RATINGS OF PERCEIVED EXERTION

STAGE VERSUS MINUTE

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Perceived exertion has been defined as "the subjective rating of the intensity of physical work" (O' Sullivan 343). The processing of sensory cues related to physical performance enables an individual to perceive general feelings of exercise and more specific sensations of physiological performance such as shortness of breath, muscular effort and joint pain (Noble 406).

A scale for ratings of perceived exertion was developed by Gunnar Borg in the late 1950's. The scale consists of fifteen points ranging from six to twenty, with seven being "very, very light" and nineteen being "very, very hard" (Borg 377).

The use of the ratings of perceived exertion (RPE) scale has gained in popularity and usage in the clinical exercise testing field (Noble 406). This scale has been used to both prescribe exercise intensity from the results of the exercise test as well as anticipate the termination of an exercise test (Noble 407). Little is known concerning how RPE's may be influenced by the number of inquiries that are made during the graded exercise test. The purpose of this study is to determine if there is a difference in the RPE values when a subject is asked more frequently for their RPE.

HYPOTHESIS

The hypothesis of this study was that there would be a difference between RPE's asked every minute and RPE's asked every stage (every three minutes). Two separate hypotheses concerning the difference between male and female reported RPE values and athlete and non- athlete RPE values were assessed as part of this study.

METHODS

Maximal treadmill tests were administered to nineteen subjects (nine females and ten males). These subjects were also divided into an athlete and non- athlete class. The athlete class consisted of collegiate varsity athletes from various sports. Gymnasts, runners, baseball, basketball, and football players were all included. The female athlete group consisted of four athletes while the male athlete group consisted of five. The non-athlete groups were evenly divided with five females and five males. All groups voluteered to participate in two maximal treadmill tests on two different days not in succession, but within one week's time period. All subjects were between the ages of nineteen to twenty-three.

Before the test procedures were explained, an informed consent was obtained, and the subject's age, weight, height, blood pressure, and resting heart rate were recorded. The subject was then asked to draw a card to randomize the test order. Next, each subject was prepared for the treadmill maximal test with ECG electrodes in a CM-5 set up. A standard Bruce protocol was performed by each subject in accordance with ACSM guidelines. In both test the subjects were asked "How are you feeling?" of which they responded with a RPE. Before the subject began exercising they read the following instructions about RPE's:

"Rate your feelings which are caused by your exercise. The feelings should be general, about the body as a whole. We'll ask you to select a number which most accurately corresponds to your perception of your total body feeling. There are no right or wrong answers. Use any number you think is appropriate."

Subjects were asked either every minute or every stage to report their RPE, depending upon which test was being performed. An ECG record was taken every minute for both tests. Both tests were terminated at the subject's request.

Recovery blood pressures and heart rates were recorded two to five minutes after cessation of exercise.

The RPE collected during the every minute inquiry test was aligned with the stage RPE value in the statistical comparisons. The P-value for statitical significance was set at .05 level.

RESULTS

As is seen in Table 1, the primary hypothesis of this study was proven by our research. A significant difference between the every minute RPE values versus every stage RPE values was found primarily in the second and third stage (6 and 9 minute) of the protocol. An almost significant difference (P= 0.06) existed between the first stage and third minute RPE value. Table two contains the correlations between the every minute versus once per stage RPE's. There is little correlation between the two RPE's during the first three stages (nine minutes) of the Bruce protocol.

Graphs II, III, IV illustrate that asking a subject every minute versus every stage resulted in a higher RPE with more frequent inquiries. The line of identity is the line where the subjects gave equal RPE values for both the stage and minute tests. Any subject above this line reported a higher stage RPE value than minute RPE value and any subjects below this line reported a higher minute RPE value than stage RPE value. The Stage 1 versus Minute 3 Graph, Graph I, does not indicate a significant difference (P < .05) for stage versus minute ratings. Graph II demonstrates a higher RPE when the subject is asked every minute versus once

per stage in 10 of the 19 subjects. The Stage 3 versus Minute 9 Graph, Graph III, also illustrates higher minute ratings than stage ratings. Comparing Stage 4 versus Minute 12 resulted in the greatest correlation (.868). This data clearly indicates that the longer the subject exercised on the protocol, the greater the correlation between the minute RPE value and the stage value.

Any effect for test order was also evaluated for different RPE values between the first test and the second test. Randomization of test order should exclude for any differences. In only stage one did test order make a significant difference. A P-value of .032 was found.

The second hypothesis stated that there would be no gender effect upon RPE values reported every minute versus each stage. No significant difference was found during any of the stages for the RPE asked each minute versus each stage. None of the P-values for any stage even approached significance. From this analysis it was determined that gender was not a variable affecting RPE and inquiry.

The final hypothesis was that there would be an effect of athleticism upon the every minute RPE versus stage RPE. No significant difference was found during any of the stages for the RPE asked each minute versus each stage. However, the athlete and non-athlete comparisons did approach significance for the Stage 3 - Minute 9 values. A P-value of .06 was reported, just short of the < .05 value that indicates a significant statistical difference.

DISCUSSION

The results indicated that the study was successful in proving the primary hypothesis. The first stage did not show a correlation between the two RPE's possibly because the subjects' initial perceptions were not clear. The greatest difference between tests was shown during the second and third stages. Near the end of the two tests, nearly everybody reported similar values as the previous test due to exhaustion. Being asked more frequently about one's physical state affects the reply. Perhaps, the more often a person is asked to rate her/his physical state, the lesser the opportunity to mentally disassociate from the physical sensations.

Although the test order, gender and athleticism differences were not exhibited, it is important to note that perhaps athleticism could have made a difference in perceptions if different athletes had been used for test subjects. Only three of the nine athletes tested were involved in aerobic sports, therefore, the other six athletes may have been just as unaccustomed to intense aerobic exercise as the non-athletes.

A summary of the research findings indicates that there is a statistical difference between minute RPE values and stage RPE values. How often a test subject is asked to report an RPE affects the RPE value.

TABLE 1
Statistical Analysis of RPE Minute vs. Stage

Paired t-Test X_1: rpe3m Y_1: rpe1s

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
18	.737	1.973	.064

Paired t-Test X_2: rpe6m Y_2: rpe2s

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
18	1.211	2.582	.0188

Paired t-Test X_3: rpe9m Y_3: rpe3s

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
17	1.944	3.828	.0013

Note: 1 case deleted with missing values.

Paired t-Test X_4: rpe12m Y_4: rpe4s

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
9	.3	.605	.5599

Note: 9 cases deleted with missing values.

Paired t-Test X_5: rpe15m Y_5: rpe5s

DF:	Mean X - Y:	Paired t value:	Prob. (2-tail):
2	-.667	-.756	.5286

Note: 16 cases deleted with missing values.

Bruce Protocol

TABLE 2

Correlation of RPE Minute vs. Stage

Corr. Coeff. X_1: rpe3m Y_1: rpe1s

Count:	Covariance:	Correlation:	R-squared:
19	.678	.363	.132

Corr. Coeff. X_2: rpe6m Y_2: rpe2s

Count:	Covariance:	Correlation:	R-squared:
19	1.573	.43	.185

Corr. Coeff. X_3: rpe9m Y_3: rpe3s

Count:	Covariance:	Correlation:	R-squared:
18	3.229	.652	.426

Note: 1 case deleted with missing values.

Corr. Coeff. X_4: rpe12m Y_4: rpe4s

Count:	Covariance:	Correlation:	R-squared:
10	7.067	.868	.753

Note: 9 cases deleted with missing values.

Corr. Coeff. X_5: rpe15m Y_5: rpe5s

Count:	Covariance:	Correlation:	R-squared:
3	1.667	.693	.481

Note: 16 cases deleted with missing values.

Bruce Protocol
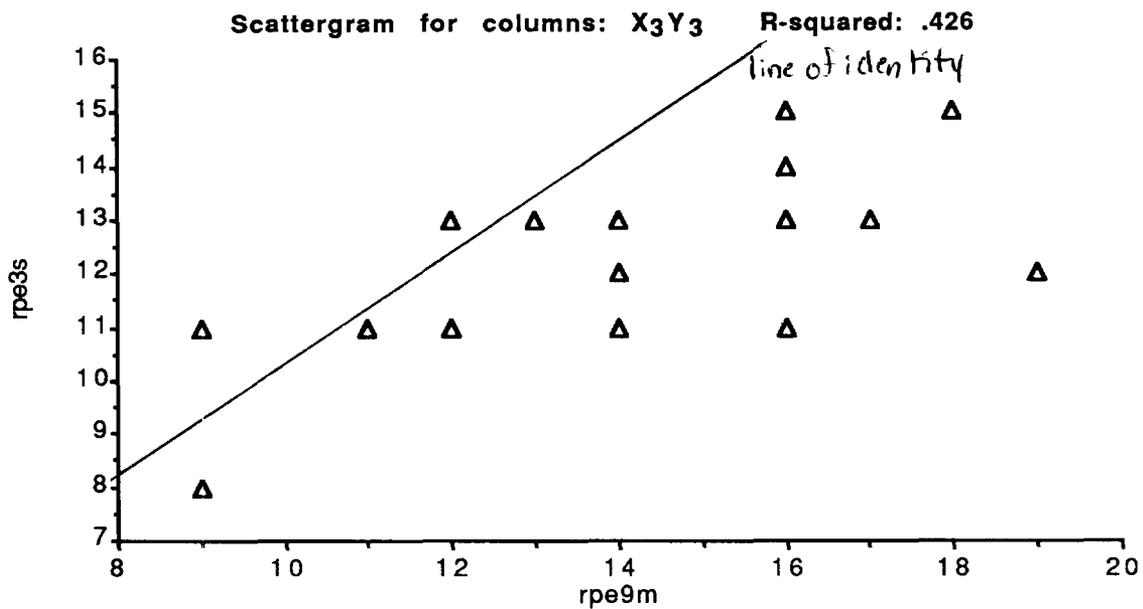
Graphic Representation of RPE Minute vs. Stage

GRAPH I

Scattergram for columns: X_1Y_1 R-squared: .132

line of identity

rpe1s vs. rpe3m

GRAPH II

Scattergram for columns: X_2Y_2 R-squared: .185

line of identity

rpe2s vs. rpe6m

Bruce Protocol

Graphic Representation of RPE Minute vs. Stage

GRAPH III

Scattergram for columns: X_3Y_3 R-squared: .426

line of identity

rpe3s (y-axis)
rpe9m (x-axis)

GRAPH IV

Scattergram for columns: X_4Y_4 R-squared: .753

line of identity

rpe4s (y-axis)
rpe12m (x-axis)

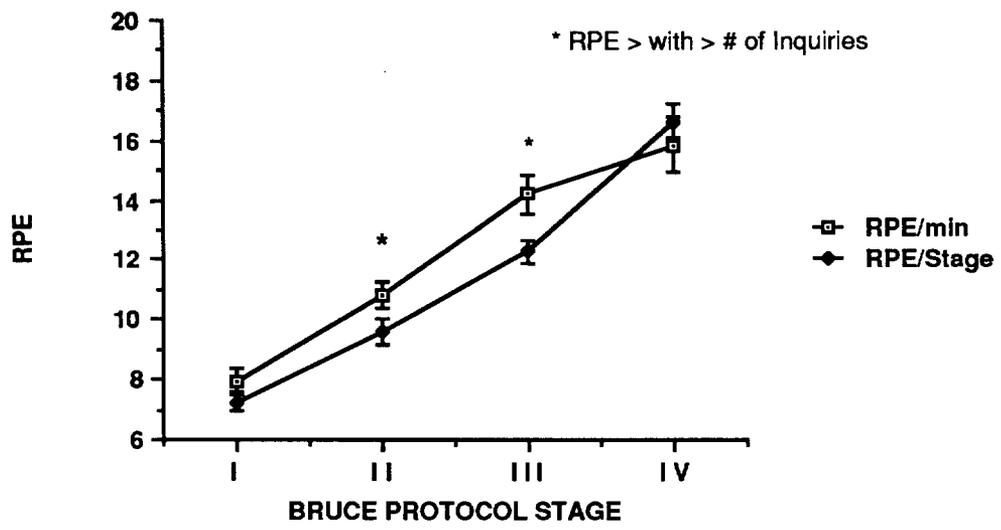Bruce Protocol
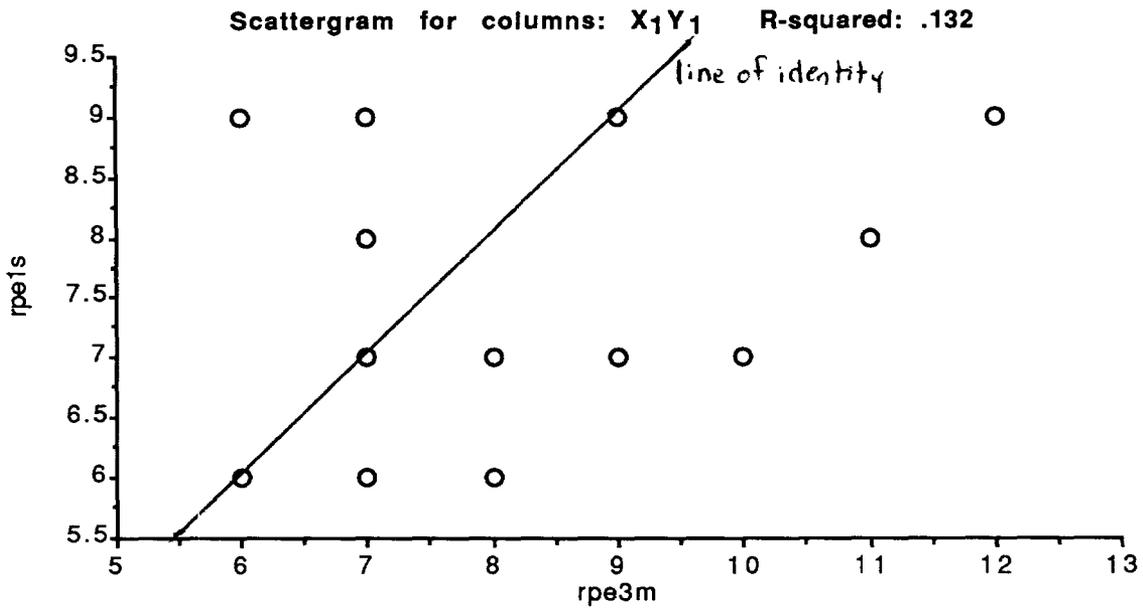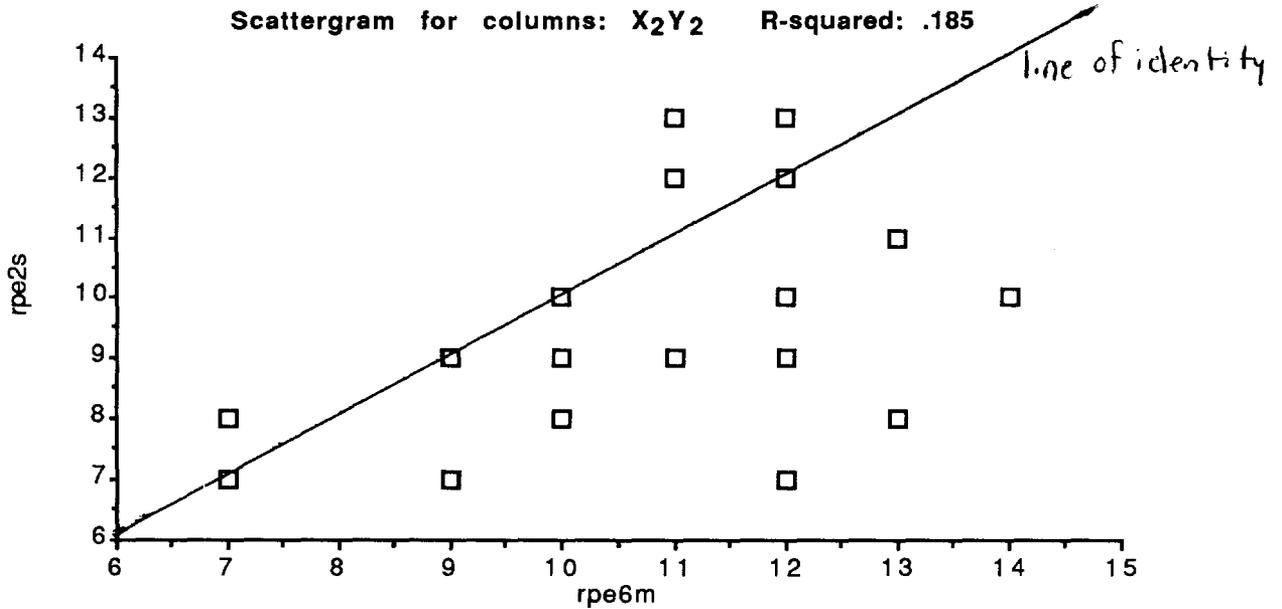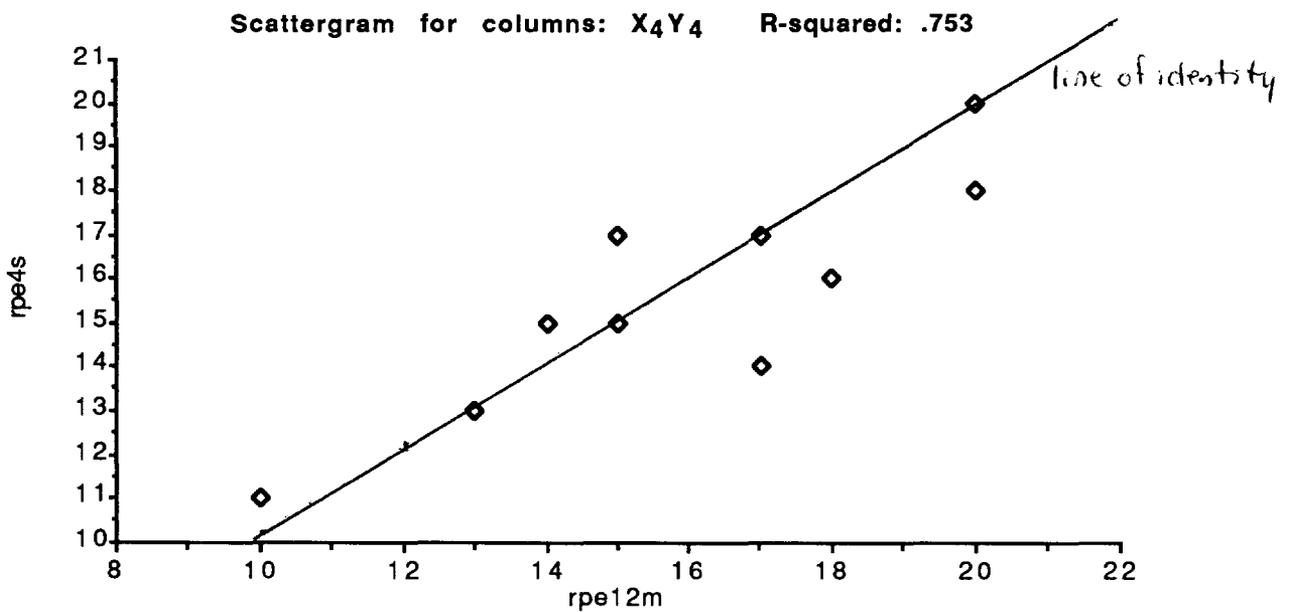
Graphic Representation of RPE Minute vs. Stage

GRAPH V

Scattergram for columns: X_5Y_5 R-squared: .481

line of identity

Bruce Protocol
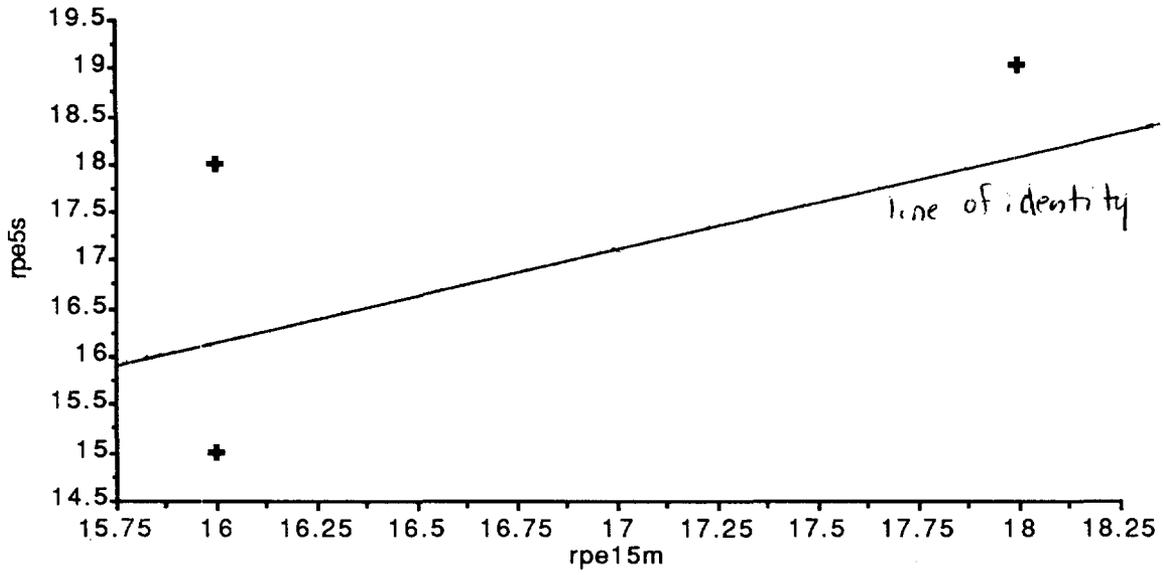
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