ABILITY GROUPING – ADVANCES IN A SWIMMING CURRICULUM

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Original scientific paper
UDC 797.21:316.45

Abstract:

There is an obvious lack of studies examining the ability grouping effects in kinesiology. Therefore, the aim was to establish the probable differential effects of the heterogeneous (control - C) vs. ability grouping (experimental - E) programmes in a higher education swimming curriculum. In this experiment male students (21 ± 0.9 years) were the sample of subjects. The E group participated in a swimming-course divided into three swimming ability-based subgroups, whereas the C group participated in a swimming programme, randomly divided into three heterogeneous subgroups. Apart from the quantitative changes, the qualitative changes were also studied. An analysis of variance showed significant improvement in the six measured swimming variables (25, 50 and 300 metres front crawl stroke; 50 metres butterfly stroke and backstroke; 100 metres breaststroke) in both groups. In conclusion, (a) the factor analysis computed on the variables of the differences, and (b) the canonical discriminant analysis calculated in the initial and final measurements marked the E programme as: (a) qualitatively, and (b) quantitatively superior when compared to the C programme.

Key words: *homogenous groups, didactic methods, achievement, skills*

DIFFERENZIERUNG NACH LEISTUNGSFÄHIGKEIT - VERBESSERUNG DES SCHWIMMUNTERRICHTS

Zusammenfassung:

Es besteht ein offensichtlicher Mangel an Studien, die sich mit den Effekten der Differenzierung nach unterschiedlicher Leistungsfähigkeit in Kinesiologie befassen. Deswegen zielt diese Studie darauf ab, die wahrscheinlichen differentialen Effekte der heterogenen Programme (C) gegenüber den Programmen nach Leistungsgruppen (E) im Hochschulschwimmunterricht zu bestimmen. In der vorliegender Untersuchung waren die Studenten (21 ± 0,9 Jahre) die Probanden. Die E Gruppe besuchte einen Schwimmkurs, wobei die Teilnehmer in drei Untergruppen eingeteilt wurden u. z. nach deren Leistung, und die Gruppe C aus drei zufällig unterteilten heterogenen Untergruppen bestand, die am Schwimmunterricht teilnahmen. Außer der quantitativen Änderungen wurden auch die qualitativen Änderungen untersucht. Die Varianzanalyse zeigte eine signifikante Verbesserung der sechs gemessenen schwimmspezifischen Variablen (25, 50 und 300 Meter Kraul; 50 Meter Schmetterlings- und 50 Meter Rückenschwimmen; 100 Meter Brustschwimmen) in beiden Gruppen. Abschließend lässt sich folgern, dass (a) anhand der Faktorenanalyse, die Differenzvariablen vorgenommen wurde, sowie (b) der kanonischen Diskriminanzanalyse, womit die Anfangs- und die Endmessungen durchgeführt wurden, das E Programm (a) im qualitativen, und (b) quantitativen Sinne besser als C Programm ist.

Schlüsselwörter: *homogene Gruppen, Methodik, Leistung, Fertigkeiten*

Introduction

Every training course in sports and exercise science (kinesiology) can be observed as a pedagogical or teaching process, regardless of whether we are talking about a sport training session, a physical education class, a recreation and/or a kinesitherapeutic session. Therefore, in all disciplines of applied kinesiology, the aim and one of the teachers' foci should be to improve their pedagogical (teaching) effectiveness, meaning, to ensure an equal opportunity for optimal development of all the participants. In kinesiology, various methods of teach-

ing effectiveness improvement (TEI) have been suggested and studied. For example, Kuleš (1984) considered the classical concept of physical education (PE) as non-effective. As pupils are only able to become superficially acquainted with too many contents comprising the PE, the author proposes a revision of the PE contents as a possibility for TEI. Findak, Metikoš, Mraković, Neljak and Prot (1997) suggested a precise selection of the PE contents in order to ensure a rationalisation in the selection and application frequency in a PE curriculum. However, TEI is mostly regarded as an attempt to design a more effective training programme and/or teaching method (Grčić-Zubčević, 1996; Jurak, Kapus, Strel, & Kovač 2001).

One of the suggested approaches for the purpose of increasing teaching efficacy is ability or skill grouping. Ability grouping, or tracking, is the practice of separating students into achievement groups and tailoring their curriculum accordingly. In theory, ability grouping increases student achievement by reducing the disparity in student ability levels and this increases the likelihood that teachers can provide instruction that is neither too easy nor too difficult for most of the students. The assumption is that ability grouping allows a teacher/instructor (1) to increase the pace and raise the level of instruction for high achievers, and (2) to provide more individual attention, repetition, and review for low achievers (adapted from Findak, 1992; Bunton, Kanihan, Stacey, & Neuzil, 2000; Chambers, 1988). Proponents of ability grouping argue that a unique, generalized curriculum short-changes both high-achieving and low-achieving students. They point out the advantages ability grouping offers to gifted students who may not thrive unless they are challenged, as well as to slower learners who may tire of trying and failing to keep up with their more able peers (Linchevski & Kutscher, 1998; Lou et al., 1996). On the other hand, one of the main arguments against ability grouping is that the practice creates classes or groups of low achievers who are deprived of the example and stimulation provided by high achievers. Further, there is an evidence that groups with low performance often receive a lower quality of instruction than other groups. Slavin (1990, 1991) sees as the most compelling argument against ability grouping its creation of "academic elites", a practice which goes against democratic ideals.

Finally, in kinesiology, apart from just a few papers examining the different methods of homogenous clustering (Jukić, Nakić, & Milanović, 2003; Chambers, 1988) there is an obvious deficiency of experimental evidence of the ability grouping (AG) effects. We are of the opinion that the reasons can be found in the following: (1) For the experimental evaluation of ability grouping practice in kinesiology at least two experimental and two control groups should be organised (low achievers and high achievers in the experimental group, and two heterogeneous subgroups in the control group). This definitely enlarges the required number of subjects. (2) The same PE teacher (trainer, instructor) has to tutor all the groups in the same environment to ensure equal quality and type of instruction in all the groups, which would also cause some difficulties in the experiment. (3) Since the control groups are not classical "passive" groups (they perform the curriculum but in the heterogeneous groups), the significant improvements in the analysed variables should be expected both for the control and the experimental groups. Consequently, probable differential effects can be expected only after a substantial time period, which increases the duration of the experiment.

The aim of the present study was to examine the differential effects of ability grouping versus heterogeneous grouping practice on improvement in selected swimming abilities. Four objectives of the study can be specified:

- To determine whether AG generally increases the efficacy of the swimming curriculum in improving swimming abilities;
- To determine whether AG increases the efficacy of the swimming curriculum particularly for the low achievers;
- To determine whether AG increases the efficacy of the swimming curriculum particularly for the average achievers;
- To determine whether AG increases the efficacy of the swimming curriculum particularly for the high achievers.

Apart from the evident lack of studies examining the ability grouping effects in kinesiology, we are of the opinion that AG, as a possible teaching effectiveness improvement strategy should be studied particularly in the context of swimming because of its popularity and usefulness in regular everyday circumstances, as well as in urgent situations, which makes it one of the most important motor skills and motor abilities generally (Brenner, Saluja, & Smith, 1993).

Methods

Subjects. Male physical education students (age: 21 ± 0.9 years; in good health), were the sample of subjects. The total sample (N = 79) was divided into the experimental group (E; N = 37), and the control group (C; N = 42). The groups did not differ significantly in the initial status of their swimming abilities (explained later in the text). The C group participated in the swimming curriculum, and was randomly divided into three heterogeneous subgroups. Using discriminant analysis no significant differences between the C subgroups were found in the analysed swimming abilities. Using

cluster analysis (K-means clustering), based on the initial swimming achievements, the E group was divided into three homogenous subgroups (E_{LA} – low -achievers; E_{AA} – average-achievers, and E_{HA} – high -achievers), significantly different in their analysed swimming abilities. At the end of the programme, based on the initial swimming achievements, the C group was also divided into three swimming ability-based subgroups (C_{LA} – low-achievers; C_{AA} – average-achievers, and C_{HA} – high-achievers). Although the C group did not perform programme in ability-based groups, the explained homogenisation in the C group was necessary for the final comparison of the results achieved by the low-achievers, average-achievers and high-achievers from the C and E group (see objectives of the study).

Variables. The sample of variables consisted of six swimming ability variables: 25 m front crawl stroke (FCS25); 50 m front crawl stroke (FCS50); 300 m front crawl stroke (FCS300); 50 m backstroke (BaS50); 50 m butterfly stroke (BuS50); 100 m breaststroke (BrS100). All the variables were measured using the standard Fédération Internationale de Natation (FINA) procedures. The testing procedure was: FCS25 and FCS50 (one day); FCS300 (one day); BaS50 (one day); Bu50 (one day); BrS100 (one day). All the subjects were tested initially (INITIAL) at the beginning and finally (FINAL) at the end (last week) of the swimming programme.

Experiment. The C group participated in the PE swimming curriculum, grouped into three heterogeneous subgroups and the E group performed a PE swimming programme in three swimming ability-based subgroups. Generally, the swimming curriculum programmes of the E and C group were equal, meaning a) each group participated in 60 training sessions (all lasting 45 minutes); b) both groups completed an equal university course official syllabus programme c) the objectives of a single training-session were equal for both the C and E group (for example; in both groups the 19th session was dedicated to the analytical approach to improving the butterfly stroke, the 20th session – to the integrative approach in the butterfly stroke, etc). Meanwhile, the actual single lesson routine was adapted according to the actual needs of the single subgroup. The actual differences between the C and E group programme will be discussed more precisely later in the text (in the discussion section). For the moment, it should be mentioned that the variations in the C and E programme applications were not planned in advance, but were dependent and induced by the current needs of a particular subgroup in each training session.

Data processing. Using the Guttman-Kaiser criterion of the factor analysis the latent structure of the measured swimming variables was established in the INITIAL and the FINAL measurement. Apart from the standard descriptive statistics (means and standard deviations), the significance of the differences between the INITIAL and the FINAL achievements of the C and E group were defined separately, using the repeated-measurement analysis of variance (ANOVA). To define any possible differences between the C and E group in the INITIAL and the FINAL measurement, two canonical discriminant analyses (DISCRA) were calculated. All the coefficients were considered significant at the level of $p \leq 0.05$ (95%).

Table1. Factor structure of the analysed swimming variables in the initial and final measurement (Expl.Var – explained variance; Prp. Totl – average proportion of the variance explained; F – factor structure)

	INITIAL	FINAL
	F	F
FCS25	0.92	0.91
FCS50	0.95	0.93
FCS300	0.90	0.91
Bu50	0.79	0.86
BaS50	0.78	0.79
BrS100	0.81	0.80
Expl.Var	4.44	4.54
Prp.Totl	0.74	0.76

Results

The factor structure of the analysed variables in the initial and final measurements is presented in Table 1. Since (a) only one significant factor has been extracted in the initial and final measurement, and (b) considerable correlations between all the variables and extracted factors are observable it can be concluded that (a) the latent structure of the applied variable-system did not change between the initial and the final measurement, and (b) all the variables determine the same latent dimension – called *swimming abilities.*

A significant improvement in all the analysed variables is evident in both groups (Table 2).

The C and E group did not differ in the INITIAL, but did differ significantly in the FINAL measurement (Table 3). Since the INITIAL discriminant function did not reach a satisfactory level of significance, the INITIAL discriminant factor structure is not presented. However, in the FINAL measurement, the centroid positioning and the structure of the discriminant factor allow us to define the E group as dominant in the analysed swimming abilities, not including the variable FCS300, where the E and the C group performed equally.

*Table 2. Descriptive statistics (Mean; Standard Deviation – SD); ANOVA significance (*** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$) for the experimental and the control group*

	EXPERIMENTAL		CONTROL	
	INITIAL	FINAL	INITIAL	FINAL
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
FCS25 (s)	15.74 ± 1.60	14.37 ± 1.09***	15.98 ± 1.89	14.83 ± 1.33***
FCS50 (s)	35.74 ± 3.89	32.87 ± 2.98***	36.50 ± 4.32	33.71 ± 3.13***
FCS300 (s)	353.15 ± 50.82	320.58 ± 36.86***	360.00 ± 50.48	318.83 ± 39.05**
BuS50 (s)	46.82 ± 10.31	42.21 ± 4.9***	45.89 ± 6.67	44.33 ± 6.23*
BaS50 (s)	44.84 ± 4.47	42.70 ± 3.94***	45.32 ± 6.57	44.05 ± 5.07*
BrS100 (s)	109.35 ± 13.39	105.32 ± 10.40***	112.40 ± 16.14	108.39 ± 11.87**

Table 3. The results of canonical discriminant analysis in the initial and final measurement (centroid positioning – CENTROID; Wilks Lambda; Canonical correlation – Can R; level of the significance – p; significant discriminant factor structure – DF)

	INITIAL	FINAL
		DF
FCS25		-0.42
FCS50		-0.30
FCS300		0.05
BuS50		-0.41
BaS50		-0.32
BrS100		-0.30
CENTROID: C		-0.43
CENTROID: E		0.48
Wilks Lambda	0.96	0.82
Can R	0.20	0.42
p	0.81	0.03

*Table 4. Descriptive statistics (Mean; Standard Deviation – SD); ANOVA significance between the initial and the final results (*** $p \leq 0.001$; ** $p \leq 0.01$; * $p \leq 0.05$) for the subgroups of the experimental (E) and control (C) group*

SUBGROUP		LOW--ACHIEVERS		AVERAGE--ACHIEVERS		HIGH--ACHIEVERS	
VARIABLES		Mean (SD)		Mean (SD)		Mean (SD)	
		INITIAL	FINAL	INITIAL	FINAL	INITIAL	FINAL
FCS25	C	17.64 (1.96)	15.62 (1.45)***	16.07 (0.98)	15.12 (1.01)***	14.46 (1.10)	13.88 (0.87)***
	E	16.89 (1.41)	15.14 (1.02)***	15.86 (1.03)	14.42 (0.74)***	14.07 (0.89)	13.29 (0.63)**
FCS50	C	40.90 (3.81)	35.91 (2.59)***	36.51 (1.76)	34.41 (2.19)***	32.67 (2.38)	31.16 (2.58)***
	E	38.62 3.04	34.67 (2.61)***	36.26 (2.57)	33.37 (2.14)***	31.28 (2.07)	29.81 (2.11)**
FCS300	C	413.05 (37.34)	345.57 (40.42)***	361.79 (11.80)	324.10 (18.03)***	312.36 (33.03)	290.73 (34.97)***
	E	404.17 (27.72)	352.00 (24.57)***	345.09 (19.73)	319.44 (21.25)***	298.11 (38.93)	281.35 (29.01)*
BuS50	C	49.86 (4.96)	48.64 (6.72)	47.40 (6.32)	45.18 (4.29)	41.05 (5.48)	39.81 (4.26)
	E	54.46 (11.54)	45.45 (3.91)***	45.00 (7.10)	42.46 (4.42)	39.44 (4.98)	37.63 (3.23)
BaS50	C	49.20 (8.43)	47.22 (5.80)	46.70 (4.25)	45.14 (3.75)**	40.67 (3.15)	40.29 (2.80)
	E	46.88 (2.81)	44.29 (2.73)***	45.89 (3.45)	44.05 (3.28)*	40.73 (5.06)	38.73 (3.54)**
BrS100	C	122.40 (13.17)	114.53 (7.94)	115.50 (10.99)	110.90 (8.87)*	100.85 (16.03)	100.73 (13.46)
	E	119.82 (14.10)	112.31 (10.41)***	107.79 (6.52)	105.16 (5.50)*	97.93 (9.18)	96.46 (9.29)

Ledend: VARS – variables

As presented in Table 4, the E_{LA} improved their swimming abilities significantly in all the six analysed variables, whereas the C_{LA} improved their performance only in three variables. Two average-achieving groups (C_{AA} and E_{AA}) progressed in the same four variables. Finally, the high-achievers from the C group (C_{HA}) significantly improved their results in three, and the E_{HA} in four variables.

Discussion and conclusions

In the introduction, we have specified that one of the possible causes for the deficiency of empirical - experimental data concerning ability grouping effects in kinesiology can be probably found in the (supposed) fact that significant improvements are expected in the control group also. Since the C group improved their swimming abilities significantly as well as the E group (Table 2), this statement is supported in here presented results. Therefore, the possible differential effects of the two programmes cannot be defined according to the INITIAL-FINAL differences exclusively.

Contrary to the INITIAL measurement, discriminant analysis revealed significant differences between the C and E group in the final measurement (Table 3). There is no doubt that the E group achieved better than the C group in the FINAL. But, the low correlation between FCS300 and the significant discriminant factor defines FS300 as the variable not contributing to the C vs. E differentiation in the FINAL measurement. Out of all the analysed variables, FCS300 is the only one related to aerobic endurance capacity (Volčanšek, 2002), simply explainable by the relatively long duration of the test (6 minutes on average). In one of the rare experimental studies of ability grouping in kinesiology, Spasov (1981) drew similar conclusions observing the ability grouping effects in a physical education curriculum. Briefly, the author defined ability grouping as relatively less effective in the improvements of the endurance capacities, compared to the positive effects achieved by the same didactic methods routine in the motor and morphological status. If aerobic endurance is to be improved, an extensive (long duration) training should be performed (Kraemer, 2000). According to most of the swimming authorities (Volčanšek, 1996, 2002), overreaching in swimming aerobic endurance training for the 300 - 400 metres relay is 6-10 times x length (300 m). It defines approximately 2,400 metres (precisely: 8 x 300 = 2,400) as an adequate training volume for the purpose of improving the swimming aerobic endurance capacity. In our case, with appropriate rest between the swimming intervals, the aerobic endurance training session should last up to 60 minutes (average time of the FS300 is 6 minutes; 2,400m/300 m = 8; 8 x 6min = 48min; plus resting… ≈ 60 min). But, as stated before, a single swimming lesson lasted 45 minutes. Since during a single session students have to complete and practise different contents and tasks, there is no chance to practise aerobic endurance capacity exclusively. More precisely, an improvement in the FCS300 can be expected, but there will be no difference in the results achieved in the ability-grouped and non-grouped students, meaning that the didactic approach (in our case ability grouping) would not contribute to any improvement in the swimming aerobic capacity.

One of the objectives of our study was to evaluate ability grouping specifically as applied to the different achieving subgroups of students. One of the main contradictions following ability grouping is the so-called "labelling of students" which may communicate self-fulfilling low expectations (Kulik, 1991). Those opposed to ability grouping are concerned about the slower pace and (potentially) the lower quality of instruction in low- -achievers, the low expectations for students' performance held by teachers and the absence of strong behavioural peer role models in classes for low-ability students. Many "middle level" theorists believe that young adolescents cannot meet the goals related to their personal development through ability grouping (modified after Fuligni, Eccles & Barber, 1995). They argue that "young people, naturally inclined toward learning from their peers, need to be grouped with individuals who are different from themselves". Additionally, "adolescents are vulnerable as they struggle to establish a sense of their own identity; ability grouping often creates negative perceptions of lower-ability students that affect the students' self-perceptions". Ability grouping, the literature says, has a negative effect on lower-achieving students' motivation and opportunities to improve as well as they are able to. At the beginning of our experiment, the problem of the absence of a "model" seemed reasonable, so we included one excellent swimmer in each C and E subgroup as a model. However, the results of our study do not support the negative observations on ability grouping practice, mainly considering the "low-achievers'" prospective. Quite the opposite, the low-achievers evidently benefited from ability grouping in our swimming curriculum. The E_{LA} significantly improved their swimming performance in all the six variables we observed in our experiment. At the same time, their "matching" colleagues, who participated in the control programme (C_{LA}) enhanced their swimming capabilities in three variables only.

It seems that high-achievers advanced because of ability grouping, too. Compared to the initial measurement, the E_{HA} performed significantly better in four variables and the C_{HA} in three variables. Taking into consideration the here defined differential influence of the E and C programmes, the authors are of the opinion that explanations have to be found in the opportunity for a trainer to carefully balance the training stress, allowed by the didactic method of ability grouping. It mainly relates to the

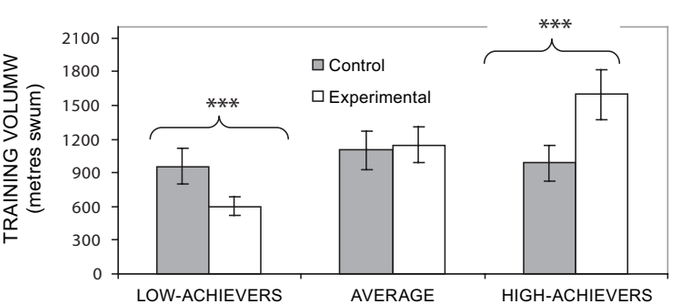

*Figure 1. Training volumes (Mean ± Standard Deviation) applied in the control and experimental group; significance of the differences - analysis of the variance (*** $p \leq 0.001$).*

training volume applied. In figure 1 the values and differences of the characteristic training volumes, applied in the C and E programme, are presented.

It is well known that the training volume is one of the most important components of a valuable and effective training programme, which implies most of the training effects (Bompa, 2000). As presented, in the C programme the training volume is practically equal for all the subgroups (remember that we divided the C group into low-achievers, average- and high-achievers on the basis of their initial swimming abilities just for the sake of comparison to the E subgroups, meaning that the C subgroups performed the programme heterogeneously). In other words, it means that all the students in the C group performed a similar training programme, no matter if they were high- or low-performers. According to Jeffreys (2004), the optimum adaptation to training requires a careful balancing of training stress (in other words – training volume and intensity) and recovery. But, when tutoring heterogeneous groups, the teacher/trainer/instructor is not able to act distinctly or offer individual attention for the variably achieving students. Therefore, in the C programme, some medium training volume was applied (Fig. 1, between 900 and 1,000 metres on average), trying to provide reasonable practice/training stress for the diverse students. On the other hand, in the E programme, the students were initially grouped according to their actual swimming abilities. The teacher adapts the training volume easily according to the students' (subgroups') specific needs. The E students train at an appropriate volume and intensity, resulting in constant improvement in the swimming abilities. More specifically, the average training volume in their E_{LA} is significantly lower than in the C_{LA} (figure 1). The only reasonable conclusion is – C_{LA} students are constantly overtrained. It implies not only insufficient training – recovery ratio, but also some other negative consequences, for example: incorrect swimming techniques and low motivation, all the well known overtraining markers (Kraemer, 2000). To support our findings, although not directly related to our issue (ability grouping), there are findings from the study published by Ružić, Heimer, Mišigoj-Duraković and BR Matković (2003), where the authors determined the possible influence of a high physical load in the workplace on the physical fitness of employees. In conclusion, the subjects with a higher Work Index (tested by means of Baecke's questionnaire) performed worse than the subjects with a lower Work Index, indicating that a high physical load does not necessarily mean an improvement in the physiological capacities and motor abilities. Ružić and associates attributed these findings to the fact that, although higher, physical activity did not have an adequate intensity, volume, and duration to induce any positive changes in either the motor abilities or physiological capacities.

Accordingly, it is not difficult to conclude that the high-achievers from the C group were undertrained. In other words, the training volume of the C_{HA} was below the optimal (significantly lower than in E_{HA}). Meanwhile, the teacher was able to increase the pace and raise the level of the training volume for the high-achievers during the E programme, all resulting in a training adequacy for the E_{HA}.

Equivalent improvement of the average-achievers from both the E and C group confirms these facts. The C_{AA} and E_{AA} improved their abilities in the same four variables (Table 4), which is not surprising knowing that a similar training volume was applied in these two groups (Figure 1).

In the previous text we discussed the quantitative changes and differential effects of the E (ability grouping) and C (heterogeneous grouping) programmes exclusively. Obviously, the E programme revealed significantly better results in the improvement of swimming abilities, and it would be interesting to examine the qualitative changes and effects of the two observed programmes. For this purpose we defined the variables of differences (VD), meaning that we calculated the differences between the initial and the final achievements ($x_{dif} = x_{initial} - x_{final}$) in each variable separately (see for details Maleš, Sekulić, & Katić, 2003). Next, we computed the factor analysis using the calculated VD, separately for the C and for the E group. The results are presented in Table 5.

Table 5. Factor structure calculated on the variables of the differences in the control and the experimental group (Expl.Var – explained variance; Prp. Totl – average proportion of the variance explained; F – factor structure)

	CONTROL		EXPERIMENTAL
	F1	F2	F1
$FCS25_{dif}$	-0.81	0.06	-0.74
$FCS50_{dif}$	-0.86	0.17	-0.85
$FCS300_{dif}$	-0.75	0.19	-0.69
$BuS50_{dif}$	0.05	-0.89	-0.62
$BaS50_{dif}$	-0.63	-0.16	-0.52
$BrS100_{dif}$	-0.49	-0.59	-0.71
Expl.Var	2.62	1.23	2.92
Prp.Totl	0.44	0.20	0.49

The level of the qualitative changes is defined according to the homogeneity of the VD factor structure. In the first phase of the data processing (see Results) we calculated the factor validity of the sample of variables, and defined only one significant factor called the *swimming abilities factor.* It means that, in our case, the programme would be considered as qualitatively superior if it ensured more general improvement in all swimming abili-

ties. The factor analysis computed on VD extracted two significant factors in the C, and only one significant factor in the E group. More precisely, we can conclude that VD of the E group are highly correlated. It means that for the experimental group, changes in any observed variable are followed by equivalent changes in all the other variables. Since we previously discussed the positive changes in all the variables, there is no doubt that the E programme generated superior qualitative changes as compared to the C programme. Two significant VD factors imply a (relatively) lower correlation between VD in the C group, and therefore an inferior general influence of the C programme on the improvement in swimming abilities.

Researchers have struggled for decades to find answers to questions about ability grouping: Does anyone benefit from it? Is anyone harmed by it? Who benefits (or is harmed) the most? Why? The answers are not always clearcut and often depend on whom you ask and what outcomes are deemed important. To many educators, ability grouping is considered a sensible response to academic diversity. To others, the practice has harmful unintended consequences and should be abandoned. However, according to the results presented here, grouping on the basis of ability with appropriate differentiated instruction and applied training volume is clearly beneficial in the swimming curriculum, not only generally, but also for high ability students and low ability students separately. Most likely, the high- -achievers benefited from having to compete with one another, and the low-achievers benefited from not having to compete with their more able peers. Since we studied swimming (motor) abilities exclusively, any further experiment should investigate the possible effects of ability grouping practice on the characteristic motor-learning processes.

References

Bompa, T.O. (2000). *Periodization. Theory and Methodology of Training.* Champaign, IL: Human Kinetics.

Brenner, R. A., Saluja, G., & Smith, G.S. (2003). Swimming lessons, swimming ability, and the risk of drowning. *Injury Control and Safety Promotion, 10*(4), 211-216.

Bunton, K., Kanihan, S. F., Stacey, F., & Neuzil, M. (2000). Improving media writing with ability groups. *Journalism and Mass Communication Educator*, *55*(2), 60-72.

Chambers, R. L. (1988). Legal and practical issues for grouping students in physical education classes. *Physical Educator*, *45*(4), 180-186.

Findak, V. (1992). *Metodika tjelesne i zdravstvene kulture.* [Didactics of physical education. In Croatian.] Zagreb: Školska knjiga.

Findak, V., Metikoš, D., Mraković, M., Neljak, B., & Prot, F. (1997). The assessment of the content value of physical education syllabus in elementary school. *Kinesiology, 29*(2), 61-69.

Fuligni, A.J., Eccles J.S., & Barber, B.L. (1995). The long-term effects of the 7th grade ability grouping in mathematics. *Journal of Early Adolescence*, *15*(1), 58-89.

Grčić-Zubčević, N. (1996). *Efikasnost različitih programa te mogući čimbenici uspješnosti učenja plivanja.* [Efficiency of various swimming programmes and potential efficiency factors of learning swimming skills. In Croatian.] (Doctoral dissertation, University of Zagreb). Zagreb: Kineziološki fakultet.

Jeffreys, F. (2004). A system for monitoring training stress and recovery in high school athletes. *Strength and Conditioning Journal, 26*(3), 28-33.

Jukić, I., Nakić, J., & Milanović, L. (2003). Primjena homogenih skupina u kondicijskoj pripremi košarkaša/ica. [Ability grouping in the physical training of basketball players.] In V. Findak (Ed.), *Proceedings of 12th Summer School of Kinesiologist of the Republic of Croatia*, Rovinj, 2003 (pp. 66-69). Zagreb: Udruga kineziologa Hrvatske.

Jurak, G., Kapus, V., Strel, J., & Kovač, M. (2001). Comparison of three breaststroke swimming instruction programmes for 8 to 9 year old children. *Kinesiology, 33*(2), 182-190.

Kraemer, W. J. (2000). Physiological adaptations to anaerobic and aerobic endurance training programs. In T. R. Beachle & R. W. Earle (Eds.), *Essentials of Strength Training and Conditioning* (pp. 137-169). Champaign, IL: Human Kinetics.

Kuleš, B. (1984). Relativna efikasnost dva različita transformacijska postupka. [Relative efficacy of two transformational programmes.] *Kineziologija, 16(*1), 65-73.

Kulik, J. A. (1991). Findings on ability grouping are often distorted: Response to Allan. *Educational Leadership*, *48*(6), 67.

Linchevski, L., & Kutscher, B. (1998). Tell me with whom you're learning, and I'll tell you how much you've learned. *Journal for Research in Mathematics Education*, *29*(5), 533-554.

Lou, Y. P., Abrami, P. C., Spence, J. C., Poulsen, C., Chambers, B., & Dapollonia, S. (1996). Within class grouping – a meta analysis. *Review of Educational Research, 66*(4), 423-458.

Maleš, B., Sekulić, D., & Katić, R. (2003). Morphological and motor-endurance changes are highly related in Croatian Navy male recruits. *Military Medicine*, *169*(1), 65-70.

Ružić, L., Heimer, S., Mišigoj-Duraković, M., & Matković, B. R. (2003). Increased occupational physical activity does not improve physical fitness. *Occupational and Environmental Medicine, 60*(12), 983-985.

Slavin, R. (1990). Achievement effects of ability grouping in secondary schools: A best-evidence synthesis. *Review of Educational Research*, *60*(3), 471-499.

Slavin, R. (1991). Are cooperative learning and "untracking" harmful to the gifted? Response to Allan. *Educational Leadership*, *48*(6), 68-71.

Spasov, Đ. (1981). Intenzifikacija nastave fizičkog vaspitanja putem rada sa homogenim grupama. [Intensification of the physical education curriculum on a basis of ability grouping.] *Fizička kultura*, *35*(2), 135-137.

Volčanšek, B. (1996). *Sportsko plivanje.* [Sport swimming. In Croatian.] Zagreb: Fakultet za fizičku kulturu.

Volčanšek, B. (2002). *Bit plivanja.* [The essence of swimming. In Croatian.] Zagreb: Kineziološki fakultet.

Submitted: May 10, 2005
Accepted: August 23, 2005

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HOMOGENO GRUPIRANJE – UNAPREĐENJE NASTAVE PLIVANJA

Sažetak

Uvod

Svaki kineziološki proces ujedno je i pedagoški proces. Stoga bi u svim područjima primijenjene kineziologije trebalo utjecati na povećanje pedagoške efikasnosti, tj. omogućiti polaznicima da optimalno napreduju u skladu sa svojim mogućnostima. Jedan od mogućih načina za povećanje pedagoške efikasnosti jest realizacija kineziološkog programa u homogeniziranim skupinama. Homogenizirane skupine su metodički organizacijski oblik rada karakterističan po tome da su skupine formirane tako da su pripadnici podjednakog stanja sposobnosti i/ili osobina. Pretpostavka je da je rad s takvim skupinama efikasniji, iako u području kineziologije praktički ne postoje znanstveni dokazi o efikasnosti rada u homogeniziranim skupinama.

Osnovni je cilj ovog istraživanja utvrditi je li rad u homogeniziranim skupinama efikasniji od rada u heterogenim skupinama u pogledu razvoja plivačkih sposobnosti, i to generalno te u pojedinim podskupinama ispitanika (ispitanici ispodprosječnih, prosječnih i iznadprosječnih plivačkih sposobnosti).

Metode

Uzorak ispitanika činili su studenti kineziologije, svi plivači (N = 79; prosječne dobi 20 godina), podijeljeni u kontrolnu (K; n = 42) i eksperimentalnu (E; n = 37) skupinu. Kontrolna skupina nastavu plivanja provodila je u tri heterogene skupine koje se inicijalno nisu međusobno značajno razlikovale u plivačkim sposobnostima. Eksperimentalna skupina je na osnovi inicijalnih plivačkih rezultata, primjenom taksonomske analize, podijeljena u tri homogenizirane skupine (ispitanici ispodprosječnih, prosječnih i iznadprosječnih plivačkih sposobnosti) te je u tako formiranim skupinama realizirana nastava iz plivanja.

Uzorak varijabli činilo je 6 varijabli za procjenu plivačkih sposobnosti i to: kraul 25, 50 i 300 metara (K25, K50, K300); leđno 50 metara (L50); delfin 50 metara (D50) i prsno 100 metara (P100). Sve varijable mjerene su standardnim procedurama FINA.

Svi ispitanici provodili su jednak službeni plan i program (120 sati jednakog rasporeda), ali je izvedbeni program bio prilagođen pojedinim podskupinama. Ispitanici su provjereni testovima plivačkih sposobnosti na početku i na kraju nastave. Potrebno je napomenuti kako je kontrolna skupina također podijeljena u tri homogenizirane skupine temeljem inicijalnih plivačkih sposobnosti, ali nastavu plivanja nije provodila u tim skupinama, već je homogeniziranje provedeno radi usporedbe postignuća odgovarajućih podskupina iz skupina K i E.

Na rezultatima inicijalnog i finalnog mjerenja izračunati su deskriptivni statistički parametri te je primijenjena faktorska analiza (utvrđivanje latentne strukture primijenjenog sustava varijabli), diskriminativna kanonička analiza (razlike između skupina K i E u inicijalnom i finalnom mjerenju), serija analiza varijance (kvantitativne razlike između inicijalnog i finalnog mjerenja za skupine K i E te odgovarajuće podskupine) i faktorska analiza na varijablama razlika inicijalnog i finalnog mjerenja (kvalitativne promjene). Svi koeficijenti na razini pogreške od $p \leq 0.05$ smatrali su se značajnima.

Rezultati, rasprava i zaključak

Faktorskom analizom utvrđena je podjednaka homogena struktura plivačkih sposobnosti u inicijalnom i finalnom mjerenju. Analizom varijance ustanovljeno je da je između inicijalnog i finalnog mjerenja došlo do poboljšanja plivačkih rezultata u svim varijablama i u E i u K skupini. Diskriminativnom kanoničkom analizom u inicijalnom mjerenju nisu utvrđene značajne razlike između K i E. U finalnom mjerenju skupina E postigla je značajno bolje rezultate u svim varijablama od skupine K, osim u K300 (obje skupine podjednake). Konačno, utvrđeno je kako je rad u homogeniziranim skupinama omogućio značajniji napredak: (a) generalno, (b) ispitanicima ispodprosječnih plivačkih sposobnosti i (c) ispitanicima iznadprosječnih plivačkih sposobnosti u usporedbi s radom u heterogenim skupinama. Rad u homogenim i heterogenim skupinama podjednako je učinkovit u razvoju plivačkih sposobnosti ispitanika prosječnih plivačkih sposobnosti. Razlike u volumenu rada posebno su analizirane analizom varijance te je utvrđena značajna razlika među odgovarajućim podskupinama programa K i E, osim za ispitanike prosječnih plivačkih sposobnosti.

Razloge za dobivene rezultate trebalo bi tražiti u samom načinu provođenja nastave. U radu s heterogenim skupinama nastavnik nije u mogućnosti pravilno dozirati opterećenje – ni ukupni volumen, ni ekstenzitet ni intenzitet. S obzirom da se u radu s heterogenim skupinama u istoj skupini nalaze i ispitanici izrazito dobrih i ispitanici izrazito loših plivačkih sposobnosti, nastavnik je prisiljen primjenjivati sadržaje rada koji su s obzirom na volumen opterećenja – prosječni. Nastavnik se u tom slučaju pokušava prilagoditi svim studentima odabirom nekakvog medijalnog opterećenja. Studentima najboljih plivačkih sposobnosti takav trenažni podražaj uglavnom nije adekvatan (ispod praga podražaja). Nasuprot tomu, takav je podražaj za studente najlošijih plivačkih sposobnosti – prenaglašen. Takav (medijalni) volumen ustvari odgovara jedino studentima prosječnih plivačkih sposobnosti, što je ujedno i razlog zašto su ti studenti podjednako napredovali i u kontrolnom i u eksperimentalnom programu.

U radu s homogenim skupinama nastavnik je u mogućnosti plan i program prilagođavati stvarnim potrebama studenata. Studenti nastavu provode u skupinama formiranima prema aktualnom stanju njihovih sposobnosti. Odabir volumena opterećenja za pojedinu skupinu u ovom je slučaju precizniji nego u radu s heterogenim skupinama. Konačno, s obzirom da pravilan odabir volumena opterećenja predstavlja osnovu napredovanja u svim sposobnostima, pa tako i u plivačkim sposobnostima, jasno je zašto je eksperimentalni program polučio bolje rezultate od kontrolnog programa.