

The purpose of this study was to investigate the relationship between cardiorespiratory fitness, muscle endurance and test anxiety levels with academic performance of high school students. Five hundred and forty-five grade nine students (mean age: 14.1 ± 0.4 years old) from a single French-Canadian public high school located in Montreal, Canada, participated in this study. Final grades in language (French), mathematics and science as well as the overall mean average of all courses were used to assess academic performance. Cardiorespiratory fitness levels were estimated using the 20 meter shuttle run test and muscle endurance was measured using push-up and curl-up tests. Participants also completed a questionnaire for the assessment of test anxiety. Subjects were then divided into two groups based on their gender (Male: n = 253; Female: n = 292). Independent t-tests, correlations and linear regression analysis were performed. Results show that female students had significantly higher grades in language and science as well as a higher overall mean average than male students (p < 0.001). Moreover, we observed that female students had significant greater correlation coefficient values than male students for the following correlations: cardiorespiratory fitness levels with overall mean average, mathematics and science; number of curl-ups with overall mean average; number of push-ups with overall mean average, mathematics and science (p < 0.05). Finally, stepwise linear regression analysis showed multiple differences between male and female students regarding independent predictors of academic performance (p < 0.01). In conclusion, results of the present study indicate that the academic performances of male and female students are different in high school and that these distinct academic performances appear to be explained by different variables.

INTRODUCTION

- Female students seem to have a better **academic performance** than male students (Duckworth et Seligman, 2006).
- Cardiorespiratory fitness** levels appear to be positively associated with academic performance (Burkhalter et Hillman, 2011). This relationship seems to be stronger in female students than in male students (Castelli et al., 2015; Burkhalter et Hillman, 2011; Grissom, 2005).
- Muscle endurance** (curl-ups and push-ups) has been shown to be positively related to academic performance (Castelli et al., 2007). However, few studies had explore the role of gender in this relationship.
- Test anxiety** appears to be negatively associated with academic performance (Pekrun et al., 2002). Despite a higher level of test anxiety in female students, there is evidence to suggest that the relationship between academic performance and test anxiety is more pronounced in male students compared to female students (Freudenthaler et al., 2008; McCarthy & Goffin, 2005).
- Taken together, it appears that gender differences in academic performance as well as the factors that could explain those differences remain contradictory.
- The present study could initiate some changes in high school policies and practices leading high school educators to consider planning interventions that are gender specific, which could lead to improving academic performance in both genders more efficiently.**

OBJECTIVE

to investigate the relationship between cardiorespiratory fitness, muscle endurance and test anxiety with academic performance in both genders of adolescent students in high school.

METHODS

Participants

- 545 grade 9 students (♀ = 292 (53,6%), ♂ = 253; Mean age: 14,1 ± 0,4 years old).
- Three entire cohorts of grade nine students participated in this study between 2012 and 2015.
- Inclusion criteria were 1) to be enrolled in the targeted school and 2) to be in grade nine.

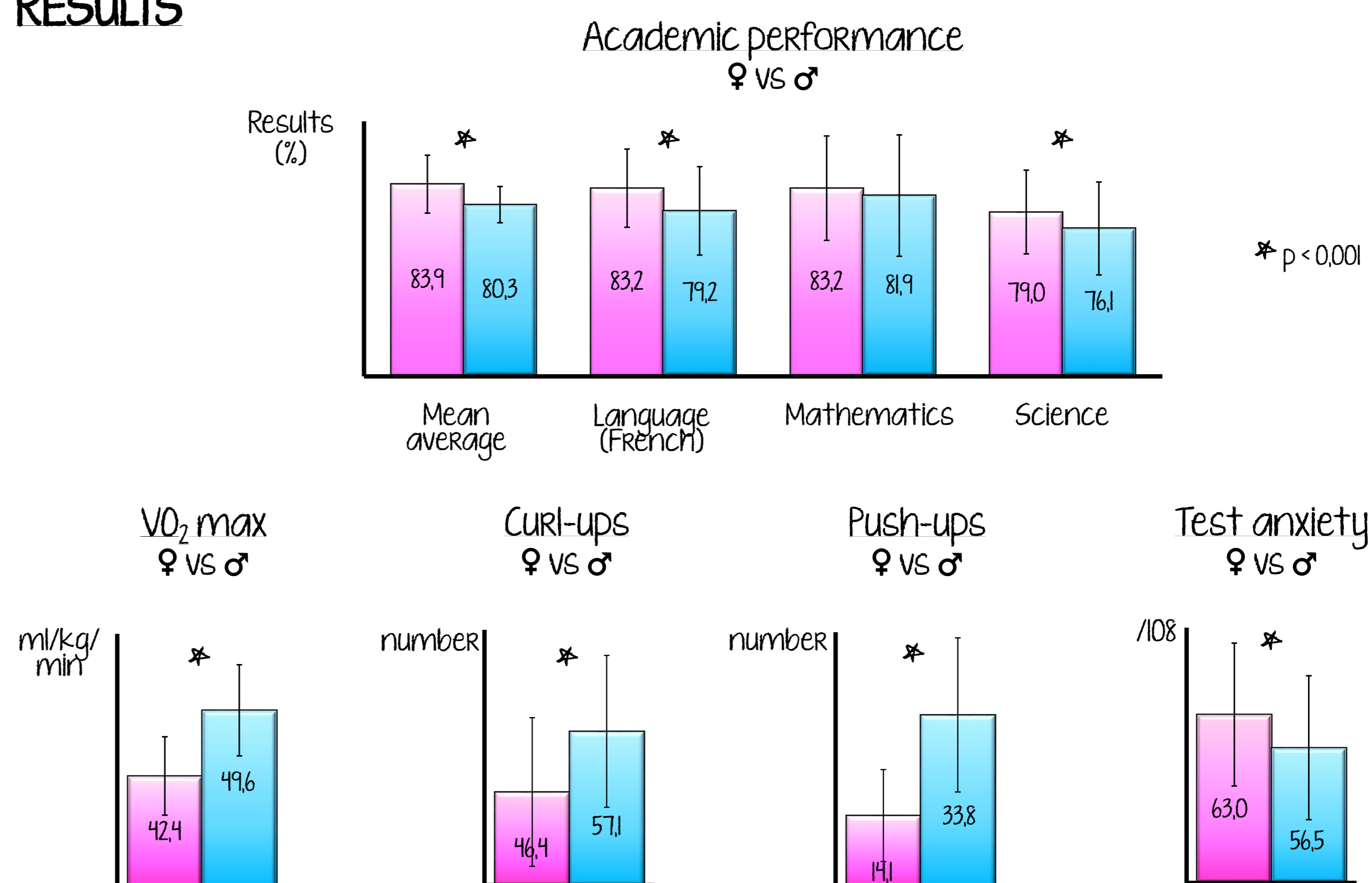
Measures

- Academic performance:** grades for language (French), mathematics, science as well as the mean average of each student, in percentage, from the school final report card.
- VO₂ max:** estimated using the validated multistage 20 meter shuttle run test (Léger et al., 1988).
- Muscle endurance:** measured using push-up and curl-up tests (American College of Sports Medicine, 2014).
- Test anxiety:** assessed using the revised 27-item version of the Cognitive Test Anxiety Scale (Cassidy et Johnson, 2002).

Analysis

- ♀ vs ♂ : Independent t-tests, correlations and stepwise linear regression analysis.
- Significance was defined at p < 0,05.

RESULTS



CORRELATIONS

	Female students ♀				Male students ♂			
	VO ₂ max	Curl-ups	Push-ups	Test anxiety	VO ₂ max	Curl-ups	Push-ups	Test anxiety
Mean average	0,45*	0,37*	0,41*	-0,34*	0,18*	0,19*	0,16*	-0,27*
Language (French)	0,27*	0,25*	0,26*	-0,31*	0,15*	0,16*	0,14*	-0,24*
Mathematics	0,32*	0,22*	0,32*	-0,27*	0,06	0,06	0,07	-0,33*
Science	0,34*	0,23*	0,30*	-0,27*	0,03	0,10	0,03	-0,26*

Significant correlation coefficient (r) (p < 0,05) are identified using *.
Significant differences in correlation coefficient values between both genders are bolded.

Academic performance predictors

	Mean average	Model	Independent variable	R ² partial	R ² total	β	P
Female ♀ students	1		VO ₂ max	0,208	0,208	0,263	< 0,001
	2		Test anxiety	0,071	0,279	-0,248	< 0,001
	3		Curl-ups	0,019	0,298	0,140	0,014
	4		Push-ups	0,013	0,311	0,141	0,019
Male ♂ students	1		Test anxiety	0,068	0,068	-0,254	< 0,001
	2		VO ₂ max	0,038	0,106	0,194	0,001

CONCLUSIONS

- VO₂ max, muscle endurance and test anxiety are associated with academic performance of high school male and female students.
- The correlation coefficient values between VO₂ max and muscle endurance with academic performance **differs in both genders**.
- VO₂ max** is the strongest predictor of academic performance in **female students** while **test anxiety** is the strongest predictor of academic performance in **male students**.
- High school educators could consider planning a great variety of free intervention programs to promote the importance of improving cardiorespiratory levels and reducing test anxiety to students in the classrooms (e.g.: organized sport activities and workshops on adopting a healthy lifestyle).

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