Journal of Human Kinetics volume 26 2010, 13-19
Section I – Kinesiology
DOI: 10.2478/v10078-010-0043-0




# The Comparison of Different Types of Observational Training on Motor Learning of Gymnastic Handstand

*by*
*Farzad Maleki[1], Parvaneh Shafie Nia[1], Mehdi Zarghami[1], Abdoljalil Neisi[1]*

*The present study aimed at assessing the influence of three types of observational training on motor learning of gymnastic handstand. Fifty healthy male subjects (age 20.35±1.44) from the faculty of Physical Education, University of Shahid Chamran served as the participants in the study. They were randomly assigned to three groups: 1: Actual model observation group (AOG), 2: Actual model observation and verbal description group (AOVG), 3: Animated model observation and verbal description group (AONG). Each group underwent training for 3 weeks, 3 sessions per week. The whole sample practiced the handstand skill equally ten times per session. The acquisition test was preformed after the last session while the retention test was done 48 hours later. Values of $p<0.05$ were chosen as significant. The results of repeated measures analysis showed that all three types of training improved the handstand skill performance for retention. As well as the acquisition phase. Furthermore, the results of ANOVA showed that there was a significant difference between the three groups regarding the acquisition test. However, there was no significant difference among the three groups regarding the retention test. Our findings revealed that observation of model with verbal teaching improves learning of the handstand skill, while observation without verbal description has no effect on learning the skills..*

**Key words:** Demonstration, Animation, Practice, Acquisition, Retention

## *Introduction*

During the late 19 century, psychologists began their studies on the learning process. In addition to experimental psychologists, the education teachers showed interest in learning. Since teaching objectives can be transferred to mankind trough learning (Schmidt and Lee, 2005). Previous research showed that although many studies were carried out in the field of education, the role of assistant instruments and various models of teaching in skill-training were not apparent. Due to the fact that teaching motor skills has been among the main goal of physical education teachers and coaches, the studies on motor learning as an assistant for motor-skills-learning is important (Singer et al., 2001).

Because of the important role of visual stimuli in learning skills, researchers use visual studies for the assessment of learning and performance. Studies have shown that learners can infer corporative patterns of skills through observing them (Oxendine, 2002). It is also claimed that the senses do not play equally decisive roles in skill learning. More precisely, about 75% of learning is attained through the visual sense (Ross et al., 1985; Scully and Newell, 1985; Weir and Leavitt, 1990). It was reported that observational learning provides information resources for skill acquisition (Laguna, 2008; Shea et al., 2000; Sooho et al., 2004). Thus, skill demonstrations are considered the most effective factor in learning proccesses, and coaches and teachers should apply this method for the short-term transfer of information to learners. Such observational learning tools are additionally supported by such scholars as Bandora (1971, 1977 and 1986). Observational learning is the observation of a behavior, followed by emulation of that behavior. This method is an important and powerful way for acquisition of new and complex skills, as well as the refinement and verification of

[1] - *Department of Sport Psychology, Faculty of Physical education& Sport Science, Shahid Chamran University of Ahvaz, Iran*

*Authors submitted their contribution of the article to the editorial board.*
*Accepted for pinting in Journal of Human Kinetics vol. 26/2010 on October 2010.*

them. Primary studies by Bandura (1971, 1977 and 1986) on social skills and clinical positions showed that observational learning was an effective factor on motor behavior changes of humans.

Sport psychologists suggest that the selective model can affect the future behaviors of athletes (Bird, 1985). Some studies have reported that observation of modeling can lead to acquisition and learning of a skill, as well as the performance of that skill (Shafizade, 2007; Black et al. 2005).

There are two common methods for information transfer: verbal description and display the skill by real model (elite athlete). Verbal description has not been very useful in learning, especially in preliminary phases of skill learning; whereas, the exhibition of skill can lead to more information transference. In addition to these two methods, video and film demonstration of skills is an alternative means for transfer of skill details. Thus video and animation modeling affect the learning process, as well as real model demonstration (Feltz, et al., 1979). According to Guadagnoli et al., 2002), both description and video description enhance learning, but video demonstration has more influence on learning. Zetou et al. (2002) stated that the most ideal means for improving skills learning was via a combined observation model with verbal description. In addition, McCullough and Little (1989) showed hat observation without verbal teaching has little effect on the learning process.

According to the Magill (1993), modeling can facilitate the acquisition of skills, especially in the beginning of skill learning, where observation of skills helps create motor patterns. Blandin et al. (1999) showed that observation combined with physical training leads to more learning; and in this pattern, the learner involves in cognitive process, as well as physical training.

These findings confirm that learning through observation is an effective method for learning skills. As Spencer et al. (2006) stated, the observation of the skills, as performed by elite athletes, can accelerate the learning of skill details and facilitate the intake of motor control parameters. Many studies revealed that the correct exhibition of skills, in comparison with its wrong counterpart, has a more effective impact on learners (Martens et al., 1976; Adams, 1986; Ross et al., 1985). Weiss and Klint (1987) and Weiss (1983) showed that the repetition of an observed stimulus in verbal encoded patterns leads to constant and strong acquisition responses and facilitates the maintenance of these responses.

Since the time assigned to skills learning constitutes a portion of the total training time, the learning program must be both efficient and effective; furthermore, necessary details of the skill must be transferred to the learner carefully. However, application of new methods and tools is directly dependant on their comparative efficiency and usefulness; and in turn, this demands further research on newly developed devises and teaching techniques. Thereby, the aims of the present study were to 1- investigation the effect of three different types of observational training (Actual model observation, Actual model observation and verbal description group, animated model observation and verbal description group) on acquisition and retention of handstand gymnastic, 2- compare three different types of observational training on acquisition and retention of handstand gymnastic.

## *Methodology*

### Subjects

The subjects were 50 healthy amateur gymnastic male students, without experience of gymnastic skills, who were selected from Shahid Chamran University of Ahvaz in 2009. Before the administration of the tests, all subjects completed an informed consent before they began the study. The consent form and all experimental methods were approved by Shahid Chamran university of Ahvaz institutional review board.

Participation was voluntary, unpaid and no apparent physical or sensorial handicap was detected among the selected participants. They were randomly divided into 3groups: 1: Actual model observation group (AOG, n=17), 2: Actual model observation and verbal description group (AOVG, n=17), 3: Animated model observation and verbal description group (AONG, n=16).

### Modeling Procedures

1. Subjects of AOG observed the execution of real model without any interference.
2. Subjects of AOVG observed the execution of real model with verbal descriptions by coach.
3. Subjects of AONG observed the demonstration of animated model combined with verbal descriptions by coach. The animated model was demonstrated for subjects through video projection. The animated model was performed in 3 stages: first demonstrating the skill step by step, then demonstrating the handstand in slow motion; after-

wards demonstrating the whole skill in normal-motion speed (demonstration of animation performed in 9 stage (figure 1)).

### Measurements

In reference to scoring, we used international referees from the gymnastics committee. The scoring criteria utilized International Gymnastic Federation rules, as we used three referees for assigning the points based on international rules scoring. Each subject performed 6 trials of gymnastic handstand and their scores (0-10 point) in each repetition were recorded by three international referees. The mean scores were considered the subjects' scores in pre-test. In this study, three groups or three types of training considered as independent variables and the execution of handstand considered as dependent variable.

Afterward the participants were randomly divided to three groups. Experimental training was performed 3 weeks, 3 times per week, with 10 trials training of the handstand per session. After 3 weeks of the training program, the post-test evaluation was accomplished and each participant performed the handstand while subjects' scores were recorded by referees, as done during the pre-test.

The experiment consisted of acquisition and retention phases. In the acquisition phase, one hour after the last training session, subjects performed 6 trails of handstand and the subjects' scores were recorded by three referees, as in the pre-test phase. In the retention phase, 48 hours after the last training session, like the acquisition phase, each subject performed the handstand 6 times and the scoring was done identical to the pre-test phase. Afterwards, participants' scores were compared with pre-test values.

In reference to scoring, we used international referees from the gymnastics committee. The scoring criteria utilized International Gymnastic Federation rules, as we used three referees for assigning the points. The mean of the referees' scores were record as the subjects' scores.

### Statistical Analyses

Repeated measure ANOVA was used to assess the within group differences for any group, followed up it, LSD test was used to indicate this differences. Also one –way ANOVA was used to compare three groups in acquisition and retention phases, followed up it, TUKEY tests was used to assess pairwise comparisons. Values of $p<0.05$ were found significant. Statistical analyses were performed using the SPSS version 17 for Windows.

**Table 1**

*Subjects'characteristics. Values are means ± standard deviation*

| Groups | n | Pre-test | | acquisition | | retention | |
|---|---|---|---|---|---|---|---|
| | | M | SD | M | SD | M | SD |
| AOG | 17 | 0.63 | 0.36 | 3.29 | 1.07 | 2.95 | 1.18 |
| AOVG | 17 | 0.75 | 0.43 | 4.64 | 1.17 | 3.01 | 1.19 |
| ANVG | 16 | 0.68 | 0.41 | 4.54 | 1.30 | 3.20 | 0.86 |

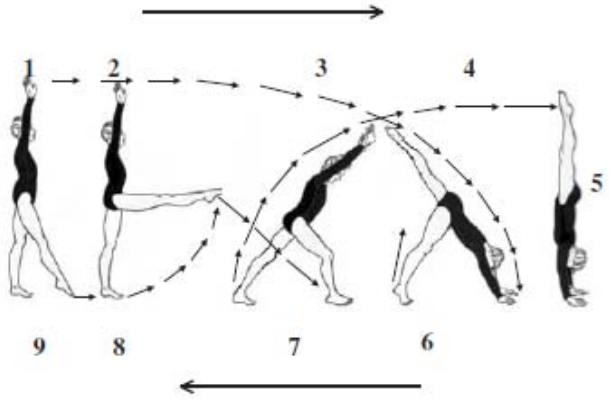


**Figure 1**

*Nine selected phases of handstand presented by the animated model*

## *Results*

Results of subjects' scores in the handstand executed in pre-test, acquisition and retention phases are shown as mean and standard (see Table 1 and figure 2).

In order to assessing differences between different stages of study the ANOVA for repeated measurement was used. The result of one way analysis of variance (ANOVA) showed that there were no significant differences in the execution of handstand between groups in pre-test phase ($F_{2, 49} = 0.37$, $p=0.69$). This implies that the level of handstand experience among the subjects were in the same range before the training program.

The analysis of variance for repeated-measures showed a significant difference in the within-group AOG ($F_{2, 49} = 108.07$, $p<0.05$), AOVG ($F_{2, 49} = 120.89$, $p<0.05$) and ANVG ($F_{2,49} = 155.51$, $p<0.05$). These results indicate that the scores in pre-test, acquisition and retention phases have significant differences among the three groups. In order to definition of existence differences between three phases, a follow-up test (LSD) was performed for three models of training, with the results are shown in Table 2.

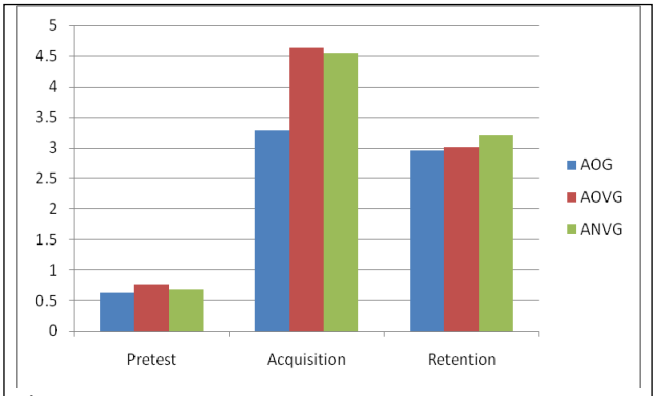


**Figure 2**

*Means and standard deviations of all measures of three groups*

Comparison of the subjects' scores in the handstand executed in three phases show that there was a significant difference between pre-test, acquisition and retention ($p<0.05$). On the other hand, all three models of training resulted in significant improvements in post-test and retention, but not in the pre-test phase (Table 2).

The results of ANOVA for comparison of scores in acquisition phase show that there was a significant difference between the three groups ($F_{2,49} = 8.23$, $p<0.05$). In order to determine the existing differences, the Follow-up test (TUKEY) was performed, with results shown in Table 3.

The results of TUKEY test showed that there was a significant difference in comparing AOG with AOVG and ANVG, where AOVG and ANVG executed the handstand significantly better than AOG. However, the difference between AOVG and ANVG was not significant.

To comparing scores of the three groups in retention phase, the ANOVA test was performed and the results showed insignificant differences in handstand performance between groups ($F_{2,49} = 0.22$, $p=0.27$).

## *Discussion*

The present research was aimed at comparing the different types of observational training on motor learning of the gymnastic handstand in amateur males. The results show that all three groups performed the handstand skill in acquisition and retention phases more skillfully than they did during pre-test phase. This implies that all three training types of observation result in the improvement of the gymnastic handstand.

With regard to the actual model observation on handstand skill acquisition and retention, our results support the findings of Shafizade (2007), who assessed the effects of observational training on dart throwing and showed that observation of model can result in skill acquisition, as well as performing the skill by model, who claim that the observation of a real model has a positive effect on the acquisition phase of learning. Spencer et al. (2006) studied the scoring of motor skills through observation with training of bowling and concluded that through observation, the demonstration of the model can facilitate the acquisition of the skill, in addition to, the results of study are accordance with results of Sooho et al. (2004), who showed that observational learning is an effective factor on motor learning, and Shea et al. (2000), who approved the effect of practical training with observation on play station games.

**Table 2**

*The repetition measure for LSD test between three phases for three models of training*

| Groups | i(mean) | j(mean) | i-j(Mean-difference) | Standard error | p-value |
|---|---|---|---|---|---|
| AOG | Pre-test | Acquisition | -2.66 | 0.18 | 0.001 |
| | Pre-test | Retention | -2.32 | 0.21 | 0.001 |
| AVOG | Pre-test | Acquisition | -3.89 | 0.20 | 0.001 |
| | Pre-test | Retention | -2.26 | 0.24 | 0.001 |
| ANOG | Pre-test | Acquisition | -3.58 | 0.19 | 0.001 |
| | Pre-test | Retention | -2.51 | 0.22 | 0.001 |

**Table 3**

*TUKEY for determining the existing differences between groups in acquisition phase*

| i (mean) | j (mean) | i-j (mean difference) | Standard error | p-value |
|---|---|---|---|---|
| AOG | AOVG | -1.35 | 0.36 | 0.001 |
| | ANVG | -1.25 | 0.37 | 0.001 |
| AOVG | ANVG | 0.10 | 0.37 | 0.79 |

However, these results are in disagreement with the Sidaway and Hand (1993) findings that investigated the effect frequency of modeling on the acquisition and retention of golf and showed that observation of model has no significant effect on acquisition of golf skill. The possible reason for some contradictory statements is the task differences in various studies.

In reference to the effect of observation of a real model with verbal explanation, the results agree with the findings of Zetou et al., (2002), who indicated that this type of training in volleyball service leads to learning both standing figure and volleyball service. We didn't find any disagreement results with this part of study results.

Regarding the positive effect of the animated model with verbal description on acquisition and retention of handstand learning, our results confirm the results of Atienza et al. (1998), who stated that animated model with verbal description improve the service performance of 9-12 years tennis players, significantly. Furthermore, the results are accordance with Bhatt and Pai (2007) in one variable and are disagreement with one variable which they survived the effect of observational training on reducing the back balance risks and showed the subjects showed improvement in constant jumping but they hadn't any significant improvement in velocity of jumping. The results also are disagreement with Shea et al (2000) that assessed and observation efficacy of practical training and showed observation of the video game had no any significant effect on the game improvement, but practical training lead to significant improvement in game performance. The possible reasons for some contradictory statements are the measured variable, training characteristics, duration of observation rather than practical training and the level of subject's experience

The comparison of the results in the acquisition phase shows that the performance of subjects' handstand in group A is weaker than groups B and C; however we did not find any significant differences in retention phase between groups.

These results are agreement with a part of the findings of Zetou et al., (2002), who clamed that observation of the model with verbal description can facilitate the learning of skills and has a more effect on learning processes, Feltz et al., (1979) state that video and animation modeling, as well as real model demonstrations, affect the learning processes and McCullagh and little, (1989). However, the results of Huang (2000) are in opposition with these results who survived the effect of different types of model demonstrating and performance abilities during video teaching of golf and showed those participants who observed real model combined with video model hadn't significant differences in performance in comparison with those subjects who observed video model only. Characteristics of tasks that include complexity and new task learning, age or type of assessed task, might be a reason for differences between study results.

The results also showed that in the retention phase, the handstand scores of the three groups were not significantly different. This finding supported results by Feltz et al. (1979). However McCullagh and Little (1989) showed that observational learning without oral teaching have a weak effect on motor learning. The possible reason for this conflict may be the different variable level of the subject's skill and the number of model repetitions.

As Weeks (1992) states, the observation of model leads to improvement in cognitive display and assists the learner to control and regulate motor performance; so the cognitive conception is an important factor for the learner to acquire the complexities of motor performance. This cognitive conception was named "symbolic representation theory" by Sheffield (1961). The existence of differences in cognitive conception might be related to differences in the effect of these training models.

It seems that the weaker performance of the real model group in post-test during the retention phase is related to the additional knowledge obtained for production of motion in the observation of model (real and animation) with verbal descriptions, which performed better than observation the model without verbal descriptions.

These results demonstrate that the observation of model with verbal teaching can lead to more learning than observation without verbal teaching, which as a lower effect on motor learning. Based on these results, we propose that teachers and coaches during motor skills teaching, they apply the verbal descriptions and use the real and animated models (specially animated model which demonstrate the execution of the skill step by step, slow-motion and finally natural execution of the skill) for efficient learning.

## *Conclusion*

Our findings reveal that all three types of observational training result in improvement in subjects' performance in the acquisition and retention phases. However, each model of training has a different effect

on acquisition. The results of study show that there is a significant difference between groups, as this difference was significant between the observation real model group and the other two groups. The scores of AOG group were significantly weaker rather than groups AOVG and ANVG. In addition, AOVG had better execution of the skill than ANVG, but this difference wan not statistically significant. Furthermore, our results indicate that in the retention phase, the difference in scores was not significant between the three groups, although the scores of ANVG were better than other two groups.

## *References*

Adams JA. Use of the model's knowledge of results to increase the observer's performance. J Hum Movement Stud, 1986. 12, 89-98.

Bird AM. Psychology and Sport Behavior (Hardcover). 1985. Publition: Mosby Year Book. ISBN: 9780801606007.

Atienza FL, Balaguer I, Garcia-Merita ML. Video modeling and imaging training on performance of tennis service of 9-to, 12-years-old children: Persept Motor Skill, 1998. 87(2), 519-29.

Bandura A. Social learning theory. Englewood Cliffs. NJ: Prentice-Hall, 1977. 247 p.

Bandura A. Analysis of modeling porcesses. In A. Bandura (Ed.), Psychoogical modeling. Psychological modeling; conflicting theories. Chicago : Aldine- Atherton, LB1051 .B244, 1971.

Bandura A. Social foundations of thought and action: A social cognitive theory, Prentice-Hall, Englewood Cliffs, NJ, 1986.

Bhatt T, Pai YC. Can observational training substitute motor training in preventing backward balance loss following an unexpected slip during walking?, J Neurophysiol 99 (2007).

Black B, Wright DL, Magnuson CE, Brueckner S. Learning to Detect Error in Movement Timing Using Physical and Observational Practice. Res Q Exercise Sport, 2005. v76 n1 p28-41.

Blandin Y L, Lhuisset LP. Cognitive processes underlying observational learning of motor skills. Q. J. Exp. Psychol. A, 1999. 52: pp. 957-979(23).

Feltz DL, Landers DM, Raeder U. Enhancing self-efficacy in high avoidance motor tasks: A comparison of modeling techniques. J Sport Psychol, 1979. 1: 112-122.

Guadagnoli M, Holcomb W, Davis M. The efficacy of video feedback for learning the golf swing. J Sports Sci 2002;20:615–622.

Huang CY. The effect of cooperative learning and model demonstration strategies on motor skill performance during video instruction. Proc. Natl. Sci. Counc, 2000. 10 (2), 255-265.

Laguna Pl. Task complexity and sources of task-related information during the observational learning process. J Sports Sci, 2008. 26: 1097 - 1113

Magill RA. Modeling and verbal feedback influences on motor skill learning. J Sport Psychol, 1993. 24, 358-369.

Martens, R. Burwitz, L. Zuckerman J. Modeling Effects on Motor Performance. Research Quarterly. 1976. Vol. 47, No. 2, 277-291.

McCullagh P, Little W,S. A comparison of modalities in modeling. Hum Perform, 1989. 2, 101-111.

Oxendine JB. Applied Sport Psychology. Englewood Cliffs, Prentice – Hall, New Jersey, 2002. pp: 15-27.

Ross D, Bird AM, Doody SG, Zoeller M. Effects of modeling and videotape feedback with knowledge of results on motor performance. Human Movement Sci, 1985.4, 149 157.

Schmidt RA, Lee TD. Motor Control and Learning: A Behavioral Emphasis 4th Edn., Champaign, IL; Windsor, ON: Human Kinetics Europe Ltd, 2005. ISBN 987-964-5547-95-8.

Scully DM, Newell KM. Observational learning and the acquisition of motor skills, toward a visual perception perspective. J. Human Movement Stud., 1985. 11, PP: 169-186.

Shafizade M. Effects abservational practice and gender on the self-efficacy and learningof aiming skill. J. Applied Sci, 2007. 7/17) 2490-2494.

Shea CH, Wright DL, Wulf G. Whitacre C., Physical and observational practice affords unique learning opportunities. J. Motor Behavior, 2000. 32, PP: 27-36.

Sheffield FD, Theoretical Consideration in the Learning of Complex Sequential Task from Demonstration and Practice. In: Student Response in Programmed Instruction, (Lumsdaine AA.(Ed.). 1961. Washington, DC: National Academy of Sciences - National Research Council.

Sidaway B. Hand M.J. Frequency of modeling offects on the acquisition and retention of a motor skill. Res. Q. Exercise Sport, 1993. 64, PP: 122-125.

Singer RN,Hausenblas HA, Janelle CM. Handbook of Sport Psychology. 2nd Edn., 2001. New York: Wiley and Sons

Sooho S, Kimberly T, McCullagh PA comparison of modeling and imagery on the performance of a motor skill. J. Sport Behav, 2004. 27 (4), p: 349-366. http://www.accessmylibrary.com/article-1G1-125568947/comparison-modeling-and-imagery.html

Spencer JH, Nicola JH, Mark AS, Robert RH, Mark WA. Scaling a motor skill through observation and practice. J. Motor Behav, 2006. 38: 357-366.

Weeks DL. A comparison of modeling modalities in the observational learning of an externally paced skill. Res Q Exercise Sport, 1992. 63, 373-380.

Weir PL, Leavitt JL. Effects of models skill level and model's knowledge or results on the performance of a dart throwing task. Human Movement Sci, 1990. 9, pp: 369-383

Weiss MR. Modeling and motor performance: A developmental perspective. Res. Q. Exercise Sport, 1983. 54, 190-197.

Weiss MR, Klint KA. Show and tell in the gymnasium. Res. Q. Exercise Sport, 1987. 58, 234-241. What's the difference between Divisions I, II and III? Retrieved from http://www.ncaa.org/ on February 19, 2004.

Zetou E, Tzetzis G, Vernadakis N. Modeling in learning two volleyball skills. Percept Motor Skill, 2002. 94(3PART2), pp.1131-1142.

**Acknowledgements**

This study was supported by the Sport Psychology Department, Shahid Chamran University of Ahvaz, Iran. The authors would like to sincerely thank all participants in this study and the Physical Education and Sport Sciences faculty.

## Corresponding author

**Farzad Maleki**
Department of Sport Psychology,
Faculty of Physical Education and Sport Science,
Shahid Chamran University of Ahvaz, Iran
Phone: +98 0611-3336316 - +989166979443
Fax: +98 0611-3336316
E-mail: farzad.m17@gmail.com