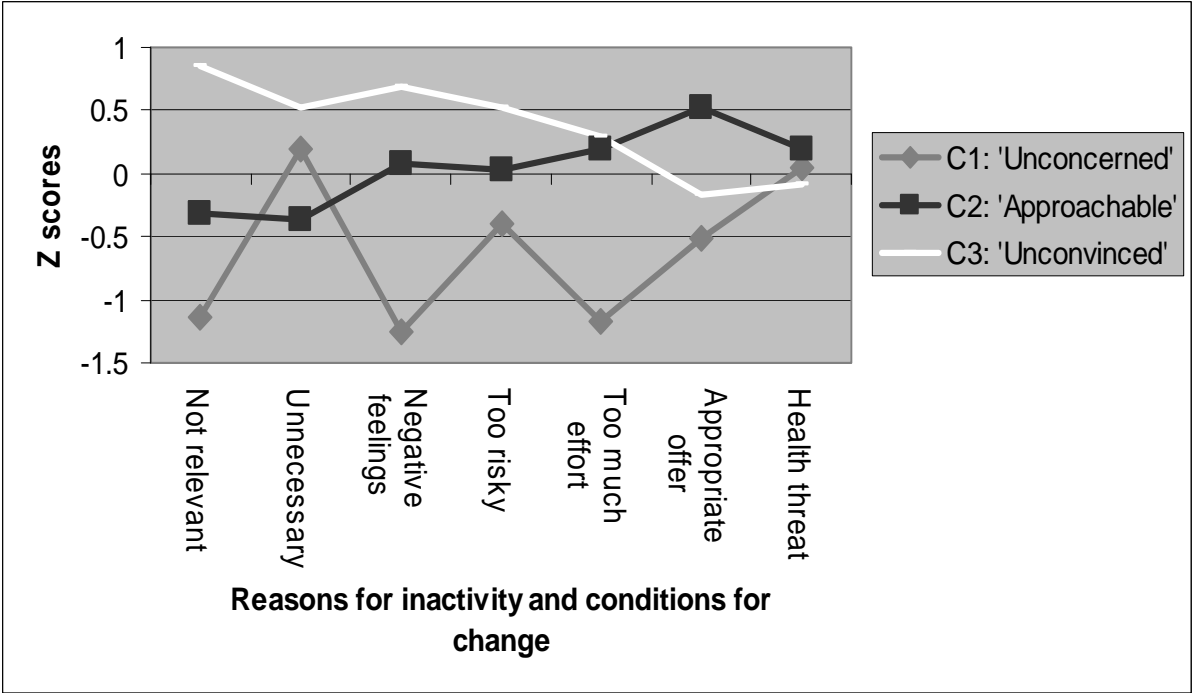


1 Hierarchical analysis



2  
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K-means analysis



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