Constraints-led Practices and Motor Ability on Basic Footwork Skills Acquisition in Fencing

Novrizal Achmad Novan, Amung Ma'mun and Nuryadi Nuryadi
Universitas Pendidikan Indonesia, Jln. Dr. Setiabudhi No. 229, Bandung, Indonesia
novrizalnovan@student.upi.edu

Keywords: Task Constraints, Motor Ability, Skill Acquisition, Fencing.

Abstract: Constraints-led practice is essential in order to channel movement skills acquisition and athlete's behaviour in decision making. The objective of this study is to identify task constraints effect towards basic footwork fencing skills acquisition on some motor abilities, and to know its interaction in the result of fencing basic footwork skills practice. Quasi-Experimental method and Factorial Design were applied, sample included 20 athletes. The athletes were tested on Barrow Motor Ability Test and Footwork Actions Performance Checklist. After 12 treatment sessions, results indicated there are statistically significant interaction between task constraints, and motor ability on fencing basic footwork skills practice. Furthermore, constraints-led practice has significant differences and greater results based on mean score between pre, and post-measurement in the experimental group. Meanwhile, there are some differences between the experimental and control groups affected by motor ability. A constraints-led practice allows to more rationally organize practice in comparison with traditional practice since it had significant effects on fencing basic footwork skills practice. However, more specific implement of motor ability assessment and their relationship with fencing skills may provide an effective development program in fencing.

1 INTRODUCTION

Numerous studies have been published in recent years related to task constraints in skill acquisition (Chow et al., 2007; Glazier and Robins, 2013; Langley, 2001; Renshaw et al., 2013). A number of key themes have emerged from these studies including that success in skill acquisition determined by an athlete's ability and task constraints (Davids, et al., 2013; Ezzat, 2011; Hastie et al., 2017; Renshaw et al., 2013). Skill acquisition requires us to interact effectively with the environment, detect most important information, and response time appropriately.

Ability to coordinate good movements in fencing is necessary, an advanced fencer must be able in order to anticipate incoming attack from the opponent and make decisions. Past studies by (Seifert et al., 2013), although the basic movement patterns in sport performances need to be acquired, there is no ideal motion patterns that someone must possess, there exists no ideal movement template towards which all athletes should aspire, since relatively unique functional movement solutions emerge from the interaction of key constraints. Hence, practices should mainly consist of recreating simulations of the game by not only manipulating practice areas, but also the objectives and rules of play.

Regarding to skills transfer with environmental constraints, (Seifert et al., 2016; Timmerman et al., 2015) showed how individuals solve various motor problems, and exploited the process of general movement transfer positively. So, they can explore information retrieval while performing a movement.

The study of motor ability as it relates to skill acquisition has been emphasized by numerous factors. Some research (Edwards, 2010; McCloy, 2013) emphasized that motor ability referred to genetic nature of person's ability while performing high performance. Motor abilities are interconnected and as a small percentage that depicts individual rank in all his motor skills. Task constraints practice with ball exercise can see in figure 1.

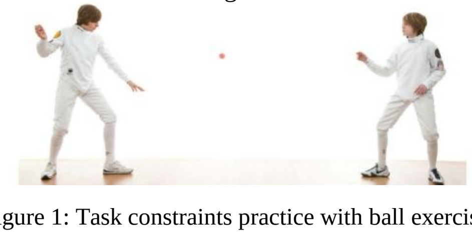

Figure 1: Task constraints practice with ball exercise.

Novan, N., Ma'mun, A. and Nuryadi, N.
Constraints-led Practices and Motor Ability on Basic Footwork Skills Acquisition in Fencing.
In *Proceedings of the 2nd International Conference on Sports Science, Health and Physical Education (ICSSHPE 2017) - Volume 2*, pages 295-298
ISBN: 978-989-758-317-9

In according to skill acquisition process differs from skill execution (motor control) where learning is a gradual process occurs more performance experiments that results less susceptible behavior to temporary factors such as fatigue, audience effects, and anxiety. Therefore, individual focus on constraint-led practices allows coaches to design various games and tasks based on athlete's dynamics and focus on overcoming the constraint levels. Constraints-led practice should provide a meaningful practice and stimulate a person to think critically, able to solve a problem occurred in skill acquisition practice.

The importance of maintaining task performance under challenging conditions reflect how individuals construe competence in a given achievement situation or context. In addition, fencers will spend years preparing footwork skills before the coach permits the to do blade work. Footwork basic skills consist of: En Garde, Advance, Retreat, Lunge and Retreat. Sowerby, (2014) explains that footwork is a foundation of blade work, so it is necessary to spend a lot of practice time to do it correctly. Few studies to date have explored whether aspects of an athlete motor ability provide clues or insight into the factors that influence or affect an athlete's skills acquisition under constraint-led practice conditions. They identified that implicit (errorless) motor learning will be more beneficial for children with low motor skills. As for children with high motor skills are advised to use explicit (errorful) motor learning. (Broadbent et al, 2015; Maxwell et al., 2017)

Consequently, the primary aim of this study was to identify the effect of motor ability and task constraints on basic fencing footwork skill acquisition. A secondary aim was to identify whether the effects of task constraints on high motor ability is better than low motor ability, and to know its interaction in the result of fencing basic footwork skills practice. Data were collected by using performance checklist. Observations were performed directly and reinforced by photos and videos during the treatment sessions. Barrow Motor Ability Test were used to measure motor ability and Footwork Actions performance checklist to observe footwork performance.

2 METHODS

Twenty beginner fencers (15 males and 5 female) participated in this study. The fencers were recruited by using purposive sampling method. The beginner fencers were all current regional standard fencers, training four times per week. All testing was carried out on some fencing clubs in Bandung, such as Bandung All Indonesian Fencing Association Club, and FPOK UPI Fencing School. This study used factorial design.

During the initial testing session, general motor ability was assessed using Barrow Motor Ability Test. Participants were instructed to do footwork actions, and divided into four groups regarding to motor ability levels and task constraint treatment.

Following this, after 12 times practice, footwork skills were assessed using footwork actions performance checklist. Post-test data were analysed during post-test session. For each analysis, the within-subject's factors were examined including motor ability and task constraints treatment. As all treatment conditions were planned, Tukey Test post-hoc procedure was used. With each analysis; Two Way ANOVA; Normality using the Shapiro-Wilk test; Homogeneity of variance was evaluated using Levene Test. The level of significance was set at 0,05, in table 1 below is a factorial design.

Table 1: Factorial Design.

Motor Ability	Treatment	
	Task Constraint (X_1)	Without Constraint (X_2)
High (Y_1)	X_1, Y_1	X_2, Y_1
Low (Y_2)	X_1, Y_2	X_2, Y_2

3 RESULTS AND DISCUSSION

Normality test in this study were analysed using Shapiro-Wilk Test at significance level $\propto = 0.05$ on IBM SPSS 23. Shapiro-Wilk Test were used because the participants less than 50 people. In according to normality test, post-test gain score was normally distributed. Tests of between-subject's effects can see in table 2.

Table 2: Tests of between-subjects Effects.

Dependent Variable: Gain					
Source	*Type III Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Corrected Model	51,600[a]	3	17,200	12,741	,000
Intercept	1216,800	1	1216,800	901,333	,000
X	5,000	1	5,000	3,704	,072
Y	33,800	1	33,800	25,037	,000
*X*Y*	12,800	1	12,800	9,481	,007
Error	21,600	16	1,350		
Total	1290,000	20			
Corrected Total	73,200	19			
a. R Squared = ,705 (Adjusted R Squared = ,650)					

Homogeneity test were analysed using Levene Test at significance level $\propto = 0.05$ on IBM SPSS 23. Results showed that gain score are homogenous.

Hypothesis were analysed using two-way ANOVA on IBM SPSS 23 at significance level $\propto = 0.05$ to identify the influence and interaction between variables. Results showed that all variables have significant differences, (X (motor ability) indicates F value 3,704 > Ft (3,55); Y (task constraints) indicates F value 25,037 > Ft (3,55)) and indicate the existence of interaction between variables (XY indicates F value 9,481 > Ft (3,55)). Therefore, variance analysis goes to post-hoc test.

Post-hoc analysis using tukey test were used to assess significant differences between groups, and to assess significant differences between groups of task constraints variables. Results showed that high motor ability group on task constraints has significant differences between another groups.

Based on two-way ANOVA and post-hoc analysis, results showed that task constraints significantly influence fencing footwork skill acquisition. Supported by (Ezzat, 2011) There are statistically significant differences between the pre, within and post-measurement in all variables of motor abilities test of physical condition description and the level of skill performance of some essential skills in fencing. Post-hoc analysis using tukey test can see in table 3.

Table 3: *Post-Hoc* analysis using *Tukey Test*.

$\bar{X}$		X_2, Y_1	X_2, Y_2	X_1, Y_2	X_1, Y_1
		5,2	7,8	8,8	9,4
$\bar{X}_i - \bar{X}_j$	X_2, Y_1	0	2,6	3,6	4,2
	X_2, Y_2		0	1	1,6
	X_1, Y_2			0	0,6
	X_1, Y_1				0
$Q = \frac{\bar{X}_i - \bar{X}_j}{\sqrt{\frac{KTE}{n}}}$	X_2, Y_1		5,098	7,058	8,235*
	X_2, Y_2			1,960	3,137
	X_1, Y_2				1,176
	X_1, Y_1				0

Skill acquisition task protocols should allow performers to use movement variability to explore and create opportunities for action, rather than constraining them to passively receiving information. (Davids et al., 2013; Renshaw et al., 2013; Seifert et al., 2013)

The analysis of motor variability can provide useful information to characterize motor performance and learning, but this relation has to be addressed in relation to the different motor capabilities of the individuals, either due to their performance level or due to alterations in voluntary movement control (Caballero et al., 2017; Seifert et al., 2014; Tsolakis et al., 2010).

4 CONCLUSIONS

According to various factors that affect in skill acquisition, authors chose to examine the effect of assigning task constraints and athlete's level of motor ability. The notions of motor ability are key source to determine someone in order to advance skills. Whereas constraints-led practice essentially provide modifications in movement tasks that must be performed by athletes.

Learners do not present themselves as a blank slate and that every individual enters a new learning situation with a pre-existing set of physical attributes as well as skill capabilities.

Moreover, interactions with the environment and task constraints in a learning context will shape the emergence of movement behaviour that may or may not meet the task goal.

Nevertheless, in this study, constant practice produces greater performance improvement in tasks with more complex environmental demands (i.e. open skills). Although these findings initially seem to be opposite to previous results found in literature about the benefits of variable practice in open skills.

REFERENCES

Broadbent, D. P., Causer, J., Williams, A. M., Ford, P. R., 2015. Perceptual-cognitive skill training and its transfer to expert performance in the field: Future research directions. *European Journal of Sport Science*. *15*(4), 322–331.

Caballero, C., Moreno, F. J., Reina, R., Roldán, A., Coves, Á., Barbado, D., 2017. The Role of Motor Variability in Motor Control and Learning Depends on the Nature of the Task and The Individual's Capabilities.

Chow, J. Y., Davids, K., Button, C., Shuttleworth, R., Renshaw, I., Araujo, D., 2007. The Role of Nonlinear Pedagogy in Physical Education. *Review of Educational Research*. *77*(3), 251–278.

Davids, K., Araújo, D., Correia, V., Vilar, L., 2013. How Small-Sided and Conditioned Games Enhance Acquisition of Movement and Decision-Making Skills. *Exercise and Sport Sciences Reviews*. *41*(3), 154–161.

Davids, K., Araújo, D., Vilar, L., Renshaw, I., Pinder, R. 2013. An ecological dynamics approach to skill acquisition: Implications for development of talent in sport. *Talent Development and Excellence*. *5*(1), 21–34.

Edwards, W. H., 2010. *Motor Learning and Control From Theory to Practice*, Wadsworth. Belmont, CA.

Ezzat, N., 2011. Performance of Some Attack and Parry

Skills in Fencing Sport. *World Journal of Sport Sciences*. *5*(2), 125–130.
Glazier, P. S., Robins, M. T., 2013. Self-organisation and constraints in sports performance. *Routledge Handbook of Sports Performance Analysis*. (May), 42–51.
Hastie, P. A., Ward, J. K., Brock, S. J., 2017. Effect of graded competition on student opportunities for participation and success rates during a season of Sport Education. *Physical Education and Sport Pedagogy*. *22*(3), 316–327.
Langley, D. J., 2001. The influence of functional constraints on sport-skill learning in a senior adult. *Journal of Aging and Physical Activity*.
Maxwell, J. P., Capio, C. M., Masters, R. S. W., 2017. Interaction between motor ability and skill learning in children: Application of implicit and explicit approaches. *European Journal of Sport Science*. *17*(4), 407–416.
McCloy, C. H., 2013. The Measurement of General Motor Capacity and General Motor Ability. *Research Quarterly. American Physical Education Association*. *5*(February 2015), 46–61.
Renshaw, I., Yi Chow, J., Davids, K., Hammond, J., Chow, J. Y., 2013. *A constraints-led perspective to understanding skill acquisition and game play: a basis for integration of motor learning theory and physical education praxis? Physical Education & Sport Pedagogy*. (Vol. 9).
Seifert, L., Button, C., Davids, K., 2013. Key Properties of Expert Movement Systems in Sport. *Sports Medicine*. *43*(3), 167–178.
Seifert, L., Komar, J., Barbosa, T., Toussaint, H., Millet, G., Davids, K., 2014. Coordination Pattern Variability Provides Functional Adaptations to Constraints in Swimming Performance. *Sports Medicine*. *44*(10), 1333–1345.
Seifert, L., Wattebled, L., Orth, D., L'Hermette, M., Boulanger, J., Davids, K., 2016. Skill transfer specificity shapes perception and action under varying environmental constraints. *Human Movement Science*. *48*, 132–141.
Sowerby, A., 2014. *Fencing: Skills, Techniques, Training*, The Crowood Press Ltd 2011. Ramsbury, Marlborough.
Timmerman, E., Water, J. De, Kachel, K., Reid, M., Farrow, D., Savelsbergh, G., 2015. The effect of equipment scaling on children's sport performance: the case for tennis. *Journal of Sports Sciences*. *33*(10), 1093–1100.
Tsolakis, C., Kostaki, E., Vagenas, G., 2010. Anthropometric, Flexibility, Strength-Power, And Sport-Specific Correlates In Elite Fencing [1]. *Perceptual And Motor Skills*. *110*(3c), 1015–1028.