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THE EFFECTS OF A VISUAL MODEL AND KNOWLEDGE OF PERFORMANCE ON DANCE SKILLS

VPLIV VIZUALNEGA MODELA IN GIBALNEGA ZNANJA NA PLESNE SPRETNOSTI

Abstract

The influence of two methods of providing information for women aged 19.5 who were novices and learning basic Cha-Cha dance figures was examined. One group (N=19) obtained information by watching a model performed by an expert; with the second group (N=19) information was provided as verbal perspective feedback or knowledge of performance, while in the third group (N=18) both of these two sources of information provided interacted in a learning situation. The acquisition at the beginning and at the end of the motor stage of the learning process and the retention (two weeks later) of seven basic Cha-Cha dance figures was measured. The results based on these measurements in the acquisition test showed that all three sources, without any significant differences (ANOVA) in information, provided sufficient information for the subjects to improve their performance and to achieve comparable levels of skill. However, according to the results of the retention test a mere visual demonstration is an insufficient source of the information required by novices to develop a memorial representation of the skills (basic Cha-Cha dance steps).

Key words: motor learning, augmented feedback, Cha-Cha dance steps

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Izvleček

Članek proučuje vpliv dveh različnih metod podajanja informacij pri učenju osnov plesa Cha-Cha med 19.5 let starimi začetnicami. Ena skupina (N=19) je informacije dobivala prek demonstracije strokovnjakov, druga skupina (N=19) prek razlage in verbalnih povratnih informacij, medtem ko je tretja skupina informacije dobivala prek obeh virov, ki sta se prepletala v učni situaciji. Stopnja pridobivanja in ohranjanja znanja sedmih osnovnih figur Cha-Cha je bilo pri vseh udeleženkah preverjeno na začetku in ob koncu vsake motorične stopnje. Rezultati, ki so temeljili na preverjanju pridobljenega motoričnega znanja prek vseh treh učnih metod, so pokazali, da ni bilo statistično značilnih razlik (ANOVA) v ravni doseženega znanja in da so vse merjenke zvišale svoj nivo znanja in dosegle primerljivo znanje, rezultati preverjanja ohranjanja znanja pa so pokazali, da zgolj vizualna demonstracija ni zadosten vir informacije, ki bi začetnicam omogočil spominsko predstavo motoričnih spretnosti (osnovnih korakov Cha-Cha).

Ključne besede: gibalno učenje, izboljšanje povratne informacije

INTRODUCTION

Understanding how students learn movement and dance structures is an important factor in processes of dance learning and dance conditioning aimed at effectively developing a dancer's technique. When a teacher knows the learning styles of their students it is then possible to make correct decisions about the dance content and appropriate assignments for their continued success and progress. Dance is primarily a kinesthetic sensory learning experience reinforced by visual and auditory learning (Kassing & Jay, 2003). Experienced dancers develop an extraordinary kinesthetic memory of movement and we can assume that professional dancers are mostly visual learners. Dancing is a desirable recreational physical activity for male and female adults (Sila, 2004) and adult novices are an intriguing research subject.

Motor learning has three distinct stages: the verbal-cognitive stage, the motor stage and the autonomous stage (Schmidt & Wrisberg, 2000). The efficiency of motor reactions is defined by the relations between the motor information and level of abilities and properties that act interactively but differently in various stages of advancement (Miletić, Katić, & Maleš, 2004). The motor stage of learning in dance education includes: (1) a constant focus on specific problems; and (2) ways of executing the movement and its variations. At this stage feedback should be positive and encouraging, but also individual, targeting obvious problems and finding ways for the student to perform the dance steps correctly.

Poon & Rodgers (2000) examined the strategies used by novices and advanced jazz dancers when learning and performing novel, appropriately challenging dance routines. The results indicated that advanced performers used atypical learning strategies for insufficiently challenging stimuli, which may reflect the characteristics of the stimuli rather than the performer. In another research (Starkes, Deakin, Lindley, & Crips, 1987) the participants (ballet dancers) were asked to recall a sequence under three conditions: the motor and the verbal recall of structured sequences, and the motor recall of unstructured sequences. The results indicated that the structured sequences led to an enhanced performance for both the expert and novice groups, particularly for the skilled dancers. The main problem of the present research, to point out the best and most effective form of teaching dance and the learning process for beginners, remains to be addressed.

The two sources of information of interest in this study are the visual model (M) and the knowledge of performance ('KP'). The visual model involves an expert performing the skill to be learned with KP being provided as verbal perspective feedback indicating which component of the skill being practised is the most important to be corrected in a later trial. KP should be viewed as a type of augmented feedback (Schmidt & Wrisberg, 2000). There are many research investigations of modelling effects and verbal feedback in motor learning and sport psychology (Magill, 1993; Zetou, Tzetzis, Vernadakis, & Kioumourtzoglou, 2002; Horn, Williams, & Scott, 2002; Tzetzis, Kourtessis, & Votsis, 2002; Kernodle, Johnson, & Arnold, 2001), but it is important to establish how they interact in a learning situation, especially in the motor stage of learning (Magill & Schoelfender-Zohdi, 1996). Further, it is possible that these two sources of information involve some redundancy. Some authors hypothesise that both modelling effects and augmented feedback (Adams, 1971; Schmidt, 1975; Carroll & Bandura, 1987) help establish a memory representation of a learned motor skill.

In the present research these two sources of information (group C) were investigated interactively in the motor stage of learning firstly because the subject can learn the skill by observing a model

while not receiving any form of augmented feedback (Whiting, Bijlard, & den Brinker, 1987) or without observing a model (Newell, 1974). The authors tried to find out whether including both sources in the same situation would enhance learning beyond what would occur with just one source alone.

The purposes of the present research were to identify:

a) which source of information should be provided while learning a complex motor skill, such as dance structures with adult novices; and

b) how those sources of provided information affect the process of memorising a complex motor skill.

Knowledge of performance provides information directly linked to the subjects' performance of the related skill while visual modelling provides information which is not based on the subject's performance of the skill. Providing both a visual demonstration and KP in the same learning situation can be expected to yield information that is redundant, unique and/or complementary (Magill & Schoelfender-Zohdi, 1996).

METHOD

Participants

Female students (n = 56) from the Teachers' College volunteered to participate in this experiment. The mean age of the subjects was 19.5 years of age. No subject had any previous experience with Cha-Cha dance steps. The subjects were randomly assigned to one of the three experimental groups, with each having 18 or 19 subjects.

The experiment lasted for 10 practice sessions, performed three times a week. Each training session was 40 minutes. All the subjects were obliged to perform seven basic figures of the Cha-Cha dance.

Procedures

One group of subjects received knowledge of performance ('KP'), but did not observe the model by an expert. That group (KP) had to construct a visualisation of the dance pattern only according to the verbal instructions of their instructor. KP included: (1) exact information about the movement pattern performance; and (2) information regarding the main mistakes made in the preceding trial. The second group observed the model presented by an expert but did not receive KP (the 'model group' or the 'M group'). Consequently, the M group did not have any verbal feedback about mistakes in their performance. The third group observed the model of an expert performing the Cha-Cha dance steps (figure by figure) and also received KP (the 'combination group' or 'C group').

In order to avoid any subjective assessment, first all the subjects were videotaped. Three independent judges evaluated their performances afterwards by watching the videotaped material. The authors tried to simplify the judging procedure, (according to Magill & Schoelfender-Zohdi, 1996) the scoring was based on awarding a 0, 1 or 2 for each of the seven segments. 0 was given if a segment was missing from the performance. A score of 1 was given if the segment was performed incorrectly, while a score of 2 was given if the segment was performed correctly. To

establish the overall performance score for each trial, the six segment scores were totalled. Thus, the final score could range from 0 to 14.

The study's design included initial, acquisition and retention phases. The performance was tested three times for each group of subjects: a pre-test, an acquisition test and a retention test. First, all the subjects were videotaped when performing Cha-Cha dance steps at the beginning of the learning process (pre-test). Second, they were videotaped when performing Cha-Cha figures at the end of the learning process (acquisition test) and, finally, the subjects were videotaped two weeks after the period of the learning process (retention test).

Task

The subjects' task was to correctly learn to perform exact Cha-Cha dance steps. The Cha-Cha, a combination of the Mambo and American swing, is an old Latin dance that originated in Cuba. The time signature is 4/4 and the tempo is 32 bars, or 128 counts, per minute.

For the subjects in the KP group the dance steps were presented in the form of verbal instructions as follows: the dance is performed without rising on the toes; instead all the steps are performed by rolling the middle of the foot to the heel and the knees are relaxed alternately. The rhythm is counted *'*one, two, cha-cha-cha*'* in all four counts. The starting position – stand erect with feet together: (1) *count* 'one*'* –take a small step on the right foot to the right; (2) *count* 'two*'*– step forward on the left foot, shifting the body weight onto it; (3) *count* 'cha*'*–rise of the right foot, lower it next to the left leg on the spot, shifting the body weight onto it; (4) *count* 'cha*'*– take a small step on the left foot to the left; (5) *count* 'cha*'*– place the right foot next to the left foot, maintaining a distance between them; (6) *count* 'one*'*– take a small step on the left foot to the left; (7) *count* 'two*'*– step on the right foot backward and shift the body weight onto it; (8) *count* 'cha*'*– rise slightly of the left foot and lower it on the spot, shifting the body weight onto it; (9) *count* 'cha*'*– take a small step on the right foot to the right; and (10)) *count* 'cha*'*– move the left foot toward the right one, maintaining a distance between the feet. The seven figures of the Cha-Cha dance were presented to the KP subjects in the same way. All subjects were videotaped individually (Panasonic NV-DS 15) from the frontal plane, and three experienced judges evaluated the following figures: (1) basic Cha-Cha steps (1-10) performed on the spot; (2) Cha-Cha steps (1-5) performed on the spot and then moving forward (steps 6-10); (3) Cha-Cha steps (1-5) performed on the spot and then moving backward (steps 6-10); (4) Cha-Cha steps (1-5) performed on the spot and then moving left –right (steps 6-10) in the form of a *promenade;* (5) Cha-Cha steps (1-5) performed on the spot and then moving into a right turn (steps 6-10): (6) Cha-Cha steps (1-5) performed on the spot and then moving in to a left turn (steps 6-10); (7) general aesthetic impression. The experts' evaluation of the subjects' dancing style was as follows: 0 for poor; 1 for good; 2 for excellent.

Methods of data processing

To establish the objectivity of the three judges' scores, Cronbach Alpha and Average Inter-item correlation coefficients were calculated separately for the Initial, Acquisition and Retention measurements. Multivariate – factorial (3 x 3) analysis of variance (ANOVA) was used to establish any general differences between the three learning conditions in the three measurements. A one-way ANOVA was used to define the differences between the groups in each of the three measurements, while repeated ANOVA measures were used to determine differences between the measurements for each group separately. All the coefficients were considered significant at $p < 0.05$.

RESULTS

Initial and Acquisition Phases

The Cronbach Alpha ranged from 0.96 to 0.97, while the Average Inter Item correlation coefficient ranged from 0.90 to 0.94, indicating the relatively high level of objectivity of the judges. All the data (e.g. all three groups for all three measurements) were analysed for normality of distribution and the Kolmogorov Smirnov test found no significant differences between the observed and expected normal distributions.

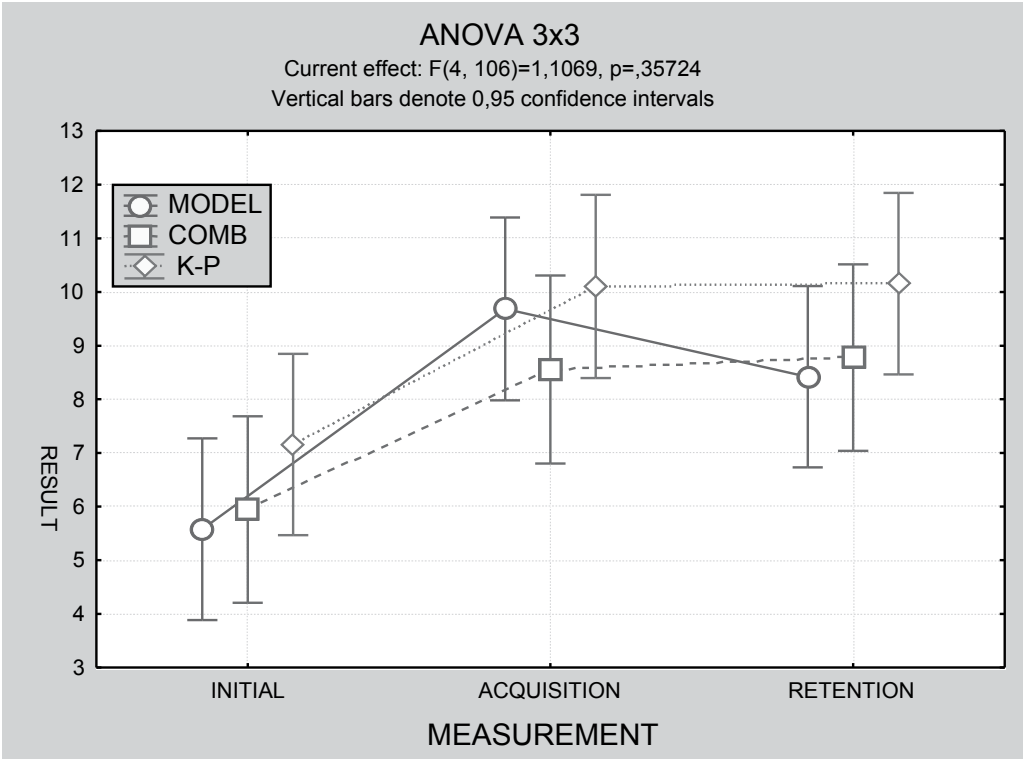

Figure 1: ANOVA 3 X 3 results (three learning conditions x three measurements)

ANOVA 3x3 found no significant differences in the three learning processes for the analysed groups.

Table 1: BASIC STATISTICS (Mean ± SD) FOR ALL THREE GROUPS OF SUBJECTS

Groups of subjects	N	Initial measurement		Acquisition measurement		Retention measurement	
		Mean	SD	Mean	SD	Mean	SD
M	9	5.58	3.88	9.68	2.94	8.42	3.24
KP	9	5.94	3.35	8.56	3.79	8.78	3.92
C	8	7.16	3.76	10.11	4.27	10.16	3.85

(M – Information was provided to the subjects by them watching a model expert; KP – information was provided to subjects as verbal perspective feedback or knowledge of performance; C –the two mentioned sources of information, M and KP, were provided interactively in a learning process).

Table 2: ANALYSIS OF VARIANCE FOR ALL THREE GROUPS OF SUBJECTS

Groups of subjects	N	Initial and Acquisition measurements		Initial and Retention measurements		Acquisition and Retention measurements	
		F	p	F	p	F	p
M	9	36.99	0.00	11.39	0.00	2.55	0.03
KP	9	24.18	0.00	29.07	0.00	0.29	0.59
C	8	16.24	0.00	19.23	0.00	0.01	0.92

Table 3: ANALYSIS OF VARIANCE BETWEEN THE DIFERENT GROUPS OF SUBJECTS IN THE SAME MEASUREMENT PHASE

Groups of subjects	Initial measurement		Acquisition measurement		Retention measurement	
	F	p	F	p	F	p
M and KP	0.09	0.76	1.02	0.32	0.09	0.76
M and C	1.62	0.21	0.13	0.73	2.26	0.14
KP and C	1.07	0.31	1.36	0.25	1.17	0.29

ANOVA calculated between the groups in the Initial, Acquisition and Retention phases found no significant differences. These findings indicated a comparable level of dance performing skills for all three groups of subjects at the beginning and the end of the dance learning process. The results in Table 1 indicate a higher level of skill performance in the initial (Mean = 7.16) and acquisition measurements (Mean = 10.11) in the C group where the subjects observed the model performed by an expert and received knowledge of performance interactively in a learning situation. The subjects who only observed the expert model or only received information as verbal perspective feedback achieved lower scores in the initial (Mean of the M group = 5.58; Mean of the KP group = 5.94) and the acquisition measurements (Mean of the M group = 9.68; Mean of the KP group = 8.56), but the ANOVA calculation did not reach a significant level.

Significant main effects were found for all three groups of subjects which indicated a continued improvement in their performance during the acquisition phase for all three practice groups (Table 2). The expert model group, the knowledge of performance group and the combination group scored significantly better in the acquisition test than in the initial test. These results suggest that all three methods of the motor learning process are important and helpful when the performance of a complex skill is involved.

A plot representing the initial, acquisition and retention scores for all three groups of subjects is presented in Figure 1. The measuring phases are labelled on the x-axis, and the judges' scores are on the y-axis (higher scores represent a better performance). Retention on the x-axis represents the 14-day rest period between the practice lessons and the last measurement.

Retention Phase

The mean scores of retention measuring for all three groups of subjects are presented in Table 1. The C group scored the highest level of performance as regards the retention measuring (Mean = 10.16). The subjects in the combination group and the subjects who only received information as verbal perspective feedback or knowledge of performance performed the dance steps in the retention measurement at approximately the same level as in the acquisition measurement (Mean =8.78). An analysis of variance (ANOVA) was conducted to assess the retention performance (after a 14-day rest period) for all groups of subjects. Repeated measures of ANOVA were calculated to compare the initial and retention as well as the acquisition and retention measurements (Table 2). A significant increase in performance levels was found between the initial and final measurements for the expert model group ($F = 11.39$; $p<0.00$), the knowledge of performance group ($F = 29.07$; $p<0.00$) and the combination group ($F = 19.23$; $p<0.00$).

The analysis of variance (ANOVA) between the acquisition and retention measurements was calculated to examine the effect of a 14-day rest period for all groups of subjects in order to establish how different sources of the provided information affect the process of memorising a complex motor skill (the 7 figures of Cha-Cha dance steps). The level of performance in that group where the subjects only received information by observing a model performed by an expert was significantly lower in the retention than in the acquisition measurements ($F=2.55$; $p<0.03$). No significant difference was found between the acquisition and retention measurements for the subjects in the KP and C groups.

DISCUSSION

Providing a visual demonstration and KP during the same practice session did not lead to any significantly better learning of the skills (performance of the dance steps) than by only observing the model or by only receiving KP in neither the pre-test nor the acquisition test. All three sources of information (M, KP and C) provided sufficient information for the subjects to improve their performance and to achieve comparable levels of skill. After two weeks of not practising the learned skill, those subjects who only received visual demonstrations (the M group) were significantly worse when it came to performing the Cha-Cha dance steps. On the contrary, the groups that had KP provided achieved the same level of performance in the retention test.

Learning a dance movement depends on processes used in motor learning. Changes take place in the central nervous system and become permanent and stable as part of the dancers' increased capacity for a skilled performance. Adams (1971) and Schmidt (1975) proposed that the primary role of augmented feedback during learning is to aid the development of the memory representation of a correct performance. Thus, only having visual demonstrations available could be an insufficient source of the information needed to develop a memorial representation of the skill. Observing a model provides direct information through the visual system that establishes the appropriate task constraints and, as a result of practice, enables someone to perform the skill as required (Scully & Newell, 1985). On the contrary, KP provides information that establishes kinematic constraints for the body and limbs, but this information is based on the person's actual performance (Newman & McGinis, 1985).

There is no doubt that modelling can have beneficial effects on the learning of complex skills (Tzetzis, Kourtessis, & Votsis, 2002; Al-Abood, Davids, & Bennett, 2001); especially in the motor stage of learning. This is consistent with the present research (Figure 1) where the subjects in the model group learned faster (achieved a higher level of performance in the same practice time in the acquisition test) than the subjects in KP group. Further, modelling plus instructional cues (the C group) seemed to improve better skills acquisition than by only obtaining information by watching an expert (Tzetzis, Mantis, Zachopoulou, & Kioumourtzoglou, 1999; Zetou, Tzetzis, Vernadakis, & Kioumourtzoglou, 2002) which is also consistent with the current research. Verbal descriptions of skill acquisition (in the KP group) in this process of learning dance steps (according to a performance outcome measure) were just as effective as the modelling in the retention test. The subjects understood the principles well enough to apply them to the new skill they had been learning.

According to Bala & Hazma (2001), the verbalisation group also had the best success in learning and memorising the most stable dynamic stereotypes when pre-school children were involved.

When a model is not presented the subjects learn by memory, which is a more lasting learning strategy. This fact might be useful as a basis for developing more active, complex and integrated motor learning strategies. Short-term memory regarding materials that are presented only once is limited in capacity, and forgetting it is rapid (occurring in about 30 secs). Williams, Davids, Burwitz, & Williams (1992) pointed out that the role of memory must be considered in order to understand how people deal with the available information. In the present research the authors tried to provide an optimal amount of information for adults through a verbal description of the motor skills (Cha-Cha dance steps). The instructions were brief, emphatic and related to the information the subject had previously learned. Information obtained in this way becomes a continuous motor skill, a connection of new information with previously learned information which indicates good results in the retention test. According to the results we obtained, in the dance learning process for adult novices it is important to provide information with verbal instructions irrespective of the performance level in the motor stage of learning.

CONCLUSION

The objective of this study was to establish which source of information should be provided when adult novices learn dance structures and how different sources of the information provided affects the dance learning process.

This experiment investigated the interaction of a visual demonstration and KP as two sources of information while learning motor skills (basic Cha-Cha dance steps).

The appropriate teaching technique (both observing the model and verbal instructions) enriched the students' learning experience. The adult novice dancers do need augmented feedback about the knowledge of their performance as much as watching the model performed by an expert to achieve a better performance test, and as this investigation's results indicate that a motor skill learned by a verbal description is a more effective learning process aimed at memorising a complex motor skill.

Observational learning conditions that increase the cognitive effort of learners during practice enhance skill retention in the absence of a model (Weeks, Hall, & Anderson, 1996). It is possible that mental rehearsal contributes to movement learning (Feltz & Landers, 1983) especially for less experienced individuals when alternating mental practice with physical practice, and it is an effective strategy for improving movement performance (Etnier & Landers,1996; Gabriele, Hall & Lee, 1989).

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