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CONTRIBUTION OF SECONDARY EDUCATION TO THE SUCCESS OF STUDENTS ATTENDING THE CLINICAL KINESIOLOGY MODULE

ABSTRACT

The aim of the research was to investigate the impact of secondary education on the successfulness of students attending the Clinical Kinesiology module offered within the frame of undergraduate Physiotherapy studies delivered by the University of Applied Health Sciences, Zagreb, Croatia.

The sample consisted of 210 first-year undergraduate students attending the Kinesiology module in the academic year 2014/2015, divided into four groups (G1, G2, G3 and G4) based on their secondary education background. The G1 group consisted of students who had completed the Physiotherapy Training School (N=55), the G2 of high school graduates (N=94), the G3 of students who had graduated from the Medical Training School (N=16), and the G4 of students of other secondary education backgrounds (N=45).

The guiding hypothesis was that the knowledge of physiotherapy acquired at the secondary schooling level significantly influences the success of first-year undergraduate students attending the Clinical Kinesiology module.

Student success (graded from 1 to 5) was evaluated by analysing the results of the preliminary and the final exam in Clinical Kinesiology, taken at the end of the first term and the end of the first academic year, respectively. The results were analysed using the ANOVA.

The results of the preliminary exam revealed no significant difference between the groups ($F=2.35$; $p=0.07$), although G1 and G3 students tended to achieve better results.

The analysis of the final exam results showed a significant difference between the groups G1, G2 and G4 ($F=5.15$; $p=0.0019$), the G2 group thereby achieving better results.

In the experience of Clinical Kinesiology lecturers, prior knowledge in physiotherapy and biomedicine facilitates content acquisition and understanding of technical terms. Furthermore, it can be assumed that students having no such knowledge are more motivated to improve their knowledge by virtue of continuous learning.

The purpose of this study was to objectify the researchers' multiyear observations and to contribute to student success by improving the teaching process.

The hypothesis that secondary education in physiotherapy significantly influences the success of first-year undergraduate students attending the Clinical Kinesiology module failed to be supported by the research results. The analysis of the preliminary exam results indicates that prior knowledge in physiotherapy and biomedicine does lead to better, although not statistically significantly better, results (G1 and G3). The results of the final exam show the superiority of high school graduates (G2) in acquiring novel knowledge.

The results of this study, as well as the results of the research conducted to the same effect on a sample of previous generations of Physiotherapy students (Kiseljak et al, 2012), suggest that the teaching process might be improved by harmonising the secondary schooling curricula.

The Clinical Kinesiology lecturers use proper educational methodology in order to solve difficulties caused by differences in student prior knowledge.

Future research shall be devoted to other factors assumed to influence student success.

Keywords: secondary education, Clinical Kinesiology module, undergraduate Physiotherapy studies

INTRODUCTION

This study aims to verify the hypothetical link between the secondary education background and the success achieved by first-year Physiotherapy students, in particular those attending the Clinical Kinesiology module.

The above hypothesis is underpinned by the multiyear experience and observations of lecturers delivering tuition within the frame of the Clinical Kinesiology module as a part of the first-year curriculum of Physiotherapy studies, as well as by the assumed reasons behind student success and the assumed link between that success and secondary school background of the students in question.

The available literature offers many analyses of factors influencing student success, especially when it comes to first-year students. The assumed influencing factors mutually differ, as does the experience of various lecturers.

Grey et al. (2001) analysed the influence of secondary education on the success of medical students and revealed that influence to be insignificant for their success. Even more so, the analysis revealed that students who have formerly graduated from Medical Training Schools were among the repeaters, as well.

Burton and Dowling (2005) strived to find the "key to studying success" by analysing the link between study success and the suitability of the high school the students have graduated from but failed to find any mutual relationship between the two. However, they also analysed the link between students' personalities and their success and proved an extroverted personality to be characteristic of the more successful student.

A simple way to assess student success in terms of student satisfaction or dissatisfaction was proposed by De Clercq et al. (2001), who analysed the relationship between elementary education and the results achieved by first-year medical students. The study curriculum came to the dissatisfaction of students formerly attending vocational and nursing schools, who achieved poorer results as compared to other students, supposedly due to the above reason.

Sade et al. (1985) were striving to establish the selection criteria that would pinpoint successful future physicians among medical students. Two lists of characteristics were assumed to define a successful physician – the list of academic and the list of clinical characteristics, which were proven to be statistically significantly interlinked.

Cook (2010) analysed academic and clinical predictors of physiotherapists' success and established no interrelation between those predictors and the actual success of Physiotherapy students but revealed student success to be linked to their capability of assuming professional and social responsibilities. According to Oducado and Penuela (2014), academic predictors, such as the command of English and inclination to research work, are of relevance for the success of nursing students. Aziz et al. (2011) compared the success of pharmacy, nursing and medical students and established teamwork to be better suited for nursing and pharmacy as compared to other students.

Andrews (2004) analysed the relevance of demographic, cognitive and economic factors for the success of Physiotherapy students but failed to establish any significant correlation between the selected predictors and the actual study success.

Lievens et al. (2002) claimed the success in the medical profession to be predestined for highly sociable, self-disciplined persons seeking excitement.

Ortiz and Dehon (2008) established the following factors to be key to student success: parental educational level (especially that of the mother), profession of the father that defined the socioeconomic standing of the student, as well as the secondary school the student had graduated from. As opposed to that, Kim and Park (2006) claimed the following factors to be of importance for student success: understanding that education represents a part of the culture and a merit of one's personal and social success, as well as parental efforts engaged in upbringing, one's own efforts engaged in the learning process and self-discipline exercised along the path, with emotional support proving to trump material support.

Oladokun et al. (2008) studied the possibility of using an artificial neuron network model to the effect of predicting student success even prior to commencing studies. The neuron network model mimics problem-solving techniques utilised by the human brain; according to the obtained results, students that used to be more successful during their secondary schooling shall also be more successful during their university studies.

Robbins et al. (2004) established academic success to be predisposed by perseverance and financial backup, while motivation plays a distinctive role in study success prediction.

Van den Hurk et al. (1999) concluded that first-year students stick strictly to the study contents that should be mastered by all means, while later on their content grasping is more guided by their personal interests and needs. Senior students are capable of self-restraining and are in better control of their time, so that out-of-the-box learning comes easier to them. Halpern (2007) took a research interest in similar issues and concluded that study success can be linked to regular tuition attendance, so that students regularly attending their lectures are already predestined for greater academic achievements.

Yildirim et al. (2008) link student success to tuition methodology and student guidance, and are of the opinion that lecturers focused not merely on tuition contents but on their students as well can greatly contribute to the success of the latter students.

„Academic circles have widely accepted the belief that grades earned during secondary schooling in UK schools are a poor indicator of university studying success,” claimed Boyle et al. (2002) (in Halpern, 2007). Nevertheless, a number of UK studies have shown that high grades earned during secondary schooling can be a significant predictor of study success (Duff, 2004; Naylor & Smith, 2004) (in Halpern, 2007).

Studies conducted outside the UK have revealed that former education can have a significant impact on the level of academic achievements (Cantwell et al, 2001) (in Halpern, 2007).

Mills et al. (2009) claimed that the successfulness of the first-year Health Sciences students depends on the following factors: high entrance score, female gender, high-level secondary school and good command of a foreign language.

Chakravarthi and Vijayan (2010) analysed and proposed problem-based learning as a learning modality vouching success of medical students. Problem-based learning consists of the following steps: establishing a scenario and the hypothesis; defining learning outcomes, selecting and confirming the source; applying and presenting the acquired knowledge and skills.

While analysing student preparation/learning strategy, van den Hurk et al. (1999) ascertained the above strategy to be common and expected in traditional educational settings. However, education techniques are improved by adjusting the education strategy to the abilities and pre-knowledge of actual students.

Tuition adjustments to actual students were studied by Comer et al. (2011), who demonstrated various domains/paths or combinations to be used in the tuition process to the effect of improving student success. According to the results of their study, these adjustments enabled the authors to improve the success of Biology and Chemistry students by 25-45%.

Lecturers' efforts to aid students in improving their study outcomes were also researched by Chakravarthi and Vijayan (2010), who demonstrated the importance of not only curricular adjustments but also lecturers' involvement in guiding and mentoring students for student success improvement.

The collaboration between lecturers and students is not a one-way street, nor is it simple in any way. Yildirim et al. (2008) analysed the lecturing style most incentive for the student audience. The results of their research revealed the leadership style to be far better accepted by students compared to the learning style, which significantly correlated to student success, as well.

Mann et al. (2005) emphasised and corroborated the importance of communicativeness, skill mastering and teamwork for medical students and future healthcare professionals. Halpern (2007) demonstrated that the successfulness of attendees of the Business Management module is conditioned by their cultural familial background, age, qualification level, employment status and courses completed during the lifelong learning process.

On top of the study goal declared above, the authors of this research also strived to define the means to the end of improving student success, as well as potential selection criteria that will help in recruiting future high-performance experts.

The first-year curriculum of undergraduate university studies in Physiotherapy offers courses in Anatomy, Physiology and Biomechanics, as well as the course in Clinical Kinesiology, which interlaces the knowledge in these three areas of expertise and prepares students to apply the acquired knowledge of the human body in clinical practice. By virtue of the above, first-year students are provided with fundamental knowledge in different areas and are further trained to interlace that knowledge so as to provide for the basis that allows for the acquisition of trade-oriented contents offered during senior study years. A comprehensive grasp of these contents should ultimately evolve into an applicable expert knowledge, of use in physiotherapeutic clinical practice.

The experience of lecturers delivering theoretical and practical tuition within the frame of the Clinical Kinesiology course as a part of the first-year Physiotherapy studies' curriculum is based on monitoring the level of student motivation and their success over the years. Physiotherapy studies are entered by students of various secondary education backgrounds, i.e. by those who have graduated from Physiotherapy Training Schools, high schools, Nursing Training Schools, or other healthcare-oriented vocational schools (of pharmaceutical, sanitary, laboratory, veterinary, dental medicine, midwifery and other profiles), but also by students who have graduated from non-medical schools (such as technicians, Business Training School graduates, clerks). Most of the study-entering generations are inhomogeneous when it comes to elementary education expected to be upgraded during their studies so as to earn the title Bachelor of Physiotherapy.

The experience gained over the years of delivering tuition within the framework of Physiotherapy studies, in particular within the frame of the Clinical Kinesiology course, points towards the specificity and typicality of students' capabilities revealed during the study course that correspond to their prior knowledge of the matter. The authors of this study did not analyse each and every student success-conditioning factor addressed above but focused primarily on the knowledge and skills manifested by the students during the course of tuition.

The aim of the study was to ascertain the significance of secondary education for the success of students attending the Clinical Kinesiology module delivered to the first-year students enrolled into the Physiotherapy studies established in the City of Zagreb.

Hypothesis: The success of students attending the Clinical Kinesiology module is significantly influenced by their secondary education, so that students who have graduated from Physiotherapy Training Schools achieve far better results when compared to other first-year Physiotherapy students.

METHODS

The study sample comprised regular students who entered the Physiotherapy studies offered by the University of Applied Health Sciences Zagreb in the academic year 2014/15, the entry threshold thereby being defined as the sum of scores earned on the occasion of the entrance exam and the scores earned based on the final secondary school grade. As can be expected, the higher the entrance score, the better the student ranking on the entrance list.

The study sample can be defined as large and independent, and was divided into 4 groups as follows:

The G1 Group (N=55) was composed of students who have graduated from Physiotherapy Training Schools and have acquired general medical knowledge and expert knowledge in Physiotherapy. The G2 group (N=94) was composed of high school graduates. The G3 group (N=16) comprised students who have graduated from Medical Training schools and have acquired certain medical knowledge. The G4 group (N=45) was composed of students who have graduated from secondary schools of other profiles and did not acquire any substantial expert or general medical knowledge.

Data were processed using the ANOVA, the inter-group differences thereby being sought at two time-points, that is to say, following the completion of the first term, at which point the grades earned based on the colloquium output were analysed, and following the completion of the second term, at which point the grades earned based on the results of the exam in Clinical Kinesiology were analysed.

Student output was graded using numerical grades spanning from 2 to 5, which were descriptive of the extent to which the colloquium/exam passing criteria were met.

RESULTS AND DISCUSSION

According to the study curriculum adopted by the University of Applied Health Sciences Zagreb, the Clinical Kinesiology module is delivered during the first and the second term of the first year of Physiotherapy studies.

In line with the Bologna process, Physiotherapy students can have their knowledge tested following the completion of certain tuition units offered within a given module. Conformant to the tuition plan according to which the Physiotherapy studies are run, the attendees of the Clinical Kinesiology module can have their knowledge tested at two points and in two forms – in the form of a colloquium upon the completion of the first term and in the form of an exam upon the completion of the second term.

The results achieved by the students comprised by this study are presented as differences in arithmetic means of the results of the colloquium and later on the exam taken in Clinical Kinesiology, seen between the 4 study groups. The results were processed using the ANOVA, the statistical significance thereby being set at 95%.

Table 1: ANOVA – differences in the colloquium results seen between the 4 study groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	13,224a	3	4,408	2,350	,074
Intercept	655,196	1	655,196	349,238	,000
Secondary school	13,224	3	4,408	2,350	,074
Error	386,471	206	1,876		
Total	1330,000	210			
Corrected Total	399,695	209			

a. R Squared = ,033 (Adjusted R Squared = ,019)

Table 2: Tukey's HSD in the colloquium results witnessed between the 4 study groups

Secondary school	N	Subset	
		1	2
Other	45	1,67	
High school	94	2,16	2,16
Physiotherapy Training School (PTS)	55	2,24	2,24
Medical Training School (MTS)	16		2,56
Sig.		,303	,606

Means for groups in homogeneous subsets are displayed.

Based on observed means.

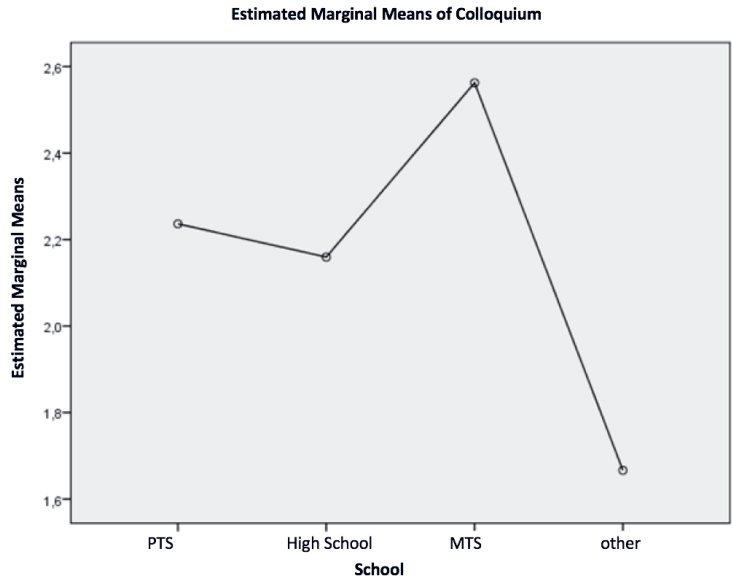
The error term is Mean Square (Error) = 1,876.

a. Uses Harmonic Mean Sample Size = 35,229.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = 0.05.

Figure 1: Arithmetic means of the colloquium results achieved by 4 study groups (G1, G2, G3 & G4)



Within the frame of this research, the analysis of variance (ANOVA), run at the level of significance of 95%, revealed no significant differences between the four study groups (G1, G2, G3 & G4) as regards their successfulness on the occasion of the colloquium ($F=2.35$) in Clinical Kinesiology, taken at the end of the first term of the first year of Physiotherapy studies (Table 1).

The results of this analysis did not meet the expectations of the researchers nor that of students. Namely, the students encompassed by the G1 group, who have graduate from Physiotherapy Training Schools and entered the Physiotherapy studies, had previous knowledge on subject-matters kindred to those under the syllabi of the courses delivered within the frame of these vocational studies. Given their prior knowledge, these students should have had fewer difficulties in grasping the contents offered at the beginning of their vocational studies as compared to students of other secondary education backgrounds (G2-high school graduates, G3-students who have graduated from Medical Training Schools, and/or G4-students of other secondary education backgrounds) (Figure 1).

The results displayed in Table 2 corroborate the assumption that the G1 group possesses better expert prior knowledge compared to other study groups, since Tukey's HSD analysis pointed towards their tendency to achieve better results. However, the same analysis revealed the same tendency in the G2 group of high school graduates, as well. The above suggests that student success can be conditioned by reasons other than pre-acquired knowledge as the fundamental parameter predestining success of first-year students.

At the end of the academic year, students take an exam in this module; the result of the exam is represented by the final grade that is entered into the student index.

Table 3: ANOVA – the results of the exam seen in the 4 study groups

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	20,577a	3	6,859	5,148	,002
Intercept	1093,423	1	1093,423	820,597	,000
Secondary school	20,577	3	6,859	5,148	,002
Error	274,489	206	1,332		
Total	2102,000	210			
Corrected Total	295,067	209			

a. R Squared = ,070 (Adjusted R Squared = ,056)

Table 4: Tukey's HSD in the exam results witnessed between the 4 study groups

Secondary school	N	Subset	
		1	2
Medical Training School (MTS)	16	2,50	
Physiotherapy Training School (PTS)	55	2,65	2,65
Other	45	2,71	2,71
High school	94		3,28
Sig.		,869	,111

Means for groups in homogeneous subsets are displayed.

Based on observed means.

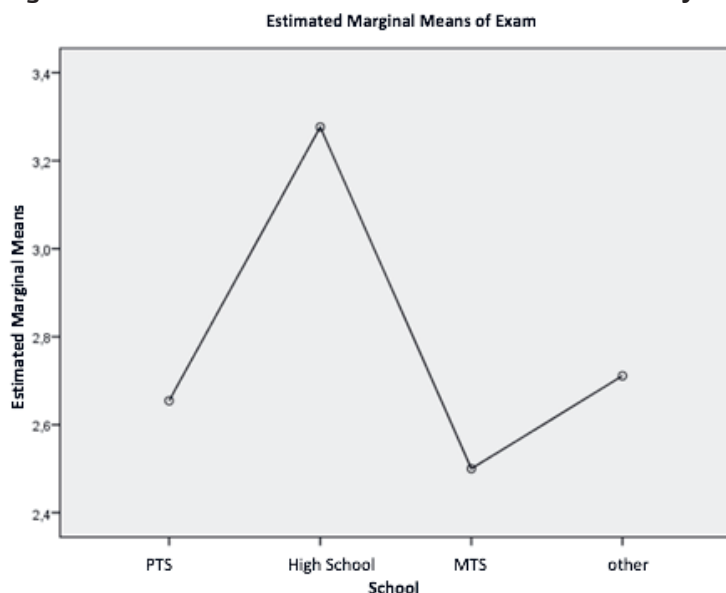
The error term is Mean Square (Error) = 1,332.

a. Uses Harmonic Mean Sample Size = 35,229.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = 0.05.

Figure 2: Arithmetic means of the exam results achieved by 4 study groups (G1, G2, G3 & G4)



The analysis of the exam results using the ANOVA revealed a statistically significant difference in success achieved by the G2 as compared to other study groups (Tables 3 and 4) in favour of high school graduates ($F=5.15$) at the level of significance of $p=0.0019$.

Based on the above, the hypothesis that the success of attendees of the Clinical Kinesiology module is significantly influenced by the curriculum of the secondary school they have graduated from can be dismissed at the significance level of $p<0.0019$. Hence, the assumption that students who have graduated from Physiotherapy Training Schools shall achieve better results compared to other first-year Physiotherapy students can be dismissed as well.

The expected "strong suit" giving a "head start" to the students who have graduated from Physiotherapy Training Schools comes down to the expected acquisition of prior knowledge in subject-matters kindred to those delivered during the first year of Physiotherapy studies.

The baseline assumption guiding this study was that, given their secondary schooling curricula, the G1 students have the vastest, while the G2 students have the poorest specific expert knowledge in Physiotherapy. The G3 students (i.e. nurses/paramedics, pharmaceutical, sanitary, laboratory and Veterinary Medicine technicians, Dental Medicine technicians, and midwives) have acquired certain prior medical knowledge during their secondary schooling, but not in Physiotherapy.

Namely, based on the experience of lecturers delivering tuition in Clinical Kinesiology to first-year Physiotherapy students, G1 students often think so highly of themselves that they even neglect to attend the lectures, rather dismissing them as unnecessary. High school graduates, on the other hand, are very particular as regards their tuition attendance, are present at lectures on a regular basis, and make meticulous preparations for the latter. They also make regular use of consultation hours and make every effort to compensate for their lack of specific knowledge at the beginning of their studies, mirrored in their lack of medical knowledge and unfamiliarity with technical terms.

The results of research conducted among Physiotherapy students attending the Clinical Kinesiology module suggest the reasons behind the obtained results. Students who have graduated from secondary schools that do not provide expert knowledge (high school graduates and other student groups) are far more motivated to grasp the tuition contents by virtue of continuous learning, as opposed to students who have already acquired certain expert knowledge. Students who have graduated from Physiotherapy Training Schools (the G1 group) are often far behind when it comes to tuition content apprehension, which comes as a result of their false belief that "they have already learned everything in secondary school", which is only partly true. Namely, they definitely have a certain prior knowledge in the matter, but merely at the level of recognition, not apprehension, and very far from know-how. This leads to their ultimate dissatisfaction with, and disappointment in, their success in grasping the contents offered not only by Clinical Kinesiology, but all other modules delivered during the first year of Physiotherapy studies.

The results of this research (Figure 2) confirmed the assumptions and observations of lecturers delivering tuition within the frame of the Clinical Kinesiology module, that student effort, compliance with the rules of studying in terms of regular tuition attendance and active participation in it, as well as an overall positive student attitude, represent the fundamentals of student success and its maintenance throughout the study course. This was confirmed also by Halpern (2007) and Robbins et al. (2004). On top of the aforementioned, the acquisition of applicable knowledge throughout the study course could pose as the pillar of a successful career development (Mann et al, 2005). Some studies have demonstrated the importance of personality traits for the ultimate career success, as well as the substantial relevance of parental influence on one's choice of educational path, parental support and parental expectations from young generations (Kim and Park, 2006).

Since students are almost unexceptionally heterogeneous in their level of prior knowledge, the tuition process should offer the possibility of grasping some basic expert knowledge (so as to allow students without such prior knowledge to better grasp the tuition contents). When it comes to students who have graduated from Physiotherapy Training Schools, exactly that same basic prior expert knowledge represents a "stumbling block", since they perceive the tuition contents as unnecessary, boring and already mastered. The lecturers delivering tuition within the framework of the Clinical Kinesiology module have made every effort to reorganise the tuition process so as to guide and motivate such students to take active part in it and continuously prepare for their colloquia and exams through seminars and practicals, but the results are only partly satisfactory. Notably, the contents offered by the Clinical Kinesiology module represent an upgrading of general knowledge and basic medical knowledge, and lean on knowledge and skills acquired during the Anatomy, Biomechanics and Physiology courses delivered during the first study term (in parallel with the Clinical Kinesiology course).

The authors are fully aware of the weaknesses of this study; namely, both a secondary school and a university grade is partially biased, which goes also for the assessment/grading of students/pupils that takes place under mutually different circumstances and therefore increases the metric error and the inaccuracy of the entire metric procedure. In light of the foregoing, a grade entered into an index does not fully mirror potential causes of, and influences on, student success. Nevertheless, the hypothesis of this study is underpinned by the experience and observations of lecturers delivering tuition to first-year students. One of the ultimate goals of this research is to improve the quality of tuition offered by the Clinical Kinesiology module.

Educational background, i.e. basic knowledge acquired during secondary schooling as a factor influencing student success, has been pointed out by a number of researchers (Boyle, 2002; Duff, 2004; Naylor, 2004; in Halpern, 2007). However, research has suggested that other factors, such as psychological profile, social environment and other factors of influence may impact student success (Grey et al, 2001; Mann et al, 2005; Robbins et al, 2004) as well. Based on the results of this study and the experience gained by lecturers delivering tuition within the framework of Physiotherapy studies, new research topics present themselves, calling for a broader analysis of possible causes of student success.

CONCLUSION

Based on the experience gained over the years of tuition delivery, some particularities of their approach to, and expectations from, the Clinical Kinesiology module, have been identified in communication with first-year Physiotherapy students. This also goes for their success in taking both the colloquium and the exam in the latter course. Based on the lecturers' experience, students lacking specific prior medical knowledge find it difficult to grasp contents offered by the module during the first term. These difficulties arise from their inability to fully understand the tuition contents, their ignorance of technical terms, and their inability to solve problems presented to them and/or to master the required skills. Differences in student motivation have been observed, as well, mirrored in the level of active participation in the tuition process. Knowledge & skills testing in the form of a colloquium and exam taken in Clinical Kinesiology have been considered to be impartial indicators of the difficulties referred to above, and founded the aim of this research, which reads as follows:

The aim of the study was to ascertain the significance of the contribution of secondary education background on the success of students attending the Clinical Kinesiology module as part of the first-year curriculum of Physiotherapy studies established in the City of Zagreb.

The study sample comprised 210 first-year students enrolled into the Physiotherapy studies offered by the University of Applied Health Sciences Zagreb, who have received tuition in Clinical Kinesiology in the form of lectures, seminars and practicals according to the same syllabus. The G1 group was composed of students who have graduated from Physiotherapy Training Schools and have therefore been given the opportunity to acquire certain general medical knowledge and specific knowledge in Physiotherapy. The G2 group was formed of high school graduates, while the G3 group consisted of students who have graduated from Medical Training or kindred vocational schools of medical profile. The G4 group was composed of students who have graduated from a secondary school of a different profile.

Data were collected by virtue of testing student knowledge on two occasions – on the occasion of the colloquium and on the occasion of the final course exam. Student output was graded from 1 to 5, while the collected data were processed using the analysis of variance (the ANOVA).

The results demonstrated no significant difference in the results of the colloquium in Clinical Kinesiology obtained in the 4 study groups. However, students of the G1 and the G2 group manifest a tendency towards better results compared to other student groups, which remained at the significance level of $p=0.07$ and is therefore statistically insignificant.

The results of the exam taken in Clinical Kinesiology at the end of the first study year go in favour of the G2 group (high school graduates), who achieved statistically significantly better results ($p=0.0019$). Of note, high school graduates have the poorest prior expert medical knowledge compared to other study groups.

Based on the multiyear experience of lecturers delivering tuition within the framework of the Clinical Kinesiology module, it was assumed that the reason behind the results of the research detailed above is the approach to the studying process, which varies across the 4 student groups. The key to student success could be regular tuition attendance and continuous learning, to which high school graduates and other successful students tend to resort.

The hypothesis that a secondary school profile significantly impacts the results achieved in Clinical Kinesiology module delivered in the first year of Physiotherapy studies, failed to be corroborated.

In light of the foregoing, the need exists for further research on the factors influencing the success of Physiotherapy students.

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