

## DANCE AND AEROBIC DANCE IN PHYSICAL EDUCATION LESSONS: THE INFLUENCE OF THE STUDENT'S ROLE ON PHYSICAL ACTIVITY IN GIRLS

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The primary aim of physical education (PE) is to promote lifelong physical activity (PA) and to promote physical literacy in children. During classes children should learn through participation in physical activities and thus physical education lessons should be as active as possible. The aims of this study were firstly to compare physical load in dance and aerobic dance lessons to the recommendation of the minimum of 50% of class time being physically active (USDHHS, 2000) and secondly to identify how the students' role in the educational process affects their engagement in PA. Two hundred and forty one girls completed the full program of dance and aerobic dance lessons. Heart rate telemetry systems were used to measure PA during dance and aerobic dance lessons. Girls spent more than 50% of class time in moderate to vigorous PA in both traditional and progressive dance and aerobic dance lessons. Results from this study suggest that the increased student's role can help to fulfill other PE goals such as responsibility for decision making and creativity along with promoting PA especially in dance and aerobic dance student oriented lessons.

*Keywords: Heart rate, traditional and progressive lessons, decision making, creativity.*

### INTRODUCTION

In a progressively more sedentary society, the role of physical education (PE) in promoting lifelong physical activity (PA) and enhancing children's quality of life should be central to long term health enhancing strategies (Burgeson, Wechsler, Brener, Young, & Spain, 2001). To complete these strategies, PA guidelines and recommendations have been created. The Healthy People 2010 objectives aim to increase the number of schools providing daily physical education as well as the number of PE participants and students who are physically active for at least 50% of lesson time (USDHHS, 2000). The Health Education Authority (Biddle, Sallis, & Cavill, 1998) recommended accumulation of one hour of PA per day at least twice a week of at least moderate intensity and children's participation in activities that help to develop and maintain muscular-skeletal health. General recommendations for adolescents (Sallis & Patrick, 1994) advocate firstly that all adolescents should be active every day as a part of their daily lifestyles and secondly that adolescents should engage in three or more sessions per week in moderate to vigorous physical activity (MVPA) that lasts 20 min. or more at a time. Several studies reported the important role of PE in delivering health enhancing PA (Fairclough & Stratton, 2005a, 2005b; Levin, McKenzie, Hussey, Kelder, & Lytle, 2001; McKenzie et al., 2006; Stratton, 1996).

Some studies have documented that physical activity drops exponentially during the adolescent period (Allison, Adlaf, Dwyer, Lysy, & Irving, 2007). Furthermore, the review paper by Armstrong and Welsman (2006) revealed that European boys of all ages participate in more PA than European girls, especially considering vigorous PA. Girls also take fewer steps per day and are less active than boys during release or recess time (Tudor-Locke, Lee, Morgan, Beighle, & Pangrazi, 2006). Therefore, there is a strong call for teenage girls' engagement in PE programs that motivate them to adopt lifelong PA habits (Cavill, Biddle, & Sallis, 2001). A range of activities must be offered if girls are to be motivated to take advantage of PA opportunities (Prusak, Treasure, Dars, & Pangrazi, 2004).

Promotion of PA can be fostered through effective curricular and extracurricular programs (Powers, Conway, McKenzie, Sallis, & Marshall, 2002). Furthermore, the teaching process should also be considered. Student oriented PE teaching approaches involve a higher range of decision making, self activity and critical thinking (Bonnette, McBride, & Tolson, 2001; Penney & Chandler, 2000). Moreover, further goals such as developing creative thinking, problem solving, metacognition, social development (Rink, 1998) and self assessment can serve to promote knowledge, understanding and independent learning (Mohnsen, 1997). These valid areas of learning could contrast, however, with meeting PA recommendations and health enhancing strategies. PA varies in dif-

ferent teaching components, e.g content of the lesson, main teaching objective, teaching approach, class size, etc. (Frömel, Vašendová, Stratton, & Pangrazi, 2002; McKenzie, Marshall, Sallis, & Conway, 2000; Stratton, 1996, 1997). PE content thus needs to include activities that are effective in promoting PA along with meeting motor, cognitive, social, spiritual, cultural and moral aims (Sallis & McKenzie, 1991).

In the case of girls, PE activities should also develop their self confidence (Solmon, Lee, Belcher, Harrison, & Wells, 2003). National surveys (Frömel & Bartoszewicz, 1998; Frömel, Formánková, & Sallis, 2002) have provided evidence that dance, aerobic dance, creative and aesthetic activities are highly popular among adolescent girls and furthermore girls' attitudes towards dance show little change between the ages of 11 to 16 (Sanderson, 2001). Dancing is among the top five activities of girls in their leisure time (Harrell, Pearce, Markland, Wilson, Bradley, & McMurray, 2003). Findings presented in literature have shown that dance and aerobic dance can enhance girls' perception of PA. It applies especially to aerobic dance since it is not considered a competitive PA and supports girls' perceptions of their own femininity, body image and physical self efficacy. Aerobic dance might enhance girls' physical self perception and therefore could be an activity through which positive psychological results could be attained (Daley & Buchanan, 1999). Another study by Bartholomew and Miller (2002) supports the affective benefits of submaximal, continuous exercise in aerobic dance classes which extend to self selected aerobic dance classes. Aerobic dance appears to be an activity which could accomplish the fulfillment of the main recommendations and enhance effectiveness in promoting cardiorespiratory fitness (Flores, 1995; Li & Dunham, 1993; MacConnie, Gillian, Geenen, & Pels, 1982).

From the point of view of educational and other values, dance is acknowledged for other reasons than aerobic dance is. They are the aesthetic, cultural, social, emotional and artistic benefits of dance (Hanna, 1999; Purcell, 1994; Sanderson, 1996; Smith-Autard, 2002). Since these contribute to progress in the learning process (Chen, 2001; Graves & Townsend, 2000; Koff, 2000; Richardson & Oslin, 2003), they belong among the main points of advocacy for dance in the school curriculum. In dance and especially creative dance, composing dances is emphasised (Morin, 2001), because every dance movement is the result of a range of useful decisions on how the dance movement uses space, time, energy and partnership of pupils. Dance gives pupils an opportunity to express their ideas, feelings and views (Purcell, 1994).

The aims of our study were twofold: firstly, to compare the physical load in dance and aerobic dance lessons to the recommendation of the minimum of 50% of class time being physically active (USDHHS, 2000)

and secondly, to identify how the students' role in the educational process affects girls' engagement in PA.

## METHODS

### Participants and setting

One middle school and two high schools in the Czech Republic and two middle schools and three high schools in Poland participated in this study. Girls from the 6th through the 11th grades ( $n = 241$ ) gave their consent to participate ( $M \pm SD$  age:  $16.0 \pm 1.6$  years; height:  $1.65 \pm 0.06$  m and weight:  $53 \pm 8.2$  kg). In total, 241 girls participated in two types of PE lessons, 171 were eliminated since they submitted incomplete monitoring record sheets. Only two girls refused to participate in the study. In compliance with the Czech and Poland national curriculum, girls attended PE lessons twice and three times a week, respectively, in single sex groups. Each lesson took 45 minutes. Lessons were taught by 9 university students studying in their last year of the master degree programs in PE. The lesson content which was dance or aerobic dance was accompanied by music.

### Measurements

A heart rate telemetry system was used to measure PA during lessons. For the confirmation as to whether progressive intervention was implemented, a standardized questionnaire was distributed.

HR monitor (Polar, Oy, Kempele, Finland): Heart rate was measured at 5 s intervals using a Polar S610™ heart rate telemetry system. Higher load (heart rate above  $[220 - \text{age}] \times 0.85$ ), medium load (in the zone of 70–84% of maximal heart rate), average heart rate during a 45 minute PE lesson were registered. The values express physical load in terms of zones – aerobic, anaerobic threshold and “redline”, which are applied in PE lessons by Swaim and Edwards (2002). In order to compare physical activity during the lessons to Healthy People 2010 recommendations with the minimum of 50% of class time being physically active (USDHHS, 2000), target heart rate zone and the percentage of PE lessons time in the target zone were calculated. Target heart zone was partially determined by the American College of Sports Medicine guidelines (2000) as over 60% of maximum heart rate ( $220 - \text{age}$ ).

Questionnaire: At the end of each lesson, participants were to complete a standardized questionnaire asking 24 dichotomous questions. The questions covered six primary dimensions (cognitive, emotive, health, social, attitudinal, and creative) and a supplementary dimension of the “student's role”. The reliability and validity of this questionnaire have been reported elsewhere

(Frömel, Vašendová et al., 2002). According to the data obtained from each dimension of the questionnaire, the changes in the students' role in the teaching process were assessed. This included measures of student satisfaction with the PA in PE lessons, the teacher's role as a facilitator of learning, freedom to make decisions, dialogue between the student and the teacher, and the students' central role in the learning process.

## Procedure

In the experiment, each class took part in 2 types of PE lessons. The first type was traditional PE involving standard teaching approaches using dance or aerobic dance with appropriate musical accompaniment. The content of the PE lessons was adjusted to the abilities and interests of the students, the student teachers, the physical environment and current curricular demands and varied in different dance styles (modern, latin, hip-hop etc.) and tempo of chosen music accompaniment.

The progressive series of PE lessons had structure and content similar to the traditional lessons. Yet "increasing the student's role in the educational process" was added as an extra variable. The educational process involved more decision making, self directed activity, critical and creative thinking, problem solving, metacognition, social development, and self assessment.

The main instructions given to the teachers on how to teach the progressive physical education lessons were:

- to incorporate individualized episodes that encourage cooperation,
- provide students with more involvement in the lesson's management and encourage the students to accept responsibility for their results,
- to allow the students to opt for different alternatives,
- to increase students' autonomy for decision making, creativity and self realization,
- to enhance peer assessment.

To achieve these aims, student teachers were allowed to use the whole range of teaching styles (Mosston & Ashworth, 2002).

Before starting the lesson HR monitors were adjusted to each monitored student. Heart rate monitors were put on according to the instructions. All monitors were set up by the research team members and started just prior to the lesson. The course of the lesson was not interrupted by this procedure. At the end of the lesson students took approximately 5 minutes to complete the questionnaire.

## Data analyses

The Statistica 6.0 program was used for data processing. For data analysis we used basic statistical character-

istics and the Wilcoxon test for nonparametric data from the questionnaire. For association between independent and dependent variables we used the repeated measure ANOVA and Scheffé post-hoc test ( $p \leq 0.05$ ). The type of lesson with two categories (traditional and progressive lessons) and content with two categories (dance and aerobic dance lessons) belong among independent variables. As dependent variables, mean heart rate and heart rate zones are considered. As a complementary characteristic for the explanation of "effect size", we used the coefficient  $\omega^2$  (Tolson, 1980) and the coefficient  $\eta^2$  in agreement with recommendations by Morse (Morse, 1999).

## RESULTS

Statistically significant differences were found between traditional and progressive dance [ $T = 6.93$ ;  $p < 0.001$ ,  $\eta^2 = 0.06$ ] and aerobic dance [ $T = 8.90$ ;  $p < 0.001$ ,  $\eta^2 = 0.07$ ] during PE lessons in the dimension of the student's role. Higher score (more points) in this dimension was obtained in progressive PE lessons in comparison with traditional PE lessons. These confirmed that progressive intervention had been put into effect (Fig. 1).

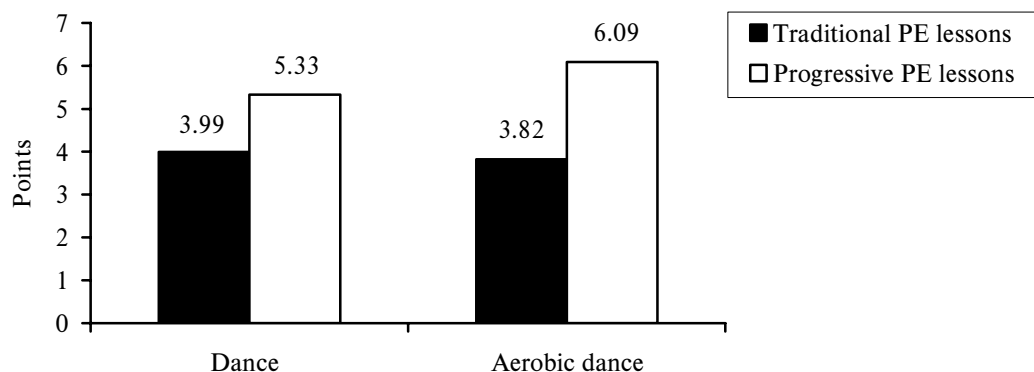
Furthermore, the intervention aimed at "increasing the student's role" in PE lessons did not cause any decrease in heart rate (mean HR) nor PA intensity in progressive type lessons ( $F = 0.62$ ;  $p = 0.431$ ; type  $\times$  content  $F = 0.54$ ;  $p = 0.464$ ). Mean heart rate was  $137.56 \pm 12.48$  beats·min<sup>-1</sup> in traditional and  $139.25 \pm 12.87$  beats·min<sup>-1</sup> in progressive dance PE lessons. In aerobic dance PE lessons, the girls' mean heart rate was  $149.94 \pm 20.29$  beats·min<sup>-1</sup> in traditional lessons and  $150.0 \pm 15.52$  beats·min<sup>-1</sup> in progressive lessons.

Differences in time (min.) spent in the zone over 85% of  $HR_{max}$  ( $F = 0.87$ ;  $p = 0.351$ ; type  $\times$  content  $F = 2.47$ ;  $p = 0.117$ ), in the zone 70–84%  $HR_{max}$  ( $F = 0.08$ ;  $p = 0.777$ ; type  $\times$  content  $F = 0.58$ ;  $p = 0.445$ ) and in the zone 60–69% ( $F = 2.91$ ;  $p = 0.089$ ; type  $\times$  content  $F = 0.18$ ;  $p = 0.670$ ) were not statistically and practically significant (TABLE 1).

The time students spent in the target zone over 60 percent of their maximal heart rate was  $32.86 \pm 8.29$  minutes in traditional dance lessons,  $33.77 \pm 8.72$  minutes in progressive dance lessons,  $40.26 \pm 5.66$  minutes in traditional aerobic dance lessons and  $39.07 \pm 7.95$  minutes in progressive aerobic dance lessons. Analysis of heart rate data revealed that the girls engaged in PA in the target zone  $73.03 \pm 18.43\%$  of class time in traditional dance lessons and  $75.05 \pm 19.38\%$  of class time in progressive dance lesson. The girls spent  $89.47 \pm 12.58\%$  of class time in traditional lessons and  $86.83 \pm 17.67\%$  of class time in progressive lessons performing aerobic dance.

**Fig. 1**

Differences between traditional and progressive PE lessons in the dimension of student's role

**TABLE 1**

HR zones and % PE lessons time in HR zones in traditional and progressive dance and aerobic dance PE lessons

| Dance physical education (PE) lessons         |                        |           |                   |           |                        |           |                   |           |
|---|------------------------|-----------|-------------------|-----------|------------------------|-----------|-------------------|-----------|
| Characteristics                               | Traditional PE lessons |           |                   |           | Progressive PE lessons |           |                   |           |
|   | <i>min.</i>            |           | % PE lessons time |           | <i>min.</i>            |           | % PE lessons time |           |
|   | <i>M</i>               | <i>SD</i> | <i>M</i>          | <i>SD</i> | <i>M</i>               | <i>SD</i> | <i>M</i>          | <i>SD</i> |
| Over 85% HR <sub>max</sub>                    | 3.56                   | 4.62      | 7.92              | 10.26     | 4.84                   | 5.04      | 10.76             | 11.19     |
| 70–84% HR <sub>max</sub> (min.)               | 14.96                  | 7.63      | 33.25             | 16.96     | 15.56                  | 6.74      | 34.59             | 14.98     |
| 60–69% HR <sub>max</sub> (min.)               | 14.34                  | 5.51      | 31.87             | 12.25     | 13.37                  | 4.70      | 29.70             | 10.44     |
| Aerobic dance physical education (PE) lessons |                        |           |                   |           |                        |           |                   |           |
| Characteristics                               | Traditional PE lessons |           |                   |           | Progressive PE lessons |           |                   |           |
|   | <i>min.</i>            |           | % PE lessons time |           | <i>min.</i>            |           | % PE lessons time |           |
|   | <i>M</i>               | <i>SD</i> | <i>M</i>          | <i>SD</i> | <i>M</i>               | <i>SD</i> | <i>M</i>          | <i>SD</i> |
| Over 85% HR <sub>max</sub>                    | 8.45                   | 10.10     | 18.78             | 22.45     | 8.13                   | 8.43      | 18.06             | 18.74     |
| 70–84% HR <sub>max</sub> (min.)               | 21.0                   | 10.27     | 46.67             | 22.83     | 20.72                  | 8.31      | 46.05             | 18.47     |
| 60–69% HR <sub>max</sub> (min.)               | 10.81                  | 9.54      | 24.02             | 21.20     | 10.22                  | 6.55      | 22.72             | 14.56     |

Legend: M = mean, SD = standard deviation, HR<sub>max</sub> = maximal heart rate.

## DISCUSSION

The data were assessed in relation to PA recommendations and according to how the students' role in the educational process affects their engagement in PA. The difference between traditional and progressive lessons was confirmed by higher scores in the student's role dimension of the questionnaire. In total, progressive intervention did not negatively affect PA in progressive PE lessons. The progressive intervention was carried out in dance and aerobic dance PE lessons similarly. In both lessons, there were not significant differences between traditional and progressive PE lessons. This result is surprising in the case of dance lessons, because the content of these lessons incorporated girls' involvement both in composing the whole or a part of a dance and its performance; usually with the emphasis on choreography, the result is less PA (Stratton, 1997). We are

however aware that the higher, although not significant, average heart rate and other heart rate characteristics in progressive dance lessons could have been caused by other factors such as emotional stress while performing dance.

PA in aerobic dance lessons was higher than in dance lessons, which is in agreement with the primary orientation of these types of PA. Aerobic dance is mainly focused on improving aerobic endurance and determines the whole body's movement in virtue of its nature. Dance lessons emphasize aesthetics of the demonstration of the movement, awareness of space, of different rhythms, of one's own body, and a right posture more than aerobic dance lessons do.

PA in aerobic dance lessons met the health recommendations for adolescents (aged 11–21) of 30 minutes at a moderate to vigorous level of exertion (Sallis & Patrick, 1994). Girls spent more than 50% of class

time in moderate – vigorous PA in both traditional and progressive aerobic dance lessons and accomplished the Healthy People 2010 recommendation (USDHHS, 2000). The accomplishment of the main recommendations and effectiveness in promoting cardiorespiratory fitness in aerobic dance lessons was confirmed also by Li and Dunham (1993) and MacConnie et al. (1982). However, moderate to vigorous PA for three or more sessions per week is recommended for improvement in aerobic fitness (Sallis & Patrick, 1994). I agree with Stratton (1996) that this aim can not be fulfilled only by PE considering the usual frequency of only two PE lessons a week.

Although the level of PA in dance lessons was lower than in aerobic dance lessons, students still spent 50% of PE class time being physically active (USDHHS, 2000), met the health recommendation for adolescents (aged 11–21) of 30 minutes of moderate to vigorous level of exertion (Sallis & Patrick, 1994) and accomplished the requested vigorous level of exertion in PE lessons (Simons-Morton, O'Hara, Parcel, Baranowski, & Wilson, 1990). The level of PA in dance lessons in this study seems to be high in comparison to a study by Hodges Kulinna et al. (2003) where a lower average heart rate ( $131.13 \pm 12.83$  bpm) and percentage of time in the target zone in dance lessons in high school students were reported. Their results are consistent with Stratton's (1997) findings that dance belongs among PE activities with the lowest amount of moderate and vigorous PA. Mean heart rate in dance lessons is similar to mean heart rate in different indoor PE classes in Portugal in girls of the 7th grade (Wang, Pereira, & Mota, 2005).

Our findings of a high level of PA in dance and especially in aerobic dance lessons are supported by the Hodges Kulinna et al. study (2003) when secondary school girls were more active in individual activities. Other studies (Fairclough & Stratton, 2005a; Fairclough, 2003; Stratton, 1997), however, reported team games as activities more valuable to reach PA recommendations, encompassing whole body movement at different speeds, whereas the nature of movement activities (dance and gymnastics) emphasizes aesthetic awareness and control. Yet, in the case of dance lessons there are also other curricular goals desired than only the PA goals, whereas aerobic dance lessons are more efficient in achieving PA goals and recommendations.

## CONCLUSION

This study shows that progressive intervention did not negatively affect PA and confirms that both aerobic dance lessons and dance lessons can be an effective means of how to achieve PA and fitness goals in PE. Results from this study suggest that the increased student's

role can help to fulfill other PE goals such as responsibility for decision making and creativity along with promoting PA and cardiorespiratory fitness in student oriented lessons. Dance lessons, in spite of a different main objective, may contribute to achieving critical PA recommendations and total daily or weekly PA. We believe that the increased student's role in PE classes and students' choice of activities can effectively motivate students to perform and sustain PA for life. Aerobic dance and dance seem to be particularly influential contents of PE lessons that can enhance promoting PA in girls.

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**VYUČOVACÍ JEDNOTKY TANCE  
A TANEČNÍHO AEROBIKU:  
JAK ROLE ŽÁKA OVLIVŇUJE  
POHYBOVOU AKTIVITU DÍVEK  
VE VYUČOVACÍM PROCESU  
(Souhrn anglického textu)**

Hlavním cílem školní tělesné výchovy je podporovat celoživotní pohybovou aktivitu (PA) a zvyšovat pohybovou gramotnost dětí. Edukační proces je v tělesné výchově (TV) naplňován pohybově aktivním zapojením žáků,

a proto by měla být převážná část jednotek TV trávena aktivní pohybovou činností s odpovídajícím tělesným zatížením. Cílem této studie je zjistit, zda tělesné zatížení v jednotkách tance a aerobiku splňuje doporučení strávit alespoň 50 % času pohybovou aktivitou střední a vysoké intenzity (USDHHS, 2000) a zda role žáka v edukačním procesu ovlivňuje pohybovou aktivitu dívek. 241 děvčat absolvovalo program tvořený tradičními a progresivními vyučovacími jednotkami tance a aerobiku. Srdeční frekvence děvčat byla v průběhu vyučovacích jednotek monitorována systémem Team Polar. Děvčata trávila více než 50 % času pohybovou aktivitou střední a vysoké intenzity v tradičních i progresivních vyučovacích jednotkách tance i aerobiku. Výsledky této studie potvrzují, že zvýšená role žáka napomáhá plnit cíle TV, jako například odpovědnost za vlastní rozhodování a tvořivost, aniž by docházelo ke snižování pohybové aktivity ve vyučovacích jednotkách.

*Klíčová slova: srdeční frekvence, tradiční a progresivní jednotky, rozhodování, tvořivost.*

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2001–2004 postgraduate student; Palacký University, Olomouc, Faculty of Physical Culture.

2005 – Ph.D. in Kinanthropology, Dissertation thesis: Dance in contemporary system of physical education at schools.

Since 2007 – research and pedagogical assistant at Palacký University, Olomouc, Faculty of Physical Culture, Center for Kinanthropology Research.

#### **Scientific orientation**

Research in Kinanthropology; focus on Physical Education at schools, monitoring and analysis of the physical activity in children, adolescents, adults and seniors, intervention physical activity programs, physical activity in relation to lifestyles and the environmental attributes.

Member of international research teams: IPAQ – International Physical Activity Questionnaire, IPEN – International Physical Activity & Environment Network and EUNAAPA – European Network for Action on Ageing and Physical Activity.

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Pelcová, J., Frömel, K., & Křen, F. (2005). Physical activity and inactivity in boys and girls of different types of school in the Czech Republic. *Journal of Coimbra Network on Exercise Science*, 2(1), 8–12.

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