

高度な身体スキルの熟達評価に関する検討 ～走方向転換動作に注目して～

A study on the Assessment of Proficiency in Advanced Physical Skills Focus on Acquiring Movement Skills for Changing Running Direction

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Abstract

It was reported that the evaluation of the skills for changing running direction which this study focuses on would require more than physical motions and speed as its evaluation methods. As just described, evaluation methods for the mastery of advanced physical skills still face many challenges. The purpose of this study was to discuss the assessment of proficiency in advanced physical skills by focusing on the coaching of the skills for changing running direction under sports settings. In discussion, it was found that the evaluations of the mastery of physical skills could receive a certain level of positive assessment in terms of the presence of mastery but, at the same time, had much room for consideration in respect of the degree of mastery. In addition, it was indicated that the learner's self-evaluation might be affected by the instructor's evaluation.

Keywords: advanced physical skills, assessment of proficiency, changing running direction

1. Introduction

In the cognitive science field, while studies on the mastery of physical skills have been accumulating many findings, most of their analytical approaches are those analyzing physical motions observable from outside[1]-[5]. These are positioned as the core of biomechanics that explores exercises from mechanical aspects, and attentions have been paid to the quantitative analysis of physical motions using a measuring device.

No one will take objection to an argument that the

analysis of physical motions as objective indexes are effective evaluations as a scientific method. Meanwhile, more advanced physical skills make it more difficult for study participants to wear a measuring device for data collection, leaving a lot of challenges such as time of day and location for measurement. Further, the more advanced physical skills become, the more complicated evaluation methods for their mastery become. For example, it was reported that the evaluation of the skills for changing running direction which this study focuses on would require more than physical motions and speed as its evaluation methods[6][7]. As just described, evaluation methods for the mastery of advanced physical skills still face many challenges.

With this background, the purpose of this study is to discuss the mastery of advanced physical skills by focusing on the coaching of the skills for changing running direction under sports settings.

2. Method

2.1 Physical Skills Subject to Analysis

This study focused on cases where the skills for changing running direction that had been already automated were dialed back again to the level of cognitive learning. In goal-oriented ball games including basketball and rugby, sprinting can be regarded as an important physical skill that makes the difference between winning and losing. In the meantime, players are expected not only to run faster but to, for reacting to their opponents' movements, repeatedly make such movements as slowing down, suddenly stopping

and then restarting in every direction. Therefore, the evaluations of mastery including how suddenly players can stop, quickly change the direction, and explosively accelerate will become complicated.

2.2 Survey Period and Surveyed People

The survey was conducted for 3 months from August 29, 2020 to November 28, 2020 and those surveyed were 8 university freshmen belonging to women's basketball club of M University designated as a promising sports club by it(refer to Fig.1). During the survey, 1 student withdrew from it due to reasons including her injury and accordingly 7 female basketball players were subject to analyses (their average age was 18.4 as of August 29, 2020).



Fig. 1 View of changing running direction

2.3 Self-Evaluation Method Employed by Players

In laboratory experiments in which factors for novice players are controlled, it is often easy to collect quantitative data because their physical skills change greatly and large difference. Meanwhile, this study focuses on cases where the skills for changing running direction that had been already automated for experienced players were dialed back again to the level of cognitive learning and accordingly their physical skills are thought to be at a certain level even before the survey. Thus, it becomes necessary to make efforts for quantitatively collecting the data on the mastery level of the skills because of small difference.

Skills herein refer to the ability to resolve challenges which can be acquired through experiences and trainings[8][9]. In the field of sports, it is common for athletes to willingly understand instruction contents given by their coach and proactively make efforts for resolving challenges regarding their individual physical skills in view of the present in order to get closer to the ideal.

With understanding differences between self-evaluations in the players' practicing the skills for changing running direction and those before the practice as changes in their skill acquirement, self-evaluations after the actual practice were compared with those before it with three answer choices such as “(-1) Getting Worse”, “(0) No Change” and “(+1) Getting Better” and then temporal changes in the degree of skill acquirement were evaluated by quantitatively collecting self-evaluations by the players[10][11].

That is, a positive cumulative total value obtained by this evaluation means that challenges regarding the skills for changing running direction have been resolved while a negative one means that they have not been resolved(refer to Fig.2).

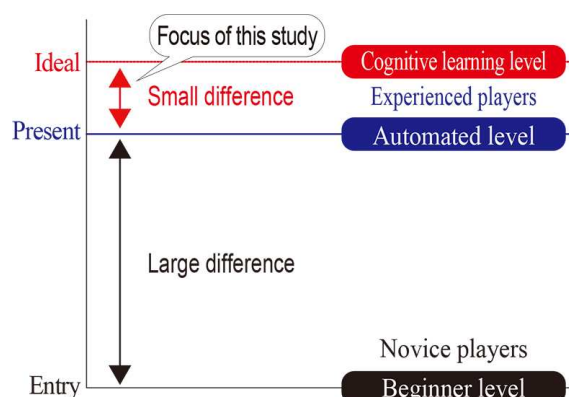


Fig. 2 Devising a proficiency assessment for experienced players

2.4 Instructor and Evaluation Method Employed by Instructor

An instruction on the skills for changing running direction was provided by the second author (hereinafter “Instructor”). The second author's instruction records are explained as follows: A skill acquisition process consisting mainly of muscle strength

trainings may harden the body of an exerciser because such trainings will place a load on the body and narrow its range of movement. For this reason, with the aim to depart from the instruction style emphasizing muscle strength trainings, Instructor produces physical movements centering on the body modification tailored to the characteristics of a relevant sport and relaxation, leading a high school girl's basketball team to the national tournament for 7 times. In addition, he assumed the coaching position of the prefectural girl's team for the National Athletic Meeting (won the championship), served as the head coach of U18 Japan's girls national basketball team for Japan-China-ROK Junior Exchange Games (won the championship), and so on.

Instructor visually examined a video in which the respective players practiced the skills for changing running direction before and after the survey and then quantitatively gave evaluations on a scale 1 to 10. As evaluation items, instructed contents such as (i)Position of Center of Gravity, (ii)Shift in Center of Gravity, (iii)Grounding Position of Feet, (iv)Landing, (v)Posture, (vi)Pelvis, (vii)Stride, (viii)Tension in Shoulder, (ix)How to Swing Arms, (x)Movement to Stop, (xi)Speed, (xii)Vision and (xiii)Restarts in Same Direction were set and the players were evaluated based on their total scores.

- (i) Position of Center of Gravity: To keep the center of gravity as high as possible and maintain the angle of knees wide by not bending them too much
- (ii) Shift in Center of Gravity: To avoid the movements to kick the floor hard and raise thighs as much as possible and move naturally by shifting the center of gravity to the moving direction; To relax in starting particularly
- (iii) Grounding Position of Feet: To move with turning the pelvis sideways; To make the grounding positions of feet a straight line
- (iv) Landing: To land the foot right below the center of gravity in moving; To land with the entire sole at once
- (v) Posture: Regarding the posture in moving, not to plunge the upper body forward by crouching the back too much
- (vi) Pelvis: To move with maintaining the pelvis par-

ticular to the moving direction so that the pelvis will not open

- (vii) Stride: To move with turning the body sideways and following the center of gravity; To enhance the flexibility of the hip joint in order to make a stride wide
- (viii) Tension in Shoulder: To reduce the strong tension in the shoulder when swinging arms in starting and engaging in the skills for changing running direction
- (ix) How to Swing Arms: To control the relaxation of shoulders and arms as forward as possible; Not to produce a movement to strongly pull the elbow backward
- (x) Movement to Stop: Instead of stopping with the "one-two" rhythm, to stop the timing of "one" for smoothly shifting to the center of gravity to the next change of direction
- (xi) Speed: To produce a fast, dynamic and energetic movement
- (xii) Vision: To basically direct the vision to the opposite side of the moving direction and widely see a position higher than the eye level because basketball is a sport developing into all directions and therefore it is important to change the vision in engaging in the skills for changing running direction
- (xiii) Restarts in Same Direction: From smooth stops and slowdowns, to control the change in acceleration and speed when restarting in the same direction

3. Result

3.1 Temporal Change in Self-Evaluation by Players

Fig.3 illustrates temporal changes in self-evaluations by the players. Concerning the shifts in scores, self-evaluations given by 6 players - A, B, C, D, F and G - presented positive values. In the meantime, the self-evaluation of Player E resulted in a negative value.

3.2 Evaluation by Instructor

Fig.4 indicates the results of evaluation quantitatively given by Instructor. Regarding the total scores

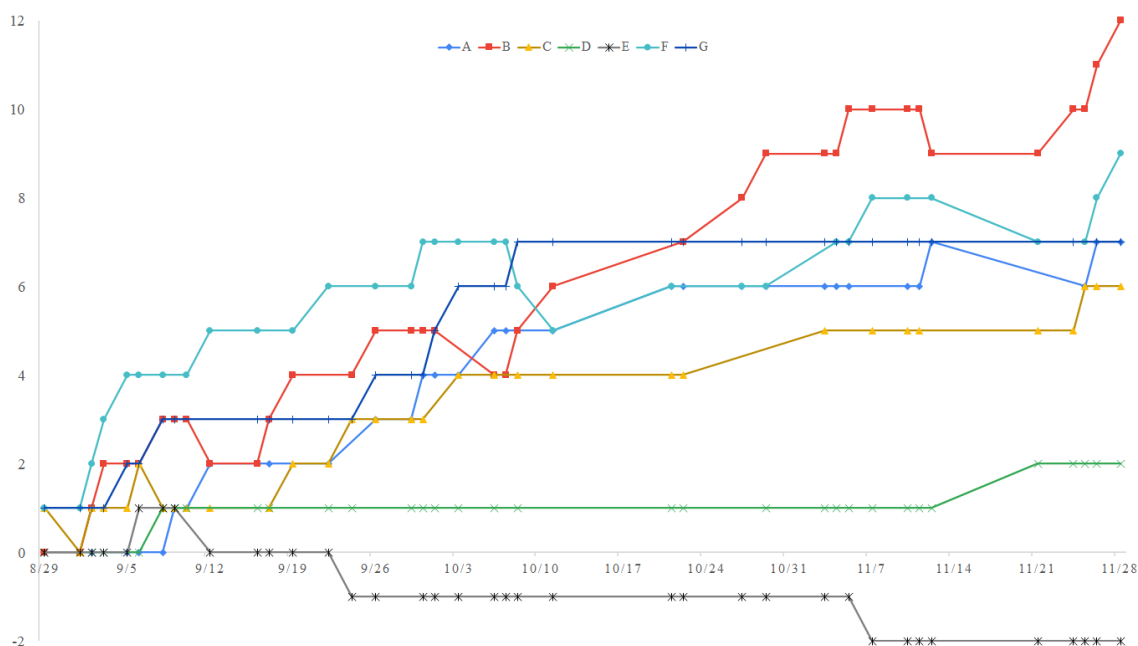


Fig. 3 Temporal change in self-evaluation by players

Evaluation Items			(i) Position of Center of Gravity	(ii) Shift in Center of Gravity	(iii) Grounding Position of Feet	(iv) Landing	(v) Posture *	(vi) Pelvis	(vii) Stride *	(viii) Tension in Shoulder *	(ix) How to Swing Arms	(x) Movement to Stop	(xi) Speed *	(xii) Vision	(xiii) Restarts in Same Direction *	(xiii) Total Scores*
	Before	After														
A	Before	After	5	6	4	5	4	4	6	5	5	6	6	6	5	67
			6	7	4	5	6	5	7	6	6	6	7	6	6	77
B	Before	After	4	4	6	5	4	6	6	5	6	6	5	6	5	68
			4	5	5	6	6	7	6	6	5	4	6	6	8	74
C	Before	After	3	6	5	6	3	5	6	5	6	7	6	4	6	68
			5	7	8	5	6	8	7	7	7	8	7	6	7	88
D	Before	After	6	6	6	3	3	6	4	5	4	5	3	4	6	61
			6	5	6	6	6	7	6	5	6	6	5	6	6	76
E	Before	After	6	6	5	5	6	6	4	6	6	5	4	6	4	69
			5	5	5	5	6	4	4	6	6	7	4	6	5	68
F	Before	After	5	5	5	5	6	6	6	5	5	5	6	6	4	69
			6	5	6	5	6	7	7	6	6	4	7	6	5	76
G	Before	After	6	4	5	4	6	3	3	5	5	4	4	6	5	60
			6	6	4	5	7	4	5	7	6	6	5	6	6	73

* $P < 0.05$

Fig. 4 Evaluation by instructor

for 13 items, it was shown that the total scores of 6 players - A, B, C, D, F and G - after the survey increased compared with those before it. Meanwhile, the total score of Player E was a negative value. The analysis of evaluations before and after the survey using a (paired) t-test found a significant difference in 6 items: (v) Posture, (vii) Stride, (viii) Tension in shoulder, (xi) Speed, (xiii) Restarts in Same Direction and (xiv) Total Scores ($df=6$, $p>.05$).

4. Discussion

Regarding the mastery of 6 players whose self-evaluation and evaluation given by the instructor both presented a positive value, the evaluation result found a difference between the degree of such evaluations. For instance, whereas a player's self-evaluation was +12 being the greatest temporal change among all the players, the degree of her mastery was smaller compared to other players in terms of the evaluation given by the instructor who gave her the scores of 68 (before the survey) and 74 (after the survey). This is assumed to be because motions which a learner imagines in her mind and actual ones are different. Therefore, whether a player's physical skills have been improved or not (inhibited mastery) can be discussed, but there is room for consideration about how to evaluate the degree of mastery such as collecting data through multiple-choice questions dealing with evaluation items identical with 13 items implemented by the instructor.

Next, Player E is going to be discussed whose evaluation given by the instructor presented a negative value in comparison between before and after the survey as well as in her self-evaluation (-2). As for Player E, her self-evaluation and the instructor's one agreed in that both of them presented a negative value. Here, among the instructor's evaluation items for Player E, attentions are paid to (1) Position of Center of Gravity and (2) Shift in Center of Gravity. Based on the instructor's evaluation, Player E was the only player given a negative value regarding both the evaluation items (1) and (2) on the center of gravity.

In this study, along with quantitative self-evaluations for the skills for changing running direction, at the earliest possible stage after every practice of their change-of-direction performance, the players

were instructed, using Google Forms, "Please freely enter how you have thought and felt after practicing the skills for changing running direction as well as your current impression of the way to move your body and the details of physical sensations". Then, SCAT (Steps for Coding and Theorization)[12], a qualitative analytical method, was used for coding. While details on the analyses of verbal reports are skipped due to a space constraint herein, as for "center of gravity experiment factor" being the contents regarding the experience of shift in and position of center of gravity, analytical findings showed that such factors were generated more frequently in the verbal reports of Player E than other players (refer to Appendix A). From a quantitative analysis on the outlier of the number of generated factors by player, it was judged that Player E was the outlier for the center of gravity experiment factor, leading to the conclusion that regarding the center of gravity the instructor's evaluations and the players' ones were thought to be almost agreed. Coaching cannot exist without interactions between an instructor providing verbal instructions while adding gestures from time to time (sender of information) and an athlete proactively learning relevant skills from the instructor (receiver of information). Thus, it was suggested that evaluations given by the instructor every day were correlated with athletes' evaluations on their physical skills.

5. Conclusion

The purpose of this study was to discuss the mastery of advanced physical skills by focusing on the coaching of the skills for changing running direction under sports settings. In discussion, it was found that the evaluations of the mastery of physical skills discussed above could receive a certain level of positive assessment in terms of the presence of mastery but, at the same time, had much room for consideration in respect of the degree of mastery. In addition, it was indicated that the learner's self-evaluation might be affected by the instructor's evaluation. Future challenges include the addition of visual evaluations by a third party (athletic trainer or others).

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A Center of Gravity Experience Factor

As shown in the plot graph (refer to Fig.A), as far as "Center of Gravity Experience Factor" is concerned, there was a tendency for the verbal reports of Player E to generate it more frequently than those of other players.

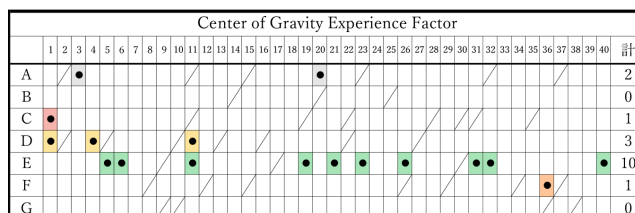


Fig. A A plot graph in Center of Gravity Experience Factor