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Does a Higher Motivation Score Predict a Bigger Increase in 2km Ergometer times in
Female Collegiate Rowers?

Kaitie McHugh

Abstract

Introduction. A collegiate athlete's schedule is typically busier than a college student, requiring time for practice, competition, training, as well as normal college student responsibilities. Because their schedules are so busy, athlete motivation is a key determinant for sustained and improved performance. **Methods.** This study was a pre and post correlation study. In fall 2016, participants completed a pre and post SMS-28 questionnaire and a 2km ergometer aerobic capacity test. Collegiate Female Rowing team was recruited with 13 participants (ages 18-22). 4 weeks later, 7 participants filled out the SMS-28 questionnaire, based on a Likert Scale, and performed the 2km test. **Results.** The main finding of this study was the correlation between pre-motivation scores and difference in test times was measured by a correlation test with the following result; $r=.220$, $p=.636$, showing no significance. Secondary findings showed significant difference between pre-motivation and post-motivation scores and significant differences between test 1 time and test 2 times. Lastly, there is significance between years of experience and pre 2km times, which means rowers with less than a years experience of rowing will have significantly different 2km ergometer times compared to rowers with over a years experience. **Discussion.** The major findings concluded that there was no significant relationship between pre-motivation scores and 2km ergometer times. Secondary measures concluded that there was significant difference between pre-motivation and post-motivation scores and significant differences between test 1 times and test 2 times. Lastly, there is significance between years of experience and pre 2km times. **Conclusion.** From this study, it can be assumed that motivation levels will not predict increases in performance for a 2k-ergometer test in Female collegiate rowers. Training age, sample size, dropout rate, and scheduling of the second test could be influences on the data collected for the second round of testing.

Introduction

Motivation is a key component of athletic performance in all levels of athleticism and sports according to Clancy, Herring, MacIntyre, & Campbell (2016). There are subscales of intrinsic and extrinsic motivation and knowing the difference between them, as a coach and sports psychologist could be the difference between a winning and losing season. Intrinsic motivation has been shown to provide a higher level of success and achievement in athletes and sustain human performance. Having a higher level of intrinsic motivation can determine the athlete's internal desire to exceed expectations and continue to compete. It can also determine continued improvement in their training. According to Gillet, Vallerd, & Paty (2013), intrinsic motivation is explained when an athlete participates in their sport purely for the enjoyment and satisfaction from participating, voluntarily performing their responsibilities.

The study performed at Merrimack College with 13 Female Rowers examined the relationship between high motivation levels of participation and their 2km ergometer row. The advanced rowers will perform a 2km test on slider dynamic ergometers, while the novice rowers will perform their test on the concept 2 ergometers. All subjects were given a Sports Motivation Scale-28 questionnaire, which examines their level of motivation. The study provided an understanding of levels of motivation to participate in early morning practices, high volume of training, continued use of one aerobic conditioning tool, and participation in strength training. They performed another 2,000km ergometer test 4 weeks after their first test to examine an increase or decrease in performance and relationship to their level of motivation.

Sports psychologists, coaches, and athletes require a certain level of understanding of motivation and its subscales. They should also be able to distinguish, identify, and demonstrate to the athlete and team's advantage towards success. The hypothesis is an increased level of motivation, the Merrimack College rowers should have a larger increase of their 2km ergometer test. Rowers with lower motivation scores will show a decrease in performance time in the 2km ergometer test. Secondary measures included differences in motivation levels between novice rowers and advanced rowers, significant differences in test 1 and test 2 times, significance between pre-motivation scores and years of experience, and correlation between pre-motivation and post-motivation scores. The literature presents findings concerning the different types of motivation, which types present a more successful athlete, types of athletes, and the relationship between intrinsic motivation and an endurance field test.

Method

Participants

The participants of this study were rowing athletes from Merrimack College (aged between 18 to 21). The Rowers were recruited by verbal communication during the time they attend their lifting sessions. There were 15 that were spoken to about the research study, but 13 participants were included in this study who volunteered to participate, excluding injured athletes who were not cleared for activity through the Athletic Training staff. Inclusion criteria required participants to be on the Merrimack College Rowing roster and injury free or cleared from Athletic Training staff. Participants were classified as Novice rowers, who have had less than a year's experience rowing, and advanced rowers, who have over a year's experience.

Measures

Aerobic capacity. 2km ergometer test was used to measure the performance of participants at the beginning and end of the study. The novice participants conducted their 2km

tests on concept 2 ergometers, and the advanced participants conducted their 2km tests on slider dynamic ergometers. The 2km tests included an all out effort from the rower to get the lowest time possible, which typically lasted for 7-10minutes. The usage of different rowing ergometers occurred because of the lack of familiarity the novice rowers had with the slider dynamic ergometers.

Motivation Scale. The Sports Motivation Scale-28 measures intrinsic motivation to know, intrinsic motivation to accomplish, intrinsic motivation to experience stimulation, extrinsic motivation-justified, extrinsic motivation-introjected, external motivation-external regulation, and amotivation. The purpose of this scale is to examine levels of motivation, specifically internal and external motivation, and amotivation. Knowing which athletes experience higher levels of motivation could help indicate whether their increase or decrease in their performance was due to motivation levels. This scale includes 28 questions and a scale of 1 to 7, and a score of one indicating “no correspondence at all” to the participant. According to Pelletier et al. (1995), internal consistency of the seven subscales varied from .63 to .80, and the mean alpha score of the SMS-28 was .75 based on two research studies performed to validate this scale. Example questions is: I participate in my sport for the pleasure I feel in living exciting experiences, I participate in my sport for the pleasure of discovering new training techniques, and I participate in my sport I don't know anymore; I have the impression of being incapable of succeeding in this sport. Each question corresponds with the seven subscales of motivation.

Procedure

Every rower was given an Informed Consent, Personal Information Form, and Sports Motivation Scale-28 to fill out before testing. Everyone signed and dated the Informed Consent and filled out the personal information form. Once the motivation scale was completed, the researcher conducted a familiarity session of testing parameters with the group. As instructed, the rowers asked any questions they may have before starting the test. Next, the rowers conducted a five -minute warm-up routine on their ergometers at a 22 stroke per minute pace. Once the five minutes concluded, the rowers stepped off their ergometer, reset their screens on the ergometer, and rested for one minute before starting their 2km tests.

To limit external motivation, the rowers did their 2km tests without music or verbal cues or motivation from the researcher. Although the rowers objected the lack of music, they stated that it was helpful in getting their test done sooner without the music because it was less enjoyable.

Once the 2km tests concluded, the rowers relayed their times to the researcher, which was recorded on a sheet with their ID numbers. Each participant was given an ID number for their motivation scales and test times, which was given based on their sign up sheet. The study was a single-blind study, so only the researcher knew the times corresponding to each participant. The second 2km test occurred exactly 4 weeks from the first test at the same times. The testing procedure was explained the same was as the first 2k tests and were given the same protocols for warm-up and testing, which can be seen in Diagram 1.

Diagram 1. Testind Day Procedure



Data Analysis

Correlations between pre-motivation and years of experience, test 1 and test 2, pre-motivation and post-motivation, pre-motivation and test 1, and pre-motivation and difference in test 1 and test 2 times were conducted. The main measure of this study was to examine the relationship between pre-motivation scores and the difference between test 1 and test 2 times. T-Tests were also performed to examine the significance of novice and varsity rowers with test 1 times, test 2 times, difference between tests, pre-motivation, and post-motivation scores.

Results

Starting this research, 13 participants volunteered to fill out the survey and perform the 2km ergometer test. During the second round of testing, 7 participants filled out the SMS-28 survey and performed the 2km test. About 50% of participants dropped from the second round of testing. This was due to injuries occurring in between the first and second testing day. The dropout rate was also due to sickness and the inability to perform maximal effort. Table 1 describes the participant's demographic statistics. Out of 13 participants, the average age was 19.3 (SD 1.25) ranging from 18 to 21. The average weight was 163.5 (SD 29.4) ranging from 118-220. The average height was 66.8 inches (SD 2.74) ranging from 63 to 70 inches. Years of experience mean were 1.7 (SD 2.4) ranging from .1 to 8 years. Out of the 13 participants, 54% were novice, and 46% were varsity.

The main testing parameter for this research study was whether motivation level at the beginning of the study predicted their improvement by the end of the 4 week study, measured by the correlation between pre-motivation scores and difference in test times. This test was measured by a correlation test with the following result; $r=.220$, $p=.636$. This tells us that there is no significant relationship between pre-motivation scores and differences in 2km test times and motivation cannot predict physical performance improvements in this current study. The correlation between pre-motivation scores and years of experience was $r=.183$, $p=.549$. The correlation between pre-motivation and test 1 had no significant relationship with a p-value of .428. The correlation between 2km test 1 and 2km test 2 was $r=.993$, $p=.000$, showing significance of the two times collected. The correlation between pre-motivation and post-motivation scores was $r=.769$, $p=.043$. This tells us that there is a significant relationship between pre-motivation scores and post-motivation scores. Lastly, as demonstrated in Table 2, years of experience and pre 2km test times are significantly correlated.

Table 1. Demographics

	Mean	SD	Range	Percent
Age	19.3	1.2	18-21	
Weight	163.5	29.3	118-220	
Height (in)	66.8	2.7	63-70	
Years of Experience	1.7	2.4	.1-8	
Novice (under 1 yr rowing experience)				
Yes				54%
No				46%

Table 2. Significance between Years of Experience with Pre and Post data and Time Differences

	<1 yr	>1 yr	<1 STDEV	>1 STDEV	Significance	
Pre 2k	521.71	485.67	30.72	26.93	0.05	*
Post 2k	508.5	496.4	10.61	19.30	0.46	
Difference	7.5	10	4.95	6.56	0.65	
Pre Motivation	124.71	112.83	22.27	21.12	0.35	
Post Motivation	89.5	114.4	13.44	13.97	0.09	

*Significant relationship (p-value<.05)

Discussion

The current study examined the potential predicted measure of pre-motivation scores on improved 2km ergometer times in 13 Female collegiate rowers. The major findings concluded that there was no significant relationship between pre-motivation scores and 2km ergometer times.

In addition, secondary measures concluded that there was significant difference between pre-motivation and post-motivation scores and significant differences between test 1 times and test 2 times. Lastly, there is significance between years of experience and pre 2km times, which means rowers with less than a years experience of rowing will have significantly different 2km ergometer times compared to rowers with over a years experience. This could be the result of a greater increase of training response from 4 weeks of rowing and weight training. As novice rowers have less than a year's experience of rowing and training, their training age is much younger than varsity rowers. The novice rowers will have a bigger response from training due to neuromuscular changes, rather than an improvement in muscular or metabolic system adaptations. As highlighted in Table 2, rowers with less than 1 years experience demonstrated a decrease in 2km times after the 4-week time in between times. This could be explained by the familiarization with the 2km-ergometer test and increased knowledge of the 2km tests, and their individual effort needed to perform this test. Rowers with less than a years experience will also experience a quicker training adaptation from training during the 4-week period. Their training

adaptations will occur frequently and much quicker compared to the training adaptations occurring in the rowers with over a year's experience of training and testing.

Conclusion

This study found that pre-motivation scores would not predict improved performance in the 2km ergometer test in 13 collegiate rowers. These findings can be used to help head coaches and strength and conditioning professionals determine level of commitment and motivation through an easy motivation questionnaire, predict performance after holidays, and testing differences between novice and varsity athletes. Knowing the athlete's motivation levels can also help predict drop out rate and level of effort being applied to training. Based on the secondary findings, coaches can predict a significant increase in novice rowers compared to varsity rowers. Coaches can also assume that pre-motivation scores don't have a direct correlation with test 1 times. The SMS-28 questionnaire can be a helpful tool to determine what type of motivation the athletes utilize to perform their sport and sustain performance. Even more important, coaches can determine why an athlete's performance has decreased or if the athlete will eventually drop out of their team.

Limitations of this study include a high rate of drop out (50%) going into the second test, limiting comparative data to determine accurate correlations. The small sample size is also a limitation, along with the schedule of the second test occurring after a week off of training. Lastly, using collegiate varsity athletes creates a problem due to scheduling conflicts, external stressors of student life, and other responsibilities that may affect their participation in a study. Performing the second test after a normal training week, with the same number of participants could have elicited more accurate results.

In future studies a larger sample size is recommended and continued testing for a longer period of time, possibly for the entire year to see changes of motivation and athletic performance in off-season and in season. It would also be interesting to see results using a different ergometer test and other performance tests, such as a 6km-ergometer test, jump testing, and strength testing.

Implications of this study include further investigation into motivational factors influencing an athlete's behaviors and sustained performance during their in season and off season programs. Knowing how an athlete becomes motivated could change the coaches methods of coaching for each individual, rather than a consistent and similar coaching method for all their athletes.

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