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The Correlation between Balance and Performance in Collegiate Swimmers

Sam Eshuis

Jennifer Leichty

Gabrielle Spanger

Viviana Giesen

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Samuel Eshuis, Jennifer Leichty, Gabrielle Spangler, Viviana Giesen
Faculty Mentor: Maureen Dunn
Kinesiology, Hope College

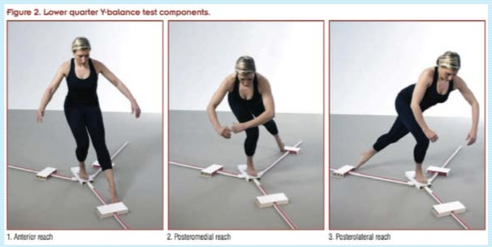
Abstract

Balance has been shown to enhance athletic performance in certain sports. However, research regarding balance and swim performance is limited, and the relationship is therefore unclear. This study was designed to determine whether a relationship exists between balance ability and swim performance of male and female Hope College swimmers (n=23). It was hypothesized that greater balance ability in swimmers would be positively correlated with faster swim times, which could be a benefit to swim-training programs in the future. A balance plate and Y-Balance test (Upper and Lower Quarter) were utilized to assess swimmer balance. The following static force plate stances were used: feet parallel with eyes open (FPEO), feet parallel with eyes closed (FPEC), left foot forward tandem with eyes open (LTEO), and left foot forward tandem with eyes closed (LTEC). The race times used for correlational analysis included: the 50m Freestyle, 100m Freestyle, 500m Freestyle, and 100m Backstroke. Significant correlations were found between FPEO velocity and the 50m Freestyle ($p<0.01$, $R=0.845$), 100m Freestyle ($p<0.01$, $R=0.762$), and 500m Freestyle ($p=0.025$, $R=0.708$). However, there were no significant results between race times and FPEO area. Significant results were also found between right arm dynamic balance scores and the 100m Freestyle ($p=0.012$, $R= -0.557$), 500m Freestyle ($p=0.016$, $R= -0.750$), and 100m Back ($p=0.039$, $R= -0.653$). Additionally, left arm dynamic balance scores were significant for the 100m Freestyle ($p=0.012$, $R= -0.561$) and 500m Freestyle ($p=0.022$, $R= -0.719$). Lastly, there were no significant results found between lower limb dynamic balance scores and race times. While further research is necessary to determine cause and effect, moderate evidence was found to support the relationship between balance and performance in collegiate swimmers.

Introduction

- ❑ Correlation between balance ability and sports performance in high-level athletes[1-3]
  - Gymnasts, hockey players, dancers
  - Athletes greater than non-athletes[4] and males greater than females[5-6] for Y-Balance test
  - Sports that utilize upper body dynamic balance, such as golf, benefit from balance training[7]
  - Also gained strength and flexibility along with balance, which could better performance
- ❑ Scarcity of research on swim performance and balance training[5]
  - High school vs. collegiate swimmers

http://philplisky.com/using-the-upper-quarter-y-balance-test-for-return-to-sport-testing/#.WiioVLaZPVo



https://www.functionalmovement.com/store/23/y_balance_test_kit

References

1. Behm DG, Wahl MJ, Button DC, Power KE, Anderson KG. Relationship Between Hockey Skating Speed and Selected Performance Measures. J Strength Cond Res.
2. Hrysomallis C. Balance ability and athletic performance. Sports Med. 2011;41(3):221-32.
3. Schmit JM, Regis DI, Riley MA. Dynamic patterns of postural sway in ballet dancers and track athletes. Exp Brain Res. 2005;163(3):370–8.
4. Sugiura H, Demura S, Kitabayashi T, Shimoyama Y, Sato D, Xu N, et al. Characteristics of static and dynamic balance abilities in competitive swimmers. Am J Sports Med. 2014Aug;2(6):208–11.
5. Bullock GS, Brookreson N, Knab AM, Butler RJ. Examining fundamental movement competency and closed-chain upper-extremity dynamic balance in swimmers. J Strength Cond Res. 2017;31(6):1544–51.
6. Butler R, Arms J, Reiman M, Plisky P, Kiesel K, Taylor D, et al. Sex differences in dynamic closed kinetic chain upper quarter function in collegiate swimmers. J Athl Train. 2014;49(4):442–6.
7. Lephart SM, Smoliga JM, Myers JB, Sell TC, Tsai Y-S. An eight-week golf-specific exercise program improves physical characteristics, swing mechanics, and golf performance in recreational golfers. J Strength Cond Res. 2007;21(3):860.

Purpose

The purpose of this study was to determine whether a relationship exists between balance ability and collegiate swimmer performance (race times), through use of a balance plate, Upper Quarter Y-Balance test, and Lower Quarter Y-Balance test to assess swimmer balance

Methods

	Testing			
Familiarization	Warm up	Upper Body Y Test	Balance plate *Feet parallel* *Left foot tandem*	Lower Body Y test

Subjects:
- ❑ 23 Hope College swimmers were recruited via email, online survey, and through the swim coach encouragement

Familiarization:
- ❑ All subjects completed a health history form, PARQ+, and provided written informed consent
- ❑ Baseline measurements included:
  - ❑ height, weight, right arm length, and resting blood pressure.
- ❑ Participants were introduced to the three balance tests

Testing:
- ❑ Reassessed participants weight and resting blood pressure
- ❑ Warm up
- ❑ Upper Quarter Y Balance Test (three trials for all three directions) → Balance plate (EO/EC for feet parallel and left foot tandem)→ Lower Quarter Y Balance Test (three trials for all three directions)

Table 1.
Relationship between race times and Y-Balance tests.

Race	Limb	*p* value	Correlation (r)
100 Free	Right arm	0.012*	-0.557
	Left arm	0.012*	-0.561
	Right leg	0.485	0.010
	Left leg	0.199	-0.227
500 Free	Right arm	0.016*	-0.750
	Left arm	0.022*	-0.719
	Right leg	0.289	-0.233
	Left leg	0.463	0.039
500 Back	Right arm	0.039*	-0.653
	Left arm	0.057*	-0.601
	Right leg	0.419	-0.086
	Left leg	0.409	-0.097

***p<0.05**

Table 2.
Relationship between race time and static balance velocity.

Race	Stance	*p* value	Correlation (r)
100 Free	FPEO	0.000*	0.762
	FPEC	0.002*	0.677
	LTEO	0.071	0.384
	LTEC	0.129	0.300
50 Free	FPEO	0.000*	0.845
	LTEO	0.154	0.307
500 Free	FPEO	0.025*	0.708
	LTEO	0.111	0.485
100 Back	FPEO	0.178	0.378
	LTEO	0.382	0.127

***p<0.05**
Legend: FPEO, Feet parallel eyes open; FPEC, Feet parallel eyes closed; LTEO, Left tandem eyes open; LTEC, Left tandem eyes closed.

Results

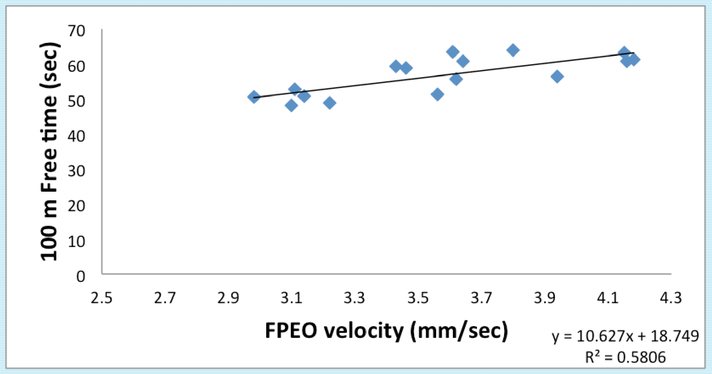


Figure 1. Individual race times from the 100-meter freestyle versus velocity of feet parallel eyes open position on force plate. A significant positive correlation exists between FPEO velocity (mm/sec) and the 100-meter freestyle (sec) ($p<0.05$).

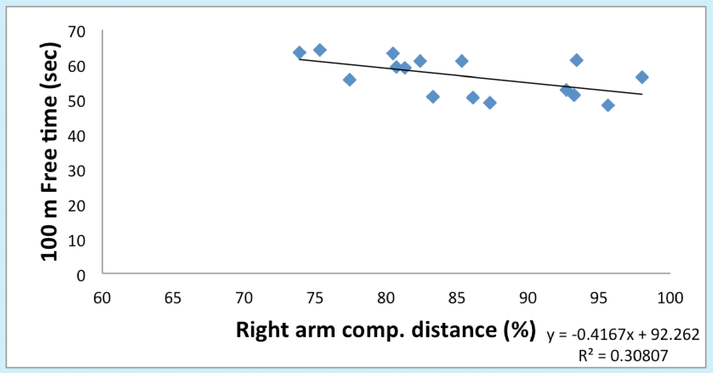


Figure 2. Individual race times for the 100-meter freestyle versus right arm composite distance for the upper body Y-balance test. A significant negative correlation exists between the two variables ($p<0.05$).

Conclusions

- ❑ Static balance only significant in velocity for feet parallel positions (50, 100 & 500 Free, 100 Back), not area or tandem positions
  - Strongest correlation with 50 Free
- ❑ Dynamic balance only significant in upper body for all races (100, 500 Free and 100 Back) except one race for the left arm (100 Back)
  - Strongest correlation with 500 Free
- ❑ Correlations found between balance and swim performance, warranting future balance training study to see if balance alone yields better swim times

Limitations

- ➢ Small sample size
- ➢ Only Hope College swimmers
- ➢ Larger number of females than males

Implications

- ➢ It could be beneficial for collegiate swimmers to incorporate balance training into their normal practice training/regiment
- ➢ Additional research is necessary to further clarify the relationship between balance ability and swim performance