PEDOMETER-ASSESSED PHYSICAL (AMBULATORY) ACTIVITY IN CYPRIOT CHILDREN

Constantinos A. Loucaides, Sue M. Chedzoy and Neville Bennett

University of Exeter, UK

Το άρθρο δημοσιεύτηκε στο EUROPEAN PHYSICAL EDUCATION REVIEW Volume 9(1):43–55

Περίληψη

Σκοπός αυτής της έρευνας ήταν να εξετάσει χρησιμοποιώντας πεδόμετρα, τις διαφορές στις σχολικές και εξωσχολικές φυσικές δραστηριότητες βάσει φύλου και εποχής. Παιδία (n = 256) του δημοτικού φορέσαν επί πέντε ημέρες τον χειμώνα και το καλοκαίρι (για την ίδια χρονική περίοδο) το πεδόμετρο. Η Two-way ANOVA έδειξε ότι τα αγόρια κατέγραψαν σημαντικά υψηλότερο αριθμό βημάτων σε σχέση με τα κορίτσια (15,480 ± 4153 έναντι 11,160 ± 2694) κατά την διάρκεια του χειμώνα και του καλοκαιριού (17,624 ± 5035 έναντι 13,607 ± 4396). Ο μέσος όρος των καταγραφομένων βημάτων των παιδιών ήταν σημαντικά μεγαλύτερος το καλοκαίρι σε σχέση με τον χειμώνα. Τα παιδιά κατέγραψαν σημαντικά υψηλότερο αριθμό βημάτων κατά τον εξωσχολικό χρόνο σε σχέση με τον σχολικό χρόνο. Δεν βρέθηκαν σημαντικές διαφορές στα επίπεδα φυσικής δραστηριότητας μεταξύ των ημερών του σχολείου ή/και των Κυριακών. Ο ημερήσιος αριθμός των βημάτων χρησιμοποιείται για να περιγράψει τα το επίπεδο φυσικής δραστηριότητας των παιδιών.

Key-words: pedometer counts • physical (ambulatory) activity • primary school children • seasonal differences
Evidence suggests that physical activity can have beneficial health effects for children regarding psychological well-being, self-esteem, overweight and obesity, and chronic disease risk factors (Cavill et al., 2001). The link between physical activity and health has resulted in a growing research interest in the measurement of children’s physical activity levels (McManus, 2000). Evidence on primary school children’s levels of activity from England (Armstrong et al., 1996; Sleap and Warburton, 1996), Singapore (Gilbey and Gilbey, 1995), Greece (Manios et al., 1999), and Hong Kong (Johns and Ha, 1999) suggests that the activity levels of a large proportion of children give cause for concern. In addition, the most consistent association found in studies is that boys are more active than girls (Sallis et al., 2000) and that children’s activity levels seem to decrease rapidly after the ages of 9 or 10 years (Armstrong, 1998; Pratt et al., 1999).

Although the need to assess physical activity for health purposes is widely acknowledged, there is no internationally agreed measure of physical activity participation (Booth, 2000). More than 30 methods are available to measure children’s physical activity including self-report, direct observation, mechanical and electronic motion sensors, heart rate monitoring and doubly labelled water (Cale, 1998; Harro and Riddoch, 2000). These instruments provide different types of information including type of activity, duration, frequency and intensity. Because different instruments provide varied information on physical activity, it is difficult to compare results from studies using diverse methods of measurement and analysis. For example, a recent paper by Sleap and Tolfrey (2001) indicated that English children’s activity levels as assessed by heart rate monitoring may not be as dramatically low as indicated in earlier studies, and they stressed that conclusions depend on the criteria set for analysing the data. It is also evident that objective physiological methods, such as heart rate monitoring, provide much lower accounts of children’s activity than self-report methods (McManus, 2000), and that self-reports underestimate demographic differences of physical activity in children in comparison to more objective methods (Sallis et al., 1998). Validity and reliability of different methods are also issues that need to be considered. In general, the easier, cheaper and more practical a method is, the less precise it is considered (Harro and Riddoch, 2000). However, costs involved in the choice of method should also be accounted for, especially in cases when funding is not available. In addition, the adoption of expensive methods also limits the number of children that can participate in studies. To advance our knowledge and practice forward, there is a need for the adoption of an internationally agreed upon measure that is also affordable in order to allow direct comparison of research findings (Booth, 2000).

A promising measure for the assessment of physical activity for examining international differences in physical activity is the pedometer (Bassett et al., 2000b). Pedometers measure steps taken, and their use is based on the assumption that much of a
person’s daily activity involves locomotor movement such as walking (Welk et al., 2000). The advantages of the pedometers lie primarily in their low cost, and ease of administration (Rowlands et al., 1997; Tudor-Locke and Myers, 2001). However, much additional empirical evidence is needed to clarify daily step patterns across different ages, genders and occupational classes (Welk et al., 2000).

In reviewing 32 studies Tudor-Locke and Myers (2001) suggested that we can expect 12,000–16,000 steps per day for 8–10-year-old children (lower for girls than boys). However, among the 32 studies reviewed, only one study (Rowlands et al., 1999) involved children of this age using pedometer counts. In the Rowlands et al. (1999) study, 34 children wore pedometers from the morning until they went to bed at night for up to four weekdays and two weekend days. Boys attained 16,035 ± 5999 steps per day and girls 12,729 ± 4026 steps per day. Thus, the expected steps per day argued by Tudor-Locke and Myers (2001) may be useful for comparison purposes between studies, but caution needs to be taken not to interpret these values as cutoff points below which activity levels are considered inadequate for health benefits. Threshold values for classifying sedentary individuals or the optimal number of steps per day necessary to produce health benefits are unknown (Tudor-Locke and Myers, 2001). For a starting point, it might be interesting to compare daily step counts with the value of 14,000 steps per day, being the average value of 12,000 and 16,000 steps per day.

As the need arises to monitor physical activity in children for public health purposes (Cavill et al., 2001), and to answer the question whether physical inactivity and its health consequences are an international issue (Booth, 2000), this study attempted to present evidence on Cypriot children’s activity levels. To our knowledge, this behaviour has not been measured in Cypriot children to date. Cyprus is situated in the north-eastern part of the Mediterranean Sea, and is the third largest island in the Mediterranean Sea, with a population of 659,900. This study was conducted in the free part of the Republic of Cyprus as access to the north is prohibited because of the Turkish occupation. This article reports results from a larger study conducted on children’s activity levels and determinants of activity on the island.

**Purpose of the study**

This study aimed to examine: (1) differences between boys and girls in physical activity levels; (2) school and after-school differences in physical activity; (3) seasonal differences in physical activity; and (4) total step daily count with reference to the value of 14,000 steps per day.

**Method**
**Sample**

The sample consisted of 256 Year 6 (aged 11–12) Greek-Cypriot primary school children (boys = 129, girls = 127) from five different schools. Stratified convenience sampling was employed, with the main factor for selection being the geographical area of the school, in order to cover all the diverse areas of the island. Children and their parents signed informed consent forms prior to participation.

**Measure**

The Yamax Digiwalker (DW-200, Yamax Corporation, Tokyo, Japan) pedometer was used as a measure of total physical activity over the day. This instrument has a horizontal, spring-suspended lever arm that moves up and down in response to vertical accelerations of the hip. With each step the lever arm makes an electrical contact, and one step is recorded (Bassett et al., 2000a; Leenders et al., 2001). The advantage of this type of pedometer for use with children is that it has a built-in clip that can be attached to the waist, and it also comes with a cover to prevent children from accidentally resetting the display. A series of studies (Eston et al., 1998; Louie et al., 1999) estimated the energy cost of selected representative childhood activities with four instruments (pedometry, uniaxial and triaxial accelerometry, and heart rate monitoring), and activity estimates of the four methods were compared with oxygen uptake.

Eston et al. (1998) found that the correlation between the Yamax DW-200 when worn on the hip and oxygen uptake with respect to a range of activities (walking, running, hopping, catching, sitting and crayoning) was 0.806, in a sample of 30 English boys and girls aged 8.2–10.8 years. When unregulated play activities (hopping, catching and crayoning) were considered together, the correlation between the hip pedometer and energy expenditure increased to 0.921. The second study by Louie et al. (1999) followed the same procedures but was carried out in Hong Kong with Chinese boys aged 8–10. In both studies the inexpensive pedometer worn at the hip was a good predictor of energy expenditure. However, these studies assessing the validity of the DW-200 were conducted in laboratory conditions and as children participate in a wider range of activities over the day, these studies may be limited by the inclusion of selected activities. Further evidence of validity of the pedometer in free-living condition needs to be conducted. Nevertheless, according to Rowlands et al. (1999) the pedometer is a good measure of total daily activity, and its low cost in comparison with other objective instruments (Leenders et al., 2001) makes it an excellent tool for use in large studies.
Procedures

Children’s activity levels were measured for five days in winter (January and February) and for five days in the summer (May and June), including four school days and a Sunday. Research has indicated that with objective measures, with children of this age, four and five days of measurement give good reliability (Trost et al., 2000). Seasonal differences were also examined in order to provide an adequately comprehensive view of the physical activity habits of these children (Booth, 2000). On the first day of the data collection the pedometers were fitted on the children from the start of the school day (7.45 a.m.). The pedometers were fitted in the midline of the thigh at waist level, either on the left or the right, as research has shown that it does not matter on which side of the body they are fitted (Bassett et al., 1996). On subsequent days children fitted the pedometers from the morning when they woke up until the evening when they went to sleep. They were advised to engage in their ‘normal’ activity levels during the course of the study.

Together with the pedometer, a recording sheet was given to each child in order to record the total step count when the school finished and the day’s total step count in the evening. The recording sheet also included the following instructions: 1.

1. Always keep the cover closed, and open it only when school finishes to register the counts during the school day; in the evening before removing the instrument to register the counts for the whole day; and in the morning in order to press the yellow button.
2. Make sure the display shows zero when fitted first thing in the morning.
3. Do not forget to refit the instrument if you change clothes.
4. Make sure that when you fit the instrument, it is not suspended loosely.
5. Do not bring the pedometer into contact with water, when you shower, wash or go swimming.
6. Do not play around with the instrument, as it will register counts that do not represent your activity.

Teachers were also requested to check in the morning whether the pedometers were fitted properly, to check children’s recording sheets daily and to make sure that children recorded the step counts before they went home at 1.05 p.m. On Sundays pedometers were fitted from the morning when children woke up until the evening when they went to bed. Steps were recorded for the whole day, in the evening. If a child was unable to fit the pedometer on a Sunday (because of formal occasions such as church gatherings or late waking-up hours), s/he was requested to fit the instrument on the Saturday.
Analyses

Data were analysed using SPSS for Windows (version 9). School step counts were subtracted from the total daily step counts to obtain the after-school step counts. The values for the three time periods (school, after-school, whole day) were then averaged to obtain composite scores over the four days. Means and standard deviations were computed to describe children’s step counts over the school period, the after-school period and over the whole day (weekday and Sunday). A two-way ANOVA, gender by season (2 X 2) with a repeated measure on the second factor was computed to test for gender and seasonal differences. Moreover, a two-way ANOVA, gender by season (2 X 2) with a repeated measure on the second factor was computed to test for gender and seasonal differences over weekends. In addition, two more mixed ANOVAs were computed to test for differences across boys and girls in school and after-school activity levels for summer and winter. These were two-way ANOVAs, gender by daytime (2 X 2) with repeated measures on the second factor. Two-way ANOVAs were preferred rather than a three-way ANOVA, as the increased number of cells in the mixed threeway ANOVA would decrease the number of contributions to each cell, and thus the test’s statistical power (Roberts and Russo, 1999). Paired t-tests were also calculated to test for differences between weekends and weekdays in the summer and in the winter. Finally, one-sample t-tests were computed to check for differences between the mean pedometer counts of Cypriot children with the value of 14,000 steps per day.

Results

Of the 256 children who participated in the study, complete data were obtained from 232 (91%) children in winter and 221 (86.3%) for summer. Means and standard deviations for total daily step counts for winter and summer are shown in Table 1. For weekends, complete data were obtained for 221 (86.3%) children in winter, and for 199 (77.7%) in the summer. Missing data were due to children being absent from school, or children forgetting to record the steps in the evening. Three children were not able to recognize the value of the displayed number, and therefore it may be appropriate, especially for younger children, to get adults to complete the recording sheets. Pedometers were given back to children who were willing to repeat the days with missing data. Tests for normal distribution indicated that data were skewed. Log transformation of the data (Tabachnick and Fidell, 1996) led to a normal distribution. However, as analyses with the transformed data yielded essentially the same results, ANOVAs were conducted with the original untransformed data.

Results of the repeated measures ANOVA showed a significant main effect for gender $F(1,205) = 74.57, p < 0.001$, and a significant main effect for season $F(1,205) = 54.47, p < 0.001$. There was no significant interaction between gender and season. An examination of the
means (see Table 2) indicated that boys attained significantly more daily step counts than girls, and that all children attained significantly more daily step counts in summer than in winter. Results were identical for weekends, with a significant main effect found for gender, $F(1,178) = 7.64$, $p < 0.01$, and a significant main effect for season, $F(1,178) = 5.92$, $p < 0.05$. Boys attained significantly more daily step counts than girls in winter ($15,724 \pm 8758$ vs $12,458 \pm 5950$) and summer ($16,543 \pm 8595$ vs $14,744 \pm 6629$), and all children attained significantly more daily step counts in weekends over summer than over winter.

Two more repeated measures ANOVA were computed to check for differences in the means of boys and girls during school and after-school. A significant main effect for gender was found for winter, $F(1,230) = 79.71$, $p < 0.001$, as well as a significant main effect for daytime, $F(1,230) = 87.51$, $p < 0.001$. However, the interaction was also significant, $F(1,230) = 7.54$, $p < 0.01$. An inspection of the mean scores indicated that boys attained significantly more step counts during school time and after-school time, and that the gap between boys’ and girls’ step counts (see Table 3) after school was wider (mean difference = 2746) than during school time (mean difference = 1655). For summer, the main effect for gender was significant, $F(1,218) = 36.46$, $p < 0.001$, as well as the main effect for daytime, $F(1,218) = 115.03$, $p < 0.001$. The interaction between gender and daytime was not significant. In contrast to winter, boys and girls increased their PA levels to about the same extent after-school (see Table 4).

**Table 1** Total daily step counts over winter and summer

<table>
<thead>
<tr>
<th></th>
<th>Winter ($n = 232$)</th>
<th>Summer ($n = 221$)</th>
<th>Boys ($n = 109$)</th>
<th>Summer ($n = 99$)</th>
<th>Girls ($n = 123$)</th>
<th>Summer ($n = 122$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>13,429</td>
<td>15,471</td>
<td>15,763</td>
<td>17,651</td>
<td>11,361</td>
<td>13,701</td>
</tr>
<tr>
<td>SD</td>
<td>4340</td>
<td>5116</td>
<td>4490</td>
<td>5087</td>
<td>2939</td>
<td>4426</td>
</tr>
</tbody>
</table>

**Table 2** Total daily step counts for boys and girls over winter and summer

<table>
<thead>
<tr>
<th></th>
<th>Boys ($n = 89$)</th>
<th>Girls ($n = 118$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>15,480</td>
<td>11,160</td>
</tr>
<tr>
<td>Summer</td>
<td>17,624</td>
<td>13,607</td>
</tr>
<tr>
<td>Mean</td>
<td>4153</td>
<td>2694</td>
</tr>
<tr>
<td>SD</td>
<td>5035</td>
<td>4396</td>
</tr>
</tbody>
</table>
Two paired t-tests were also calculated to test for differences in the means of the whole group between weekdays and weekends in winter and summer. No significant differences between weekdays (mean = 13,355, SD = 4262) and weekends (mean = 13,945, SD = 7522) could be detected in winter or between weekdays (mean = 15,618, SD = 5072) and weekends (mean = 15,766, SD = 7795) in summer. It is interesting to note the larger standard deviations over weekends that indicate a greater variability in activity. This may be partly explained by the fact that the weekday values are an average value over several days, while the weekend value is the value of a single day. Data from more than one day at the weekend might have provided more reliable estimates of weekend step counts, and therefore these data may be treated with caution.

One-sample t-tests were computed to compare total daily step counts of Cypriot children (see Table 1) with the value of 14,000 steps per day. For winter, the mean of the sample was significantly lower when compared with the value of 14,000 steps per day ($t = 2.00, p < 0.05$). In the summer, the sample’s mean was significantly higher ($t = 4.27, p < 0.001$). To elucidate these findings gender-specific analyses are also presented. Boys had a significantly higher mean than the value of 14,000 steps per day in winter, $t = 4.10, p < 0.001$, and in the summer, $t = 7.14, p < 0.001$. The mean

for girls in winter was significantly lower, $t = 9.96, p < 0.001$. No statistically significant difference was revealed for the summer, but the mean for girls was slightly lower.

Discussion
Evidence from this study confirms previous findings that boys are more active than girls (Cavill et al., 2001; Sallis et al., 2000). Boys’ activity levels were significantly higher than girls’ activity levels for both during school and the after-school time. It was interesting that the difference was larger for the after-school period for the winter, rather than for the summer. Boys increased their activity levels by 36 percent in winter for the after-school time and girls by 26 percent (see Table 3). This difference was not evident for the summer (see Table 4), where boys and girls increased their physical activity levels to about the same extent (49 and 45 percent respectively). This finding perhaps suggests that girls view weather as a potential barrier to physical activity, bearing in mind that the average temperature ranges between 10 and 3º C in the winter months and between 36 and 27º C in the summer months. These data strengthen the policy to target girls as a priority group for the promotion of physical activity (Cavill et al., 2001).

Children in this study were found to be significantly more active after-school than during school. This finding is in contrast with the findings of studies conducted in Crete (Manios et al., 1999), England (Sleap and Warburton, 1996), and Hong Kong (Johns and Ha, 1999). It is interesting to note the discrepancy of results between the study conducted in Crete and the present study. The structure of the school day in Crete and Cyprus is similar, with the lessons starting at 8.15 a.m. and 7.45 a.m. respectively, and finishing at about 1.00 p.m. In addition, the same time is devoted to school breaks and to physical education (PE) lessons, including three breaks of 10–25 minutes duration per day, and two weekly 45-minute PE lessons. The difference found may be due to the younger age of the Cretan children (6-year-olds) as they may not be allowed to play as freely outdoors as the older Cypriot children in the after-school time.

Differences from studies conducted in England and Hong Kong may be attributed to the shorter school day in Cyprus, where children have more free time in the after-school time to engage in physical activity than during school time. Unfortunately, no data were collected for comparison purposes between break times and PE lessons. However, regarding PE lessons, a great emphasis is given to the preparation of a usually small number of children for inter-school competitions, thus not involving the rest of the class in a more structured lesson. Factors like reduction of management time in PE, modification of curricular context and adjusting class sizes (McKenzie et al., 2000) may help improve children’s physical activity during school time in Cyprus. Curricular context is an issue that also needs to be raised, with an emphasis on health-related activity. Finally, opportunities for children during schools breaks may be increased with supervised activities, as children are usually not allowed to engage in ball games during breaks.
This study also confirmed previous findings (Armstrong and Bray, 1991; Gilbey and Gilbey, 1995) relating to the lack of significant differences between weekdays and weekend activity levels. Marked seasonal differences were also found in this study, with children participating in significantly higher levels of activity over the summer period. This is probably attributed to the longer day and the ideal weather during early summer in Cyprus. Total daily step counts increased by 15 percent over the summer month (see Table 1). Seasonal differences in levels of physical activity were observed in a study of 191 3–4-year-old children (Baranowski et al., 1993). In this study, outside activity levels of all children were at their lowest during the hottest summer months. This may be the case in the Cypriot context, where the increased activity levels observed in the early summer in comparison to winter may not continue over the hotter summer months. Therefore, it is important that physical activity is assessed throughout the year, in order to be able to identify periods where children’s activity may be targeted for intervention.

Interestingly, the total daily step counts found in this study are within the expected values (12,000–16,000 steps per day) for 8–10-year-old children as reported in the paper by Tudor-Locke and Myers, (2001). The mean of the sample in this study (see Table 1) lies in the lower range of the expected values for winter (13,429), and in the upper range of the expected values for the summer (15,471). With reference to the value of 14,000 steps per day, this sample attained significantly lower step counts for winter and significantly higher counts for the summer. Gender-specific analyses revealed that boys had attained significantly more steps per day for both winter and summer. On the contrary, girls attained significantly lower steps per day for winter and lower steps per day for the summer. Sixty-five percent of boys in winter and 74 percent in the summer reached the value of 14,000 steps per day, and for girls, only 19 percent in winter and 39 percent in the summer attained the value of 14,000 steps per day. Although Tudor-Locke and Myers (2001) argue that lower daily step counts should be expected for girls than for boys, this practice may guide practitioners and researchers to expect girls to be necessarily less active, and thus consider girls’activity levels satisfactory when in fact they are not. Interpretation, however, of data from pedometers is not without its limitations.

Pedometers may be used to accurately measure steps taken, but they are not sensitive to changes in speed, and studies have shown that more step counts are recorded for walking paces than for running, as average stride length is shorter when walking (Welk et al., 2000). Therefore, pedometer data cannot provide accurate estimates of intensity. This finding is important for children of this age. Although anthropometric data were not derived for this sample, girls at this age are taller than boys (Armstrong and Welsman, 1997), and thus they may accumulate fewer steps for the same distance walked. Another issue to be considered is that pedometers record step action, and their utility to account for activities not involving step action should be questioned. According to Bassett et al. (2000a), motion sensors ‘cannot be
used for swimming or other water sports, and that there is little reason to believe that they would be accurate for activities like bicycling or weight lifting’. Thus, it may be important for researchers to present evidence on the type of activities that children engage in, so that they have a more accurate picture of the physical activity levels of the children. From data not presented in this article, between 29 and 30 percent of the children in our sample reported participating in bicycling at least once in the four days of measurement for both summer and winter. Although equal number of boys and girls reported cycling for summer, in winter 68 percent were girls. This may provide an indication that pedometer counts underestimated physical activity derived from actions other than those involving walking. Therefore, the disappointingly low percentages of girls exceeding the average value of 14,000 steps per day may be misleading.

Another word of caution is that total walking behaviour or ambulatory activity over the day is not synonymous with total daily energy expenditure, which also consists of the resting metabolic rate, the thermic effect of food and physical activity related energy expenditure (Leenders et al., 2001). Ambulatory activity is a component of physical activity energy expenditure. To illustrate this, evidence from adults indicated that physical activity energy expenditure estimated from number of footsteps taken per day underestimated physical activity energy expenditure derived from doubly labelled water by 59 percent (Leenders et al., 2001). This suggests that total steps per day may be used with caution when referring to energy expenditure derived from physical activity. This could apply to adults to a greater extent, as their activity may be more variable because of differences in occupational activities, for example, with regard to upper body movement. For children, the use of pedometers may represent a more accurate picture of their physical activity energy expenditure if used in the school time where children are not engaged in activities such as cycling and swimming, at least as far as the Cypriot context is concerned. Other problems associated with the use of pedometers is the lack of a time sampling mechanism to store data by time, and thus the researcher needs to rely on the children’s report. Evidence from this study seems to support the expected values of 12,000–16,000 steps per day. For boys, total daily step count was towards the highest range for winter and exceeded the highest range for the summer. For girls, total daily step count was marginally less than the lowest range for winter, and approached the average for the summer.

This research has added to the body of knowledge of the international literature regarding physical activity across different time periods and between boys and girls. Whereas interventions are needed to encourage adequate physical activity for all young people (Cavill et al., 2001), girls need to be targeted for special intervention programmes (Sallis et al., 2000). This is also applicable in the Cypriot context where girls were found to be less active than boys. In addition, interventions during school time and in the winter months may help improve physical activity levels of children in order to increase the percentage of children that
meet existing guidelines. Most importantly, it has provided information that begins to clarify daily steps patterns of children’s physical activity. The relative objectivity, low cost, ease of administration and durability when used with children are qualities that can promote pedometers as a common, worldwide, measurement tool for children’s physical activity. With this prospect in mind, more studies are needed from different parts of the world to enhance evidence regarding children’s daily step patterns for comparison purposes, and for the establishment of appropriate guidelines.

Acknowledgement

We are grateful to the head teachers, teachers, and children of Akropoli, Chirokoitia, Kyperounta, Laniteio and Yermasogeia Primary Schools for participating in the present study. Special thanks are due to Charalambos Chrysostomou, Andreas Patsalidis and Karen Walshe for their support and help with data collection.

References


**Constantinos A. Loucaides** is a primary school teacher in Cyprus. He holds an MSc in Exercise and Health Science from the University of Bristol, and he is now studying for a PhD in the School of Education and Lifelong Learning, University of Exeter.

**Address:** Constantinos Loucaides, 77 Larnaca Avenue, Aglanjia 2102, Nicosia, Cyprus. [email: conlou@avacom.net]

**Sue M. Chedzoy** is with the School of Education and Lifelong Learning, University of Exeter.

**Address:** Sue Chedzoy, School of Education, University of Exeter, Heavitree Road, Exeter EX1 2LU, UK. [email: S.M.Chedzoy@exeter.ac.uk]

**Professor Neville Bennett** is with the School of Education and Lifelong Learning, University of Exeter.

**Address:** Professor Neville Bennett, School of Education, University of Exeter, Heavitree Road, Exeter EX1 2LU, UK. [email: S.N.Bennett@exeter.ac.uk]