

THE EFFECT OF AGE ON RELATIONSHIPS BETWEEN PERCEIVED TEACHING BEHAVIOURS, BASIC PSYCHOLOGICAL NEEDS AND SELF-DETERMINED MOTIVATION IN PHYSICAL EDUCATION

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ABSTRACT

The present study examined the effect of age on relationships between perceptions of various teaching behaviours, satisfaction of the basic psychological needs for competence, autonomy, and relatedness, and self-determined motivation in physical education, using Deci and Ryan's self-determination theory [3] as a theoretical framework. The 264 students from 7th grade (M age=13.2, SD=0.42) and 432 from 12th grade (M age=18.1, SD=0.38) completed measures of perceived teaching behaviours with dimensions of democratic behaviour, autocratic behaviour, teaching and instruction, situation consideration, positive general verbal feedback, and both positive and negative nonverbal feedback, as well as measures of perceived satisfaction of the needs for competence, autonomy, and relatedness, and self-determined motivation. Path-analytic models revealed similarities and discrepancies in the magnitude of relationships between perceived teaching behaviours, satisfaction of the basic psychological needs, and self-determined motivation in physical education among students with different age groups. Results suggested that for 7th graders, the perception of positive general verbal feedback was essential antecedent of self-determined motivation, whereas for 12th graders both perceptions of positive general verbal feedback and democratic behaviour were essential antecedents of self-determined motivation in physical education.

Key words: significant other, 7th and 12th grade students, intrinsic and extrinsic motivation, path analysis

INTRODUCTION

One of the most influential factors affecting students' motivation in physical education (PE) is teacher's behaviour. For example, in line with self-determination theory (SDT) [3], Standage and colleagues [12] demonstrated that secondary school students' perceptions of teacher's generic autonomy support positively predicted self-determined motivation through the satisfaction of the basic psychological needs for competence, autonomy, and relatedness. Koka and Hagger [7], however, tested the process by which perceptions of various specific teaching behaviours such as democratic behaviour versus autocratic behaviour, teaching and instruction, situation consideration, and both verbal and nonverbal feedback influence students' self-determined motivation in PE, using SDT as a framework. They found that only perceived positive general verbal feedback had a significant indirect effect on students' self-determined motivation in PE via the satisfaction of needs for competence and relatedness. Unexpectedly, results revealed that perceived situation consideration, and teaching and instruction had significant positive and direct effects, whereas autocratic behaviour, and negative nonverbal feedback had negative and direct effects on students' self-determined motivation in PE, unmediated by the psychological needs satisfaction variables as hypothesised by SDT. Koka and Hagger [7] explained this deviation from the tenets of SDT by suggesting that these teaching behaviours failed to provide students with the substantial competence information or facilitate their feelings of autonomy and relatedness in PE.

Studies have showed that students of different ages differ in preferred and perceived instructional/teaching behaviours [2, 6]. Koka [6], for example, demonstrated that 12th graders scored significantly higher than 7th graders on several perceived teaching behaviours such as teaching and instruction, social support, situation consideration, and informational feedback, but lower on autocratic behaviour and negative nonverbal feedback. While age differences in mean scores of perceived teaching behaviours as well as basic psychological needs and self-determined motivation have been determined, the pattern of relationships between these variables in PE among students with

different age groups have not yet established. The present study thus aimed to test the process by which perceptions of various teaching behaviours such as democratic behaviour and autocratic behaviour, teaching and instruction, situation consideration, and both verbal and nonverbal feedback influence students' self-determined motivation in PE among students with different age groups, using SDT [3] as a theoretical framework.

METHODS

Participants and procedures

Participants were 696 students from several schools located in southeast of Estonia. From the sample, 264 students were in 7th grade (M age=13.2, SD=0.42) and 432 were in 12th grade (M age=18.1, SD=0.38). In all schools only those classes were included to the study where the same PE teacher was teaching both 7th and 12th grade students. Permission to carry out the study was obtained from the headmaster or from a class teacher. Also, parental consent was obtained for all children. Questionnaires were administered in quiet classroom conditions. The questionnaire took approximately 15 min to complete. Students were assured that their answers would remain confidential.

Measures

The Leadership Scale for Physical Education [7] was used to assess students' perceptions of various teaching behaviours in PE with dimensions of democratic behaviour, autocratic behaviour, teaching and instruction, and situation consideration. The Perceptions of the Teacher's Feedback questionnaire [8] was used to assess students' perceptions of different types of teacher's feedback in PE on dimensions of positive general verbal feedback, positive nonverbal feedback, and negative nonverbal feedback.

Students' perception of competence in PE was measured by the subscale from the Intrinsic Motivation Inventory [9]. Students' perception of autonomy in PE was measured using a 3-item scale [7]. Students' perception of relatedness in PE was assessed using five items derived from the previous research in sport setting [4] that has been modified to the PE context by Koka and Hagger [7].

An adapted version of the Behavioural Regulations in Exercise Questionnaire [10] was used to assess students' intrinsic motivation, identified regulation, introjected regulation, and external regulation in PE. To estimate relations among study variables in the path model, four types of motivation were integrated into single index of autonomous motivation by calculating a self-determined index, also called as self-determined motivation. That is, each subscale average score were weighted as following: intrinsic motivation (+2), identified regulation (+1), introjected regulation (-1), and extrinsic regulation (-2), and a self-determined index was calculated based on the weighted composite of these scores.

Data analyses

First, Independent-samples T-tests were used to investigate age differences on all variables. Second, separate path analysis for 7th graders and 12th graders with averaged manifest scales for each construct was carried out to test relationships between study variables, using structural equation modelling package named LISREL 8.51. The path analysis was carried out in two steps. The first step included the specification of the model in which various dimensions of perceived teaching behaviours were hypothesized to predict students' self-determined motivation only through the satisfaction of psychological needs for competence, autonomy, and relatedness. The second step included the specification of the model in which all dimensions of perceived teaching behaviours were hypothesized to predict students' self-determined motivation directly. This was done to demonstrate whether the effects of perceived teaching behaviours are completely or partially mediated by the psychological needs.

Several indices such as Comparative Fit Index (CFI), Non-Normed Fit Index (NNFI), and Root Mean Square Error of Approximation (RMSEA) were used to assess the adequacy of the fit of path models to the data. According to Hu and Bentler [5], a model that fits the data well is indicated when values for CFI and NNFI are close to or greater than .95, and values for RMSEA is .06 or less.

RESULTS

Preliminary analysis

Results of the Independent-samples T-tests indicated that 7th graders scored significantly higher than 12th graders on perceived teaching and instruction behaviour and negative nonverbal teacher's feedback, but lower on both perceptions of autonomy and relatedness in PE (see Table 1).

Table 1. Age differences for all study variables.

	7 th Graders (n=264)		12 th Graders (n=432)		
	M	SD	M	SD	t-value
Democratic behaviour	2.86	0.84	2.90	0.84	0.54
Autocratic behaviour	2.27	0.81	2.16	0.76	1.82
Teaching and Instruction	3.49	0.77	3.37	0.77	1.98*
Situation consideration	3.36	0.84	3.47	0.93	1.59
Positive general feedback	3.25	0.96	3.22	0.93	0.39
Positive nonverbal feedback	2.58	0.87	2.54	0.92	0.44
Negative nonverbal feedback	2.06	0.87	1.72	0.74	5.23***
Perceived competence	3.78	0.87	3.80	0.87	0.23
Perceived autonomy	2.71	1.05	2.87	0.98	2.00*
Perceived relatedness	4.67	1.46	5.02	1.24	3.24***
Self-determined motivation	4.58	3.50	4.73	3.33	0.55

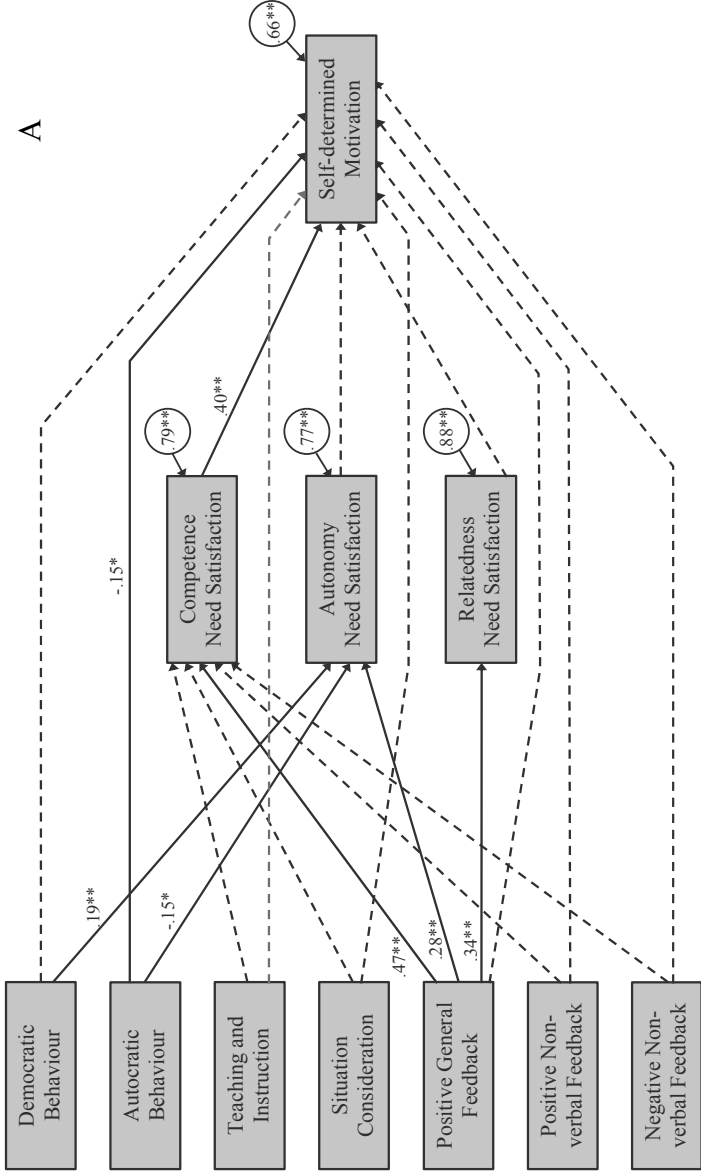
Note. All variables were measured on 5-point scale, with the exception of the Perceived relatedness variable, which was measured on 7-point scale. * $p < 0.05$; *** $p < 0.001$.

Main analysis

The path models in which various dimensions of perceived teaching behaviours were hypothesized to predict students' self-determined motivation through the satisfaction of psychological needs for competence, autonomy, and relatedness exhibited poor fit with the data for both 7th graders and 12th graders (Path model for 7th graders: Satorra-Bentler $\chi^2(19)=60.75$, $p < 0.001$, CFI=0.95, NNFI=0.85, RMSEA=0.093, 90% confidence interval (CI)₉₀ for RMSEA range=0.067 to 0.120; Path model for 12th graders: Satorra-Bentler

$\chi^2(19)=91.59$, $p<0.001$, CFI=0.96, NNFI=0.88, RMSEA=0.095, CI₉₀ for RMSEA range=0.076 to 0.110). Therefore, alternative models for both 7th graders and 12th graders were tested in which direct paths from all dimensions of perceived teaching behaviours on self-determined motivation were specified as free parameters. The alternative models exhibited good fit with the data for both 7th graders and 12th graders (Path model for 7th graders: Satorra-Bentler $\chi^2(12)=22.38$, $p=0.034$, CFI=0.99, NNFI=0.94, RMSEA=0.058, CI₉₀ for RMSEA range=0.016 to 0.095; Path model for 12th graders: Satorra-Bentler $\chi^2(12)=33.58$, $p<0.001$, CFI=0.99, NNFI=0.94, RMSEA=0.065, CI₉₀ for RMSEA range=0.040 to 0.092). The standardized path coefficients for the free parameters in the alternative models for both 7th graders and 12th graders are presented in Figure 1. For 7th graders, the model accounted for 34% of the variance in self-determined motivation and 21%, 23%, and 12% of the variance in perceived competence, autonomy, and relatedness, respectively. For 12th graders, the model accounted for 36% of the variance in self-determined motivation and 19%, 32%, and 9% of the variance in perceived competence, autonomy, and relatedness, respectively.

For 7th graders, results of the path analysis indicated that only perceived competence ($\beta=0.40$, $t=6.24$, $p<0.01$) had significant positive effect on students' self-determined motivation in PE. Perception of autonomy was positively predicted by perceived democratic behaviour ($\beta=0.19$, $t=2.94$, $p<0.01$), but negatively by perceived autocratic behaviour ($\beta=-0.15$, $t=-2.46$, $p<0.05$). However, the indirect effects of both perceived democratic and autocratic behaviour on self-determined motivation were not significant. Perception of autocratic behaviour ($\beta=-0.15$, $t=-2.39$, $p<0.05$) had also significant negative and direct effect on self-determined motivation. Significant positive effect of perceived positive general feedback on the perceived competence ($\beta=0.47$, $t=5.48$, $p<0.01$), autonomy ($\beta=0.28$, $t=4.45$, $p<0.01$), and relatedness ($\beta=0.34$, $t=5.78$, $p<0.01$) emerged. Moreover, the indirect effect of perceived positive general feedback ($\beta=0.17$, $t=3.77$, $p<0.01$) on self-determined motivation through the perceived competence was significant.



(Figure continues)

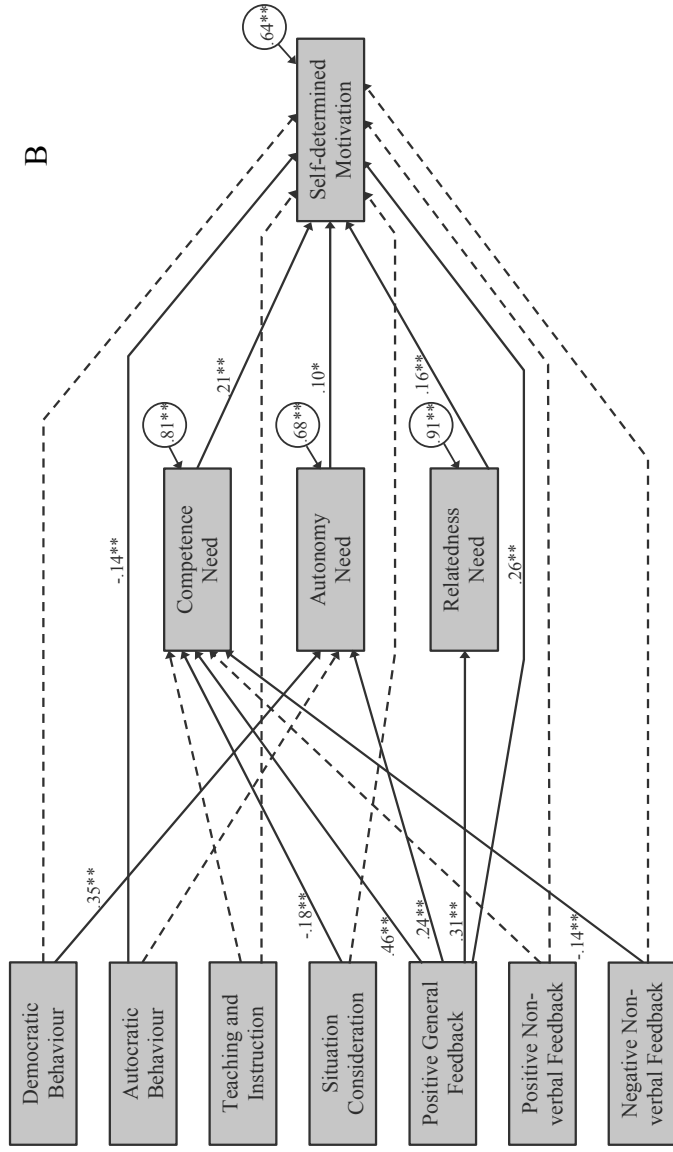


Figure 1. Path analysis showing relations between perceived teaching behaviours, perceived satisfaction of the needs for competence, autonomy, and relatedness, and self-determined motivation in physical education (A) for 7th graders and (B) for 12th graders.

Note. All path coefficients are standardized. The feint broken lines indicate non-significant paths. For clarity, error covariances among perceived competence, autonomy, and relatedness need satisfaction variables are omitted. Covariances of the error terms for 7th graders were as follows: $r_{\text{competence-autonomy}}=0.07$, $r_{\text{autonomy-relatedness}}=0.23$, $r_{\text{competence-relatedness}}=0.18$. Covariances of the error terms for 12th graders were as follows: $r_{\text{competence-autonomy}}=0.13$, $r_{\text{autonomy-relatedness}}=0.16$, $r_{\text{competence-relatedness}}=0.17$. * $p<0.05$; ** $p<0.01$.

For 12th graders, results of the path analysis indicated that both perceived competence ($\beta=0.21$, $t=4.55$, $p<0.01$), autonomy ($\beta=0.10$, $t=2.01$, $p<0.05$), and relatedness ($\beta=0.16$, $t=3.83$, $p<0.01$) had significant positive effects on students' self-determined motivation in PE. Similarly with 7th graders, significant positive effects of perceived positive general feedback on the perceived competence ($\beta=0.46$, $t=5.84$, $p<0.01$), autonomy ($\beta=0.24$, $t=4.83$, $p<0.01$), and relatedness ($\beta=0.31$, $t=6.57$, $p<0.01$) emerged. The indirect effect of perceived positive general feedback ($\beta=0.17$, $t=5.51$, $p<0.01$) on self-determined motivation was significant through the all three psychological needs. However, perceived positive general feedback predicted students' self-determined motivation also directly indicated that three psychological needs only partially mediated the effect of perceived positive general feedback on self-determined motivation. Perception of autonomy was positively predicted by perceived democratic behaviour ($\beta=0.35$, $t=6.34$, $p<0.01$). Furthermore, the indirect effect of perceived democratic behaviour ($\beta=0.04$, $t=2.02$, $p<0.05$) on self-determined motivation was significant. Perception of competence was negatively predicted by negative nonverbal feedback ($\beta=-0.14$, $t=-2.84$, $p<0.01$) and situation consideration ($\beta=-0.18$, $t=-2.83$, $p<0.05$). The indirect effect of negative nonverbal feedback ($\beta=-0.03$, $t=-2.33$, $p<0.05$) on self-determined motivation was also significant. Finally, the indirect effect of perceived situation consideration on self-determined motivation was small and borderline in statistical significance ($\beta=-0.03$, $t=-1.96$, $p=0.05$).

DISCUSSION

The present study revealed some similarities and discrepancies in the magnitude of relationships between perceived teaching behaviours, satisfaction of the basic psychological needs for competence, autonomy, and relatedness, and self-determined motivation in PE among students with different age groups. First, results indicated that while satisfying the all three psychological needs for competence, autonomy, and relatedness were related to 12th graders self-determined motivation in PE, only satisfying the need for competence was related to 7th graders self-determined motivation. This is not surprising, as 12th graders perceived significantly higher than 7th graders that their

feelings of autonomy and relatedness in PE were satisfied (see Table 1). These results suggest that 7th graders are not included into the decision-making process by their PE teachers as much as their older counterparts that would facilitate the feelings of autonomy. It is also possible, as noted by Ntoumanis [11] and later by Koka and Hagger [7], that teachers are probably not very skilled in using autonomy supportive instructional behaviours. Significantly lower score in perceived relatedness among 7th graders seems to indicate that close relationships among classmates have not been developed yet that would facilitate the feelings of belonging.

Turning next to the SDT [3] hypothesis that satisfying basic psychological needs would mediate the effects of various perceived teaching behaviours on students' self-determined motivation in PE, results of path-analytic models revealed that the mechanism of how perceived teaching behaviours affect self-determined motivation might vary among students with different age groups. For 7th graders, the pattern of relationship proposed by SDT was evident only for perceived positive general verbal feedback. This is consistent with results of previous study with students of similar ages [7]. For 12th graders, however, the pattern of relationship proposed by SDT was supported for perceived teaching behaviours such as positive general verbal feedback, democratic behaviour, nonverbal negative feedback, and situation consideration with positive general verbal feedback and democratic behaviour having positive, but nonverbal negative feedback and situation consideration having negative indirect effect on self-determined motivation. The negative indirect effect of negative nonverbal feedback and positive indirect effect of positive general verbal feedback and democratic behaviour was expected. That is, the more students felt that their teachers provided them with positive feedback (i.e., praise and encouragement) and included them into decision-making process (i.e., democratic behaviour), but less negative nonverbal feedback in response to poor performance (i.e., making angry face), the more they felt their needs to be competent, autonomous, and related to their classmates are satisfied, which, in turn, increased their motivation to participate in PE. The negative indirect effect of situation consideration on self-determined motivation through the perception of competence was surprising, as Zhang and colleagues [13] have proposed situation consideration behaviour as a key behaviour that facilitates subordinates perception of competence, which, in turn, would increase intrinsic motivation and self-determi-

ned types of motivation towards particular activity. The possible reason for negative indirect effect of perceived situation consideration behaviour on 12th graders self-determined motivation might be that they probably to not prefer their teacher assigning them to the appropriate game positions in lessons (i.e., situation consideration behaviour). This kind of teacher's behaviour may provide students with the information that they cannot manage to play in different game positions, provoking the feelings of incompetence, which, in turn, will diminish the intrinsic motivation and self-determined types of motivation in PE. Finally, path-analytic models indicated that perceived autocratic behaviour had negative and direct effect on self-determined motivation for both 7th and 12th graders. This is consistent with previous studies in sport [1] and PE [7] indicated that both coaches and PE teachers should avoid autocratic decision-making style (i.e., refusing to compromise on a point with students, disliking suggestions and opinions from the students etc.).

In sum, PE teachers should take into account that students with different ages may interpret various teaching behaviours differently. This may cause the discrepancy in magnitude of the effect of various teaching behaviours on self-determined motivation in PE among students with different ages.

REFERENCES

1. Amorose, A. J., Horn, T. S. (2000) Intrinsic motivation: Relationships with collegiate athletes' gender, scholarship status, and perceptions of their coaches' behavior. *J. Sport Exerc. Psychol.* 22: 63–84
2. Chelladurai, P., Carron, A. V. (1983) Athletic maturity and preferred leadership. *J. Sport Psychol.* 5: 371–380
3. Deci, E. L., Ryan, R. M. (1985) *Intrinsic motivation and self-determination in human behavior.* New York: Plenum Press
4. Hollembeak, J., Amorose, A. J. (2005) Perceived coaching behaviors and college athletes' intrinsic motivation: A test of self-determination theory. *J. Appl. Sport Psychol.* 17: 1–17
5. Hu, L., Bentler, P. M. (1999) Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Modeling.* 6: 1–55

6. Koka, A. (2008) Perceived teaching behaviours and motivation in physical education: Effect of age. In *Children and Exercise XXIV: The Proceedings of the 24th Pediatric Work Physiology Meeting*, T. Jurimae, N. Armstrong, J. Jurimae (eds.). Routledge, Taylor & Francis Group. 71–74
7. Koka, A., Hagger, M. S. (2010) Perceived teaching behaviors and self-determined motivation in physical education: A test of self-determined theory. *Res. Q. Exercise Sport*, 81(1): 74–86
8. Koka, A., Hein, V. (2005) The effect of perceived teacher feedback on intrinsic motivation in physical education. *Int. J. Sport Psychol.* 36: 91–106
9. McAuley, E., Duncan, T., Tammen, V. V. (1989) Psychometric properties of the Intrinsic Motivation Inventory in a competitive sport setting: A confirmatory factor analysis. *Res. Q. Exercise Sport.* 60: 48–58
10. Mullan, E., Markland, D., Ingledew, D. K. (1997) A graded conceptualisation of self-determination in the regulation of exercise behaviour: Development of a measure using confirmatory factor analysis. *Pers. Individ. Differ.* 23: 745–752
11. Ntoumanis, N. (2001) A self-determination approach to the understanding of motivation in physical education. *Brit. J. Educ. Psychol.* 71: 225–242
12. Standage, M., Duda, J. L., Ntoumanis, N. (2006) Students' motivational processes and their relationship to teacher ratings in school physical education: A self-determination theory approach. *Res. Q. Exercise Sport.* 77: 100–110
13. Zhang, J., Jensen, B. E., Mann, B. L. (1997) Modification and revision of the Leadership Scale for Sport. *J. Sport Behav.* 20: 105–122

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