

SKILL LEVEL AND PARTICIPATION OF UNIVERSITY STUDENTS IN RECREATIONAL SPORT

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This study investigated the relationship between throwing skill level and the engagement of college students in sports involving an element of throwing. There is a lack of knowledge about the throwing level of typical college students, and how this skill level influences students' participation in physical activity. 54 undergraduate students were qualitatively analysed performing the overarm throw and the volleyball serve, and completed questionnaires detailing their engagement in sports involving an element of throwing. Results indicated that college students are not proficient at throwing and that a higher throwing skill level is correlated with better serve form. Throwing skill level was not related to engagement in sports involving an element of throwing.

KEY WORDS: fundamental movement skill, overarm throw, physical activity

INTRODUCTION: An underlying concept in motor development is that the failure to develop proficient fundamental movement skills, such as throwing, will limit involvement in sports that utilise related skills, such as tennis (Gallahue & Ozmun, 2002). Proficiency is defined as the basic movement form that all learners can and should reach (Gallahue & Ozmun, 2002). A recent longitudinal study in Australia has reported that adolescent fitness levels, physical activity engagement and perceived competence may be positively influenced by the development of proficient object control skills (Barnett et al., 2008). Qualitative ratings of movement form at age 10 were significantly correlated to a questionnaire-based measure of physical activity taken 6 years later.

University education may have an important role to play in the development of an active population as it provides subsidised access to a wide range of sporting activities (Lunn, 2007). Although some research has investigated university students' physical activity (Staten et al., 2003; Suminski et al., 2002), the focus has been on factors such as the availability of facilities and physical activity promotion initiatives. No research was identified linking the effect of fundamental movement skill proficiency to sport participation in college students.

Limited research has looked at the fundamental movement skills of adults. In terms of throwing, Leme & Shambes (1978) qualitatively assessed 18 female adult students, selected on the basis of having a poor release velocity, and found all to have less than proficient throwing patterns. Rose & Heath (1990), utilising the same qualitative method as the present study, also found less than proficient throwing form typical of a sample of male and female college participants enrolled in tennis lessons. Without opportunity for practice and/or specialist instruction, it appears that low levels of throwing form will be maintained into adulthood (Haywood & Getchell, 2001). No quantitative studies were identified, however it is likely that as many children are not reaching fundamental movement skill proficiency, they will not be proficient as adults (Stodden et al., 2008).

Stodden et al. (2008) suggested that "If children cannot proficiently run, jump, catch, throw, etc., then they will have limited opportunities for engagement in physical activities later in their lives because they will not have the prerequisite skills to be active" (p. 291). The present study seeks to test this statement with regard to the throwing ability and engagement in sports involving throwing of a subset of Irish first year university students. Throwing was selected as it underlies a large number of sport skills (in volleyball, badminton, tennis, etc).

METHODS: Data Collection: 54 first year students volunteered to participate in the study (mean age 19.54 years). Ethical approval was obtained from the Physical Education & Sport Sciences department research ethics committee (PESSREC 61/07). Participants were free of injury assessed using standard pre-test questionnaire.

Procedures: Participants performed a self-directed general warm up. For the overarm throw and the volleyball serve similar procedures were observed. The task-specific protocol was explained. A pre-recorded demonstration of a proficient performer was observed. Five practice trials were performed followed by five recorded trials. A single camera (JVC Everio 50Hz) was placed perpendicular to the direction of the action on the throwing/striking side at a distance of 6m. Inter-trial interval was at least 30 seconds. Throws were towards an A3 sheet placed vertically on a wall 14m distant centred at a height of 1.80m. Participants were informed that accuracy was not being measured, and the goal of the task was to throw as fast as possible. A radar gun (Stalker™ ATS) was used to measure throwing speed. Before each throw participants were encouraged to throw “as hard as you can”. Participants served towards a marked area (3m²) in the centre-rear of the opposite court over a net of height 2.24m. Finally participants completed two questionnaires detailing both their present and past involvement in sports involving an element of throwing.

Table 1. Component actions for the volleyball overhead serve

Component	Level	Description
Foot action	1	Feet together or homolateral step taken
	2	Contralateral foot forward, no step taken
	3	Contralateral foot forward, step taken or pronounced weight shift
Trunk action	1	No rotation, flexion-extension only
	2	Blocked rotation, ball contact before front facing
	3	Blocked rotation, ball contact at or after front facing
Backswing action	1	Shoulder remains in a horizontally adducted position
	2	Shoulder horizontal abduction, shoulder abduction less than 90°
	3	Shoulder horizontal abduction, shoulder abduction greater than 90°
Forearm action	1	No forearm lag
	2	Forearm lag, maximum lag before front facing
	3	Delayed forearm lag, maximum lag after front facing
Contact point	1	Ball contacted behind shoulder or greater than one ball width ahead of shoulder
	2	Ball contacted above shoulder, elbow extension less than 150°
	3	Ball contacted above shoulder, elbow extension greater than 150°

Data Analysis: Video was analysed using the component approach (Robertson & Halverson, 1984). The lead author reduced the video data after establishing intra-individual objectivity following the procedure outlined by Robertson (1977). Four weeks after final data reduction 25 trials were randomly selected and categorised a second time. Intra-observer agreement ranged from 94-100%, in excess of the 80% agreement typically required (Robertson, 1977). For ease of comparison, participants were defined as Proficient (all components at proficient level), Moderate (all but two components at proficient level) or Poor (more than two components less than proficient level) based on their summed component scores (O’Keeffe, 2001). The volleyball serve was analysed in a similar manner following a qualitative checklist (Table 1) devised following the main teaching points of the skill as identified by Viera & Ferguson (1996). The activity questionnaires asked the participants to detail which throwing-related sports they had engaged in (a) at any time previously, and (b) during the previous college semester. Participants who indicated participation were asked to (i) rate their perceived skill level on a Likert-type scale (1 = poor, 5 = excellent), and (ii) to identify how often they participated in the sport in question. Activity in throwing sport was classified as participating greater than or equal to four times per month in one or more throwing related activities. This figure was chosen as it represents the minimum frequency of training for throwing-related sports clubs within the university.

Statistical Analysis: Kendall's tau was used to investigate the relationship between throwing form and volleyball serve form as both data sets were ordinal in nature, and there were a moderate number of tied ranks. Fisher's exact test was used to examine the relationship between throwing skill level and engagement in sports involving an element of throwing. Independent t-tests examined the relationship between throwing speed and engagement in sports involving an element of throwing. Alpha was set to 0.05.

RESULTS: Of the 51 participants, only 3 (all male) demonstrated proficiency in the overarm throw (Figure 1). Kendall's tau indicated that individuals who scored higher on throwing form also scored higher on volleyball form, $\tau(49) = 0.467, p < .01$. 38% of respondents were classified as being active in throwing-related activities. 25.5% of participants had never engaged in throwing-related activity during the semester. There was no relationship between throwing form and being active in a throwing related sport, $p = 0.301$, Fisher's exact text. Active males ($M=26.05, SE=1.29$) threw faster than inactive males ($M=23.88, SE=0.77$), $t(24)=-1.528$, and active females ($M=16.49, SE=1.03$) threw faster than inactive females ($M=14.84, SE=0.63$), $t(18)=-1.409$, but these differences were not significant, $p>0.05$.



Figure 1. The number of participants attaining each skill level as defined by O’Keeffe (2001). The mean throwing velocities by skill level and by gender are listed over each subgroup.

DISCUSSION: Many authors (e.g., Gallahue & Ozmun, 2002; Haywood & Getchell, 2001) have argued that most children have the potential to be proficient in throwing by six to seven years of age. Only three participants in the current study demonstrated proficiency, as defined by Robertson & Halverson (1984). The mean throwing speeds obtained supported this finding: values were comparable to those previously reported for 13-year old children (Ehl et al., 2005) for males, and were even poorer for females.

Third level education is an important factor in the development of a sporting population, offering a wide range of subsidised opportunities to participate (Lunn, 2007). A less than proficient throwing pattern, as demonstrated by this population of college students, is suggested to present a barrier to their engagement in sports involving an element of throwing (Stodden et al., 2008). The present research did not support this suggestion. Participants with a higher throwing skill level were not more likely to participate in a sport involving an element of throwing than their less skilled peers. A number of factors may have contributed to this finding: (a) it is possible to participate recreationally in many sports that incorporate an element of throwing, such as badminton or volleyball, without utilising overarm strokes or without using a proficient action, (b) limitations in estimating physical activity from recall, and (c) participants demonstrating proficient throwing actions may not participate in throw-related sports due to a preference for alternative sports. General engagement in physical activity was not measured in this study. A further limitation was in the small number of proficient throwers located. The finding that participants who manifested higher form on the throw also

tended to show higher form on the serve suggests that having a proficient fundamental movement skill may be an advantage when attempting to learn a novel sport skill, but that its importance to continuing participation may be diluted with respect to other factors. Skill level is only one of a multitude of interacting factors affecting participation (Barnett et al., 2008). Future research must make an attempt to tease out the influence of these different factors.

CONCLUSION: The majority of a sample of young Irish adults had not reached proficiency in the overarm throw. Individuals who performed better on the overarm throw tended to also perform better on the volleyball serve. There was no relationship between throwing ability and engagement in throw-related sport. The role of fundamental movement skills in participation in sports involving an element of those fundamental skills may be better assessed through direct observation of performance rather than through questionnaire-based assessments of participation.

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