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Enhancing the academic success of competitive student athletes using a motivation treatment intervention (Attributional Retraining)

Patti C. Parker*, Raymond P. Perry, Jeremy M. Hamm, Judith G. Chipperfield, Steve Hladkyj

University of Manitoba, Winnipeg, MB, R3T 2N2, Canada

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ABSTRACT

Competitive student athletes who experience the typical challenges inherent in high school-to-university transitions must also overcome sport-related difficulties which can undermine their academic motivation and class attendance due to competitions, fatigue, injuries, identity issues, and novel training environments (MacNamara & Collins, 2010; Simons et al., 1999). In an eight-month quasi-experimental, randomized treatment field study, an attribution-based motivation treatment (Attributional Retraining: AR) was administered to student athletes ($n = 185$) and non-athletes ($n = 281$) who differed in perceived control beliefs (±1 SD) in a two-semester, online course. Simple slope regression analyses revealed the AR (vs. no-AR) treatment assisted competitive student athletes who had low control beliefs by increasing perceived success in the course ($b = 0.84$, $p = 0.038$), post-treatment test performance ($b = 11.68$, $p = 0.001$), year-end course grades ($b = 6.32$, $p = 0.017$), and by reducing course withdrawals ($b = -1.00$, $p = 0.034$, $OR = 0.37$). These results demonstrate the benefits of an attribution-based motivation treatment for vulnerable student-athletes in terms of perceived course success, performance, and persistence in making the transition from high school to college.

For many students entering higher education institutions, the transition from high school can be a markedly adverse learning experience. Approximately 30% of first-year students drop out of university within the first 12 months, and on average, only 59% of undergraduates enrolled in four-year institutions graduate within six years (Snyder & Dillow, 2012). Students making this transition often face various obstacles (e.g., elevated work demands, responsibility, more frequent failures, etc.) that can undermine their perceived control beliefs over academic demands and hinder their academic performance (e.g., test scores, grade point averages) and persistence to remain in their courses (Perry, 2003; Perry, Chipperfield, Hladkyj, Pekrun, & Hamm, 2014; Perry, Hall, & Ruthig, 2005; Stewart et al., 2011). Students involved in competitive sports may be at an even greater risk of dropping out of school due to additional athletic demands (Johnson, Wessel, & Pierce, 2013). Competitive student athletes must learn to adapt to two distinct learning environments (i.e., academic and sport) and hence, the purpose of this study was to investigate the impact of a motivation treatment intervention on vulnerable competitive athletes' academic persistence and performance.

Adding sport demands to an already demanding academic environment may compound the pressures faced by students who are involved in athletics. Competitive student athletes are also likely to encounter other challenges that include physical fatigue, training requirements, competitions that overlap with class schedules, injuries, higher rest and recovery demands, student-sport identity issues, and novel training environments. These additional stressors can serve to impede their academic learning and motivation (De Knop, Wylleman, Van Houcke, & Bollaert, 1999; MacNamara & Collins, 2010; Simons, Van Rheenen, & Covington, 1999). As such, students face the difficulty of having to balance a full-time academic schedule with a competitive sport that can include inflexible practice and competition schedules (Bengtsson & Johnson, 2012; Scott, Paskus, Miranda, Petr, & McArdle, 2008).

The findings are inconsistent regarding whether sport participation facilitates or undermines academic achievement. Where some research reveals athletes perform equal to or better than non-athletes in terms of academic attainment (Georgakis, Wilson, &

* Corresponding author. Department of Psychology, University of Manitoba, Winnipeg, MB, R3T 2N2, Canada.
E-mail address: umparkep@myumanitoba.ca (P.C. Parker).

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Ferguson, 2014; Picou & Hwang, 1982; Richards & Aries, 1999), other research suggests student athletes suffer declines in their academic performance compared to non-athletes (Hauser & Lueptow, 1978; Maloney & McCormick, 1993; Purdy, Eitzen, & Hufnagel, 1982). These mixed findings may, in part, be due to the fact that studies have varied in classifying athletes as elite or professional, or as involved in supportive academic programs.

A considerable number of these studies have focused on college or university sport teams, with a lesser focus on the broad range of student athletes who might frequently participate in alternate sport activities (e.g., external programs and club teams). Furthermore, an athlete's perceived competitiveness and investment in their sport may impact and often hinder their commitment to, and focus on, academic achievement (Intrator & Siegel, 2008; Richards & Aries, 1999). Comeaux and Harrison (2011) discuss student athletes as part of a "non-traditional" group who deal with both athletic and academic demands. They propose that athletes' success in college is determined by several factors including pre-college experiences, different types and levels of personal commitments, and social and academic integration (i.e., in-class and extra-curricular). Their research fills existing gaps by providing a conceptual model that more comprehensively addresses the ongoing demands that impact athletes' college success. However, they recommend that more research be conducted to explain individual differences (e.g., cognitive variables like perceived control beliefs), as well as the academic climate (e.g., competitive learning conditions) that might affect academic success.

1. Perceived control beliefs and competitive learning conditions

Extensive research examining the transition to competitive learning environments (e.g., high school to university) shows that students' perceived control beliefs play an instrumental role in their motivation, performance, and persistence (Perry, Hladkyj, Pekrun, Clifton, & Chipperfield, 2005; Perry, Hladkyj, Pekrun, & Pelletier, 2001). Perceived control beliefs are generally defined as the subjective capacity to influence and predict life events (Perry, 2003). Perry, Stupnisky, Daniels, and Haynes (2008) examined students' control beliefs in highly competitive, novel learning conditions. They found that more than 40% of students had maladaptive mindsets where they endorsed uncontrollable causes for performance (e.g., low ability, bad luck, poor teaching) compared to endorsing controllable causes (e.g., effort, strategy). These maladaptive mindsets negatively predicted students' final grades and GPAs.

In achievement settings, perceived control over outcomes can play a role in influencing academic failures and successes (Ross & Broh, 2000; Skinner & Pitzer, 2012). In a meta-analysis examining the relationship between psychosocial variables and academic outcomes, Robbins et al. (2004) reported a control-related construct—described as academic self-efficacy—strongly predicted grade point average and retention (duration of time participants stayed enrolled at their institution; $rs = 0.50, 0.36$, respectively). Perceived control beliefs have also been associated with various achievement-related outcomes including intrinsic motivation, effortful behaviours, learning-related enjoyment, hope, pride, anger, hopelessness, boredom, and academic performance (Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011; Perry et al., 2001; Ruthig et al., 2008). In addition, students with low perceived control beliefs have an increased risk of withdrawing from their courses (Perry et al., 2005).

Perceived control over future events (e.g., failure and success outcomes) has been assessed in the context of attribution research in both academic and sport domains (Anderson & Riger, 1991; Anderson, 1983; Biddle, 1993; Coffee, Rees, & Haslam, 2009; Rees, Ingledew, & Hardy, 2005). According to Weiner (1985, 2006, 2012) attribution theory, individuals' explanations of failure and success outcomes can influence their perceptions (beliefs) of control over future outcomes. In a sport setting, Coffee and Rees (2009) found that, following unsuccessful performances at multiple time points (i.e., one day following the performance and four days later), controllable attributions predicted higher self-efficacy, particularly when causes were seen as stable. Other studies in achievement settings indicate that encouraging at-risk students to make controllable attributions for failure outcomes can lead to better academic performance, improved expectations for success, greater adaptive emotions, and more persistence for at-risk students (Hall et al., 2007; Perry & Penner, 1990; Perry, 2003).

These results generate questions concerning whether an attribution-based treatment may enhance perceived control beliefs, performance, and persistence in novel and low-control learning conditions. They also underscore the scarcity of research on student athletes' perceived control beliefs in academic settings. Thus, our study focuses on a group of athletes with low perceived control beliefs who engage in competitive sports.

2. Attributional Retraining treatment interventions

Attributional retraining (AR) is a control-enhancing treatment intervention based on Weiner's (1972, 1985, 2012) attribution theory of motivation and emotion. Weiner's theory asserts that it can be maladaptive for an individual to attribute negative events to causes that are internal, stable, and uncontrollable (e.g., failing an exam because of low intelligence) in terms of motivation, goal striving, and performance (cf. Perry et al., 2014). The dimensional properties of causal attributions, locus (internal vs. external), stability (stable vs. unstable), and controllability (controllable vs. uncontrollable), relate to individuals' cognitions and emotions that, in turn, impact their motivation and behaviour. In achievement settings (e.g., academic or athletic), these dimensional properties influence a person's expectations regarding desirable (e.g., success) or undesirable (e.g., failure) outcomes. For example, attributing failure to causes that are internal, stable, and uncontrollable (e.g., lack of ability) can result in shame and hopelessness because the cause of failure is seen as internal to that person, likely to occur again (stable), and not controllable. In contrast, internal, unstable, and controllable attributions for failure (e.g., more effort required) result in taking responsibility for the failure, little shame, and motivation to change the outcome in the future.

In the context of Weiner's attribution theory, AR is designed to encourage individuals to use more controllable and unstable causes for negative experiences such as attributing an exam failure to poor study strategy. AR treatments have typically been implemented in achievement settings and have been particularly successful in facilitating academic attainment for high-risk students (e.g., Boese, Stewart, Perry, & Hamm, 2013; Perry, Stupnisky, Hall, Chipperfield, & Weiner, 2010). Past research demonstrates that AR effectively increases students' perceived control beliefs, achievement striving, and decreases course withdrawal rates (see Perry et al., 2005, 2014; Perry & Hamm, 2016 for reviews of the literature). For example, Perry et al. (2010) showed that AR produced moderate to large effect sizes for performance outcomes for AR recipients who achieved increases of nearly one standard deviation on a post-treatment test ($d = 0.92$) and one half standard deviation on their overall year-1 GPAs ($d = 0.51$) compared to their no-AR counterparts.

When considering AR in sport settings, studies have examined athletes' attributions and their relationship with athletic motivation and performance. AR research reveals that having a more controllable attribution mindset is related to greater persistence in a golf-putting task (Le Foll, Rascle, & Higgins, 2006). Moreover, AR treatments that encourage more adaptive attributions for failure performance (i.e., controllable/unstable) helped novice golfers increase expectations for future success and persistence in a putting task (Le Foll, Rascle, & Higgins, 2008). AR treatments have also improved the shooting performances of collegiate basketball players (Orbach, Singer, & Murphey, 1997; Miserandino, 1998), as well as increased expectations for success and positive emotions in tennis players (Orbach, Singer, & Price, 1999). In line with these findings, Rascle et al. (2015) showed that following a failure performance in a golf-putting task, participants who received attributional feedback (i.e., controllable/unstable causes) increased their expectancy of success four weeks later and across contexts (i.e., from a putting-task to a dart-throwing task). They also showed greater persistence over time as measured by the number of attempts made in the putting or dart-throwing task.

3. AR treatments and student athletes

There is a constellation of risk factors that students may face in their undergraduate development, two of which are addressed in this study involving low perceived control beliefs and a competitive athlete status. Both are influential factors that can hinder academic learning and performance to the extent that student athletes must deal with the pressures of juggling both academic- and athletic-related demands and schedule. In examining both of these factors conjointly, this study focuses on a unique group of at-risk students navigating both academic and athletic endeavours.

Our study explores whether an AR treatment can assist competitive student athletes when administered in an online learning environment. AR protocols have received little attention in the context of online learning conditions, though studies evaluating course delivery methods report similar achievement outcomes for courses administered either online or face-to-face (Campbell, Gibson, Hall, Richards, & Callery, 2008; Johnson, Aragon, Shaik, & PamaRivas, 2000). Previous AR studies have administered treatments largely in laboratory settings (Menec et al., 1994; Perry & Magnusson, 1989; Perry & Penner, 1990), and field settings (Struthers & Perry, 1996; Wilson & Linville, 1982, 1985; Van Overwalle & De Metsenaere, 1990).

Our eight-month, randomized treatment field study assessed whether an online AR (vs. no-AR) treatment promotes academic persistence and attainment for a unique group of competitive student athletes who regularly compete in their sport, but differ in perceived control beliefs during a two semester, introductory online course. AR (vs. no-AR) was also administered to a non-athlete student population for comparison purposes to assess whether treatment effects occur in both groups independently. Based on recent AR studies (Hamm et al., 2014; Perry et al., 2010), we expected that, for competitive athletes with low perceived academic control, AR (vs. no-AR) would increase post-treatment in-class test performance, final course grades, and end-of-term perceived course success and perceived general control, as well as lower voluntary course withdrawals (VW rates). Non-athletes were also observed to determine whether AR (vs. no-AR) would facilitate changes in academic performance, perceived course success, perceived general control, and VW rates. For non-athletes with low perceived academic control, AR (vs. no-AR) effects were expected to be less pronounced since AR recipients are not facing a unique combination of academic and athletic challenges. No treatment differences were expected for competitive athletes or non-athletes with high perceived academic control.

4. Method

4.1. Participants and procedure

Participants were drawn from a cohort of first-year university students enrolled in multiple sections of a two-semester, online introductory course at a Midwestern, Research-1 university. The total sample was made up of non-athletes, competitive athletes, and less competitive athletes ($N = 669$) who participated for course credit. The majority reported English as a first language (81%, $M = 1.20$, $SD = 0.40$), were 17–20 years old (84%, $M = 1.78$, $SD = 1.26$), in their first year of university (75%, $M = 1.37$, $SD = 0.76$), and female (64%, $M = 1.36$, $SD = 0.48$). Ethical approval was secured from an institutional Research Ethics Board associated with the university.

Two participant groups were selected from the full sample to allow the competitive athletes and non-athletes to be examined separately. The competitive athletes ($n = 185$) were 47% female, 90% between the ages of 17 and 20, and 87% spoke English as a first language. They were defined as competitive if they participated in a competitive sport within the last three years and were currently training for or playing their most competitive sport more than four times a week. Competitive sport was defined as sport or competitions above the level of intramurals (e.g., sports played within the same university or organization) or simple recreation (e.g., hobbies or daily exercise). A three-year athletic training time-span was chosen to ensure a large enough sample size was available. The participation frequency criterion also ensured that the competitive athletes were involved in their respective sport(s) each week and were juggling busy sport and academic schedules. Non-athlete students ($n = 281$) were 72% female, 77% between the ages of 17 and 20, and 74% spoke English as a first language. They were considered non-athletes if they did not participate in a competitive sport within the last three years.

The study involved procedures that occurred at five time points over a two-semester online introductory psychology course (see Fig. 1). Data collection only began after the students wrote their first introductory psychology test (Time 1) and received test feedback. In October (Time 2), the non-athlete and competitive athlete groups completed an omnibus questionnaire using a secure survey website that measured psychosocial and demographic information (i.e., perceived control beliefs, perceived course success, age, gender, etc.).

Directly following the questionnaire (Time 2), both non-athlete and competitive athlete participants were given access to a secure survey website which randomly assigned them to one of two experimental conditions, AR or no-AR. At Time 3, students wrote a post-treatment test two weeks following the Time 2 questionnaire and treatment administration. All consenting students' test scores were obtained from course instructors at the end of the semester. In March (Time 4), participants in both AR and no-AR treatment conditions completed a follow-up questionnaire similar to the Time 2 questionnaire. Finally, in May (Time 5), all consenting participants' final introductory psychology grades and course withdrawal data were obtained from course instructors.

4.2. Study variables

4.2.1. Perceived academic control (PAC; Time 2)

Perry et al. (2001) 8-item Perceived Academic Control (PAC) scale was included to measure the participants' domain specific perceived academic control at Time 2 (1 = *strongly disagree*, 5 = *strongly agree*; e.g., "I have a great deal of control over my academic performance in my psychology course;" Cronbach's $\alpha = 0.70$; Competitive athletes: $M = 31.95$, $SD = 4.93$,

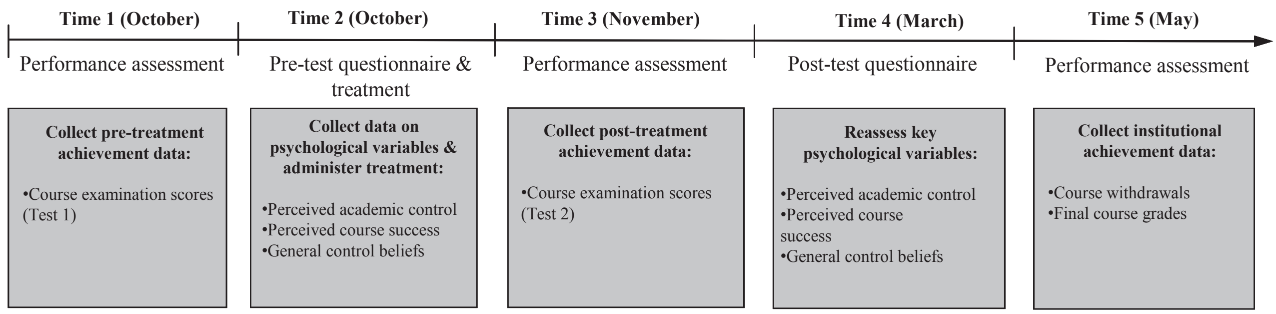

Fig. 1. Treatment protocol.

range = 17–40; Non-athletes: M = 32.22, SD = 5.10, range = 16–40). The four negative items (e.g., "No matter what I do I can't seem to do well in my courses") were reverse coded so when summed, high scores indicated high control beliefs. The PAC scale was designed to assess achievement-related perceived control beliefs and previous research demonstrates that it is psychometrically reliable: Cronbach's α = 0.77 to 0.80 (Hall, Perry, Chipperfield, Clifton, & Haynes, 2006; Pekrun, Goetz, Daniels, Stupnisky, & Perry, 2010; Perry et al., 2001; Ruthig, Haynes, Stupnisky, & Perry, 2009; Stupnisky, Renaud, Daniels, Haynes, & Perry, 2008) and five-month test-retest reliability: r = 0.59–0.66 (Perry et al., 2005; Stupnisky et al., 2008).

4.2.2. Attributional Retraining (AR) treatment (Time 2)

The AR treatment protocol was comprised of three stages (causal search, attribution content induction, and attribution content consolidation) and was administered in a one-hour session that occurred approximately one week after participants received performance feedback on their first introductory psychology test (see Perry et al., 2010, 2014 for details). In Stage 1 (causal search activation), AR recipients were asked to rate the extent to which specified causes contributed to poor academic performance (e.g., not putting enough time into their studies, social distractions, course demands are too difficult, job/financial pressure, etc.). This causal search procedure and the AR protocol were only administered after participants received their grades on a pre-treatment in-class test to give them time to reflect on recent performance feedback. The rationale for causal search activation is grounded in Weiner's attribution theory (1985, 2012) and empirical evidence that causal search often follows a performance outcome (See Perry et al., 2014; Stupnisky, Stewart, Daniels, & Perry, 2011; Wong & Weiner, 1981).[1]

All AR recipients (competitive athletes and non-athletes) viewed a narrated online video in Stage 2 (attribution induction) that encouraged them to ascribe poor performance to internal, unstable, and controllable attributions (e.g., low effort, ineffective studying strategies) which can facilitate future academic success according to Weiner's attribution theory (1985, 2012). The video described how attributions can be depicted using two dimensions: locus of causality (internal/external) and controllability (controllable/uncontrollable), which was represented visually in a four-cell attribution matrix. Based on previous research, participants were informed that university students improved their learning and performance when they ascribed attributions that fit into the internal/controllable cell (Hamm et al., 2014; Perry et al., 2010).[2]

During the attribution consolidation process (Stage 3), participants were encouraged to deeply process the AR information by engaging in a cognitive elaboration writing activity (see Haynes, Perry, Stupnisky, & Daniels, 2009). This activity prompted students to summarize the main points of the AR treatment video (i.e., attribution content) and to describe how the content could be applied to their own lives. Students in the no-AR condition completed the Time 2 questionnaire, but did not participate in the AR induction or attribution consolidation stages and did not view the video (see Perry et al., 2014).

4.2.3. Pre-treatment course-based test 1 (Time 1)

A pre-treatment, in-class introductory psychology test (Test 1) occurred at the end of September prior to the administration of the AR treatment (Competitive athletes: M = 66.22%, SD = 15.87, range = 22.50–97.50; Non-athletes: M = 66.70%, SD = 14.96, range = 25.00–97.50).

4.2.4. Post-treatment course-based test 2 (Time 3)

A post-treatment, in-class introductory psychology test (Test 2) was administered approximately two weeks after the AR treatment. Test 2 scores were obtained from course instructors at the conclusion of the second semester (Competitive athletes: M = 69.26%, SD = 16.47, range = 22.50–97.50; Non-athletes: M = 69.94%, SD = 17.56, range = 20.00–97.50).

4.2.5. Perceived general control (Time 4)

Five months post-treatment, student's perceived general control was assessed in Semester 2 using an adapted (four-item) version of Chipperfield et al. (2012) Sense of Control scale. This adapted version was used to examine students' influence over general life events which was an important focus of the AR video material.

General control is also less interfering with respect to the AR content and shares a positive relationship with PAC (r = 0.44; Perry

[1] "Performance feedback" refers to the students receiving their (actual) introductory psychology Test 1 scores via their personalized university student accounts. Although we cannot confirm that all students looked at their Test 1 scores prior to receiving the treatment, when we asked students what grade they received on Test 1 in introductory psychology, their responses correlated strongly with their actual Test 1 performance (r = 0.95, p < 0.001). This suggests that most students had received their performance feedback. Although not all students performed poorly on Test 1, AR recipients were instructed to think about when they had performed poorly at some point in their academic career.

[2] Other studies have considered the importance of stability and controllability as important attributional dimensions for enhancing self-efficacy, (Coffee & Rees, 2009; Coffee et al., 2009), expectations of success, persistence (Le Foll et al., 2008; Rascle, Le Foll, & Higgins, 2008), and performance (Coffee et al., 2009; Orbach et al., 1997) in sport settings. Weiner's attribution theory (1985) was used to inform our study and encompasses all three dimensions (stability, controllability, and locus of causality), however only two dimensions (internal and controllable attributions) were used in the AR video to help students retain the treatment content.

Table 1
Two-stage hierarchical regression analyses for competitive athletes.

Predictor	Outcome				
	Perceived general control	Perceived course success	Test 2 grades	Final course grades	Course withdrawals[a]
Step 1					
AR	0.03	0.08	0.25	0.20	0.42*
PAC	0.27**	0.36**	0.28**	0.23**	0.65*
R^2	0.07	0.12	0.08	0.05	0.07
Step 2					
AR × PAC	0.01	−0.33*	−0.48**	−0.29*	1.20
ΔR^2	0.00	0.03*	0.05**	0.02*	0.00
R^2	0.07	0.15	0.13	0.07	0.07

Note. In Step 1, partially standardized regression coefficients for AR and fully standardized regression coefficients for PAC are provided for all outcome variables (see Hayes, 2013). In Step 2, partially standardized regression coefficients for AR × PAC interactions are provided. Regression coefficients are for the step in which they were first entered. AR = Attributional Retraining. PAC = perceived academic control.
*p < 0.05, ***p* < 0.01 (one-tailed).
[a] Nagelkerke's R^2 values and odds ratios are presented for the dichotomous course withdrawal outcome measure.

et al., 2001). The perceived general control scale required students to rate statements pertaining to their experience in university more generally (1 = *strongly disagree*; 7 = *strongly agree*; "All things considered, I am generally able to keep things in control;" Cronbach's α = 0.85; Competitive athletes: *M* = 20.13, *SD* = 4.26, range = 7–28; Non-athletes: *M* = 19.26, *SD* = 4.95, range = 4–28).

4.2.6. Perceived course success (Time 4)

Students were asked to report how successful they felt in their introductory psychology course with a one-item scale (1 = *very unsuccessful*, 10 = *very successful*; Competitive athletes: *M* = 5.66, *SD* = 2.06, range = 1–10; Non-athletes: *M* = 5.62, *SD* = 2.15, range = 1–10). Past studies have found a strong relationship between students' perceived success and actual achievement such as final grades and GPAs (e.g., *r* = 0.67, Daniels et al., 2008; *r* = 0.78, Hall et al., 2006; *r* = 0.70, Ruthig, Haynes, Perry, & Chipperfield, 2007).

4.2.7. Final course grade (Time 5)

Consenting students' final course grades in the online psychology course were obtained from instructors at the conclusion of the second semester (Competitive athletes: *M* = 70.55%, *SD* = 13.20, range = 30.10–94.93; Non-athletes: *M* = 71.36%, *SD* = 13.90, range = 7.90–96.00).

4.2.8. Course withdrawal (Time 5)

Introductory psychology course withdrawal data were obtained from instructors with students' permission at the conclusion of Semester 2 (0 = *completed course*, 1 = withdrew from course; Competitive athletes: *M* = 0.15, *SD* = 0.35, range = 0–1; Non-athletes: *M* = 0.19, *SD* = 0.39, range = 0–1).

5. Results

5.1. Rationale for analyses

A two-step hierarchical regression procedure assessed the conditional effects of Attributional Retraining (AR) on academic performance, perceived course success, perceived general control, and voluntary course withdrawals (VW rates). In Step 1, AR and perceived academic control (PAC) were entered as predictor variables. In Step 2, an AR × PAC interaction term was entered to assess whether PAC moderated AR's effects. The same two-step hierarchical approach was used for the logistic regression analyses that assessed likelihood of course withdrawal. A priori one-tailed tests were used to assess the AR × PAC interaction effect based on the directional hypothesis that AR (vs. no-AR) effects would become stronger as PAC decreased (e.g., AR would improve academic performance for students reporting lower levels of PAC). See Table 1 for a summary of the main effect (Step 1) and interaction effect models (Step 2). Since our focus was on AR treatment effects for students who vary in PAC, only interaction effects and simple slope analyses are presented below.[3]

Simple slope analyses (see Hayes, 2013) were conducted to probe the AR × PAC interaction and to examine whether AR benefited students with low (−1 SD) or high (+1 SD) PAC. We tested the significance of our directional hypotheses using 90% bias corrected confidence intervals (CIs; Hayes, 2013; Preacher & Hayes, 2008). Because the AR treatment variable is dichotomous, it has been left in its original metric (0 = *no-AR*, 1 = *AR*) for ease of interpretation (Hayes, 2013). AR effects are reported using both partially standardized and unstandardized regression weights. The latter provides the AR vs. no-AR mean difference on the outcome variables in raw units (e.g., percent difference), whereas the former provides the mean difference in standard deviation units (e.g., the standard deviation difference between the treatment conditions in academic performance). Note that partially standardized regression weights are conceptually equivalent to Cohen's *d*. Competitive athletes and non-athletes were considered in separate analyses.[4]

5.2. Preliminary analyses

5.2.1. Random assignment to treatment groups

The random assignment of competitive athletes and non-athletes to treatment conditions (AR vs. no-AR) was accomplished using a secure survey website. To rule out pre-existing differences between the two treatment conditions that may exist despite random assignment, we examined pre-treatment Test 1 performance and pre-treatment PAC scores (Shadish, Cook, & Campbell, 2002). Independent sample *t*-tests showed students in the AR and no-AR conditions did not differ in Test 1 performance or PAC for either competitive athletes [$t(152) = -1.11$, and $t(183) = 1.40$, respectively] or for non-athletes [$t(226) < 1.00$, and $t(279) < 1.00$, respectively].

[3] We employed $p < 0.05$ as the standard probability for novel hypothesis testing (i.e., for low PAC competitive athletes), but a less conservative $p < 0.10$ for low PAC non-athletes because of previously replicated AR findings where AR (vs. no-AR) benefits students characterized by a risk variable (see Hall et al., 2004; Perry, 2003).

[4] For the athlete and non-athlete samples, multicollinearity between predictor variables was tested using variance inflation factor (VIF) and correlation coefficients. VIF coefficients (all < 2.31) and the correlation coefficients between predictors and outcomes (all < 0.36) revealed multicollinearity values that did not merit further investigation (Neter, Kutner, Nachtsheim, & Wasserman, 1996; Tabachnick & Fidell, 2007). Analyses were based on all available data.

Table 2
Subgroup analysis for competitive athletes varying in perceived academic control.

Dependent measure	Low PAC		High PAC	
	No-AR	AR	No-AR	AR
Perceived general control				
M (*SD*)	19.17 (3.84)	18.72 (3.62)	21.60 (3.79)	20.88 (4.16)
N	18	29	25	26
Perceived course success				
M (*SD*)	4.28 (1.74)	4.87 (1.70)	6.68 (2.32)	6.50 (1.63)
N	18	30	25	26
Test 2 grades				
M (*SD*)	54.95 (15.06)	67.35 (13.36)	72.07 (19.27)	73.87 (13.26)
N	22	29	31	27
Final course grades				
M (*SD*)	61.23 (11.70)	69.05 (11.47)	71.94 (15.89)	74.54 (12.49)
N	22	30	32	27
Course withdrawals[a]				
%	30%	3%	14%	3%
N	33	36	37	28

Note. Subgroup analyses conducted where group splits were created based on removing the middle 20% of students' PAC scores (low PAC = bottom 40%; high PAC = top 40%). See Footnote 3 for rationale.
[a] Observed frequencies for voluntary course withdrawals.

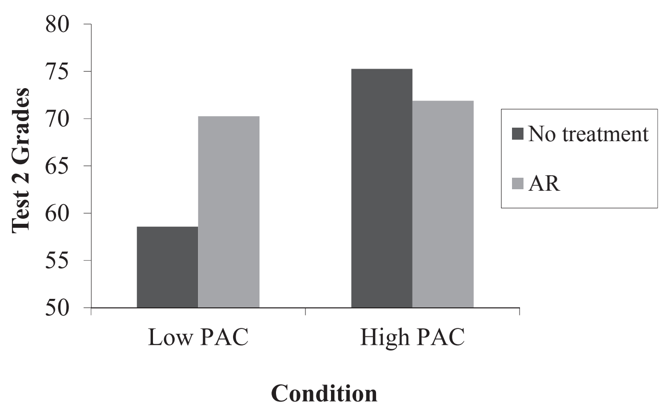

Fig. 2. Treatment × PAC interaction on post-treatment test scores for competitive athletes. Attributional Retraining effects (vs. no-treatment) are given at low (−1 SD) and high (+1 SD) levels of PAC. PAC = perceived academic control.

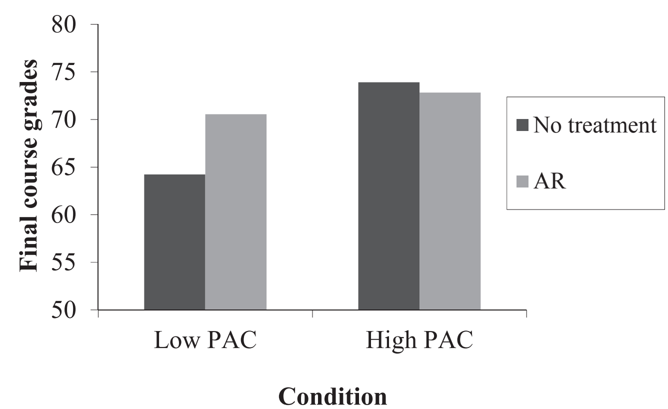

Fig. 3. Treatment × PAC interaction on final course grades for competitive athletes. Attributional Retraining effects (vs. no-treatment) are given at low (−1 SD) and high (+1 SD) levels of PAC. PAC = perceived academic control.

5.2.2. Zero-order correlations

Competitive athletes' PAC was correlated positively with second semester perceived general control and perceived course success in keeping with previous research ($r = 0.27$, $p < 0.01$; $r = 0.35$, $p < 0.001$, respectively). In addition, PAC was positively related to achievement performance on Test 2 ($r = 0.26$, $p = 0.002$) and to final grades ($r = 0.21$, $p = 0.009$), underscoring the high academic risk profile of students with low PAC. In addition, achievement-related variables Test 2 and final grades correlated positively with perceived general control ($r = 0.25$, $p = 0.004$; $r = 0.24$, $p = 0.006$, respectively), perceived course success ($r = 0.62$, $p < 0.001$; $r = 0.70$, $p < 0.001$, respectively), and with one another ($r = 0.83$, $p < 0.001$). Results for non-athletes yielded a similar pattern of significant correlations.

5.3. Main analyses

5.3.1. AR (vs. no-AR) treatment effects for competitive athletes

See Table 1 for a summary of the results. For *post-treatment Test 2*, an AR × PAC interaction was found for performance two-weeks post-treatment in Semester 1 [partially standardized $\beta = -0.48$, $t(147) = -2.96$, $p = 0.002$, CIs = −0.75 to −0.21, $b = -1.59$]. The interaction was probed to assess whether AR (vs. no-AR) treatment effects occurred at low and high levels of PAC. Simple slope analyses revealed that, for low PAC athletes, AR (vs. no-AR) improved Test 2 performance two weeks post-treatment by nearly 12% [partially standardized $\beta = 0.73$, $p = 0.001$, CI = 0.36 to 1.10, $b = 11.68$; see Fig. 2 for unstandardized estimates]. This 12% performance gain translates into almost a two letter-grade difference (i.e., B+ vs. C+). As expected, AR (vs. no-AR) had no effect for high PAC athletes [partially standardized $\beta = -0.21$, $p = 0.350$, CI = −0.58 to 0.16, $b = -3.37$].[5]

For *perceived course success*, an AR × PAC interaction was found five months post-treatment in Semester 2 [partially standardized $\beta = -0.33$, $t(134) = -2.03$, $p = 0.022$, CI = −0.59 to −0.06, $b = -0.14$]. Simple slope analyses indicated that AR (vs. no-AR) facilitated perceived course success for low PAC athletes [partially standardized $\beta = 0.41$, $p = 0.038$, CI = 0.03 to 0.79, $b = 0.84$], but not for high PAC athletes [partially standardized $\beta = -0.24$, $p = 0.278$,

[5] Supplementary analyses probed the AR × PAC interactions by examining treatment effects within subgroups of students who reported low or high PAC. Subgroups retained athletes with scores in the top and bottom 40% of the PAC distribution to provide adequate separation between the low and high PAC groups and retain a sufficient sample size to test the effects (see Table 2 for group means and SDs).

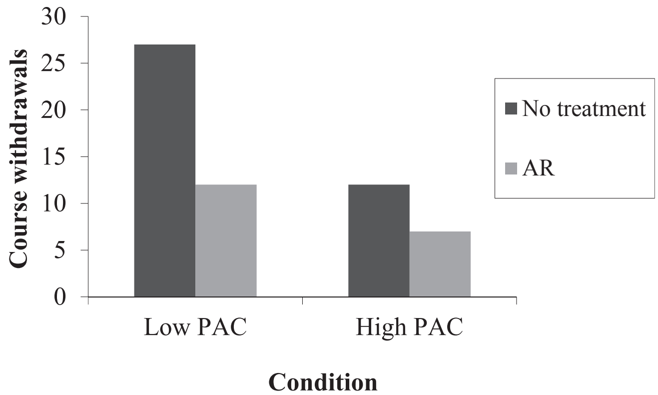

Fig. 4. Treatment × PAC interaction on course withdrawals for competitive athletes. Attributional Retraining effects (vs. no-treatment) are given at low (−1 SD) and high (+1 SD) levels of PAC. PAC = perceived academic control.

CI = −0.62 to 0.13, $b = -0.51$]. For *perceived general control*, the AR × PAC interaction was not significant.

For *final course grades*, an AR × PAC interaction was observed [partially standardized $\beta = -0.29$, $t(150) = -1.77$, $p = 0.040$, CI = −0.61 to −0.02, $b = -0.77$]. Simple slope analyses indicated that low PAC athletes who received AR outperformed their no-AR counterparts by over 6% in final course grades [partially standardized $\beta = 0.53$, $p = 0.017$, CI = 0.12 to 0.95, $b = 6.32$; see Fig. 3] which is equivalent to a full letter grade in introductory psychology. As expected, AR (vs. no-AR) had no effect on high PAC athletes [partially standardized $\beta = -0.09$, $p = 0.716$, CI = −0.51 to 0.32, $b = -1.08$]. The AR × PAC interaction was not significant for *voluntary course withdrawals*, however an AR main effect emerged [Wald = 3.62, $p = 0.029$, $OR = 0.42$, CI = −0.17 to 1.03, $b = -0.88$]. An odds ratio (OR) of 0.42 indicates that athletes in the AR condition were 58% less likely to drop the online course than their counterparts who did not receive AR.

Though the omnibus interaction was not significant for course withdrawals, simple slope analyses were conducted to explore the effects of AR for our high-risk group of interest (low PAC athletes). Results indicated AR (vs. no-AR) reduced the likelihood of voluntary withdrawals for these high-risk athletes [Wald = 3.34, $p = 0.034$, $OR = 0.37$, CI = −1.89 to −0.10, $b = -1.00$; see Fig. 4]. An odds ratio of 0.37 indicates that low PAC athletes who received AR were 63% less likely than their no-AR peers to withdraw from their introductory psychology course (12% vs. 27%). For high PAC students, no AR treatment effect occurred on course withdrawals [Wald = 0.75, $p = 0.388$, $OR = 0.47$, CI = −1.84 to 0.57, $b = -0.63$].

In sum, AR × PAC interaction effects for athletes were significant for perceived success, Test 2 scores, and final course grades. Simple slopes analyses revealed that, for low PAC athletes, significant AR treatment effects occurred for all outcome variables except perceived general control. For high PAC athletes, AR treatment effects were not found for any of the outcome measures.[6]

5.3.2. AR (vs. no-AR) treatment effects for non-athlete students

No AR × PAC interaction effects were observed for non-athletes. However, planned simple slope analyses revealed two AR treatment effects for low PAC non-athletes. First, AR (vs. no-AR) increased *post-treatment Test 2* performance by nearly 5% [partially standardized $\beta = 0.28$, $p = 0.066$, CI = −0.03 to 0.59, $b = 4.96$]. Second, AR (vs. no-AR) boosted *perceived general control* at the end of Semester 2 [partially standardized $\beta = 0.40$, $p = 0.018$, CI = 0.09 to 0.71, $b = 1.96$].

5.3.3. Supplementary analyses

A combined sample ($N = 669$) of non-athletes, competitive student athletes, and *less competitive* athletes (i.e., those competing in or practicing their sport less than 4 times per week) was used to increase statistical power. Simple slope analyses showed that low PAC students benefitted from AR (vs. no-AR) in terms of perceived general control [$b = 1.60$, $p = 0.002$], Test 2 scores ($b = 5.93$, $p = 0.001$), final grades ($b = 3.44$, $p = 0.012$), and voluntary withdrawals (Wald = 5.38, $p = 0.010$, $OR = 0.52$), but not perceived course success ($b = -0.01$, $p = 0.484$). For the most part, these findings complement and support past studies that have examined AR-achievement linkages for low PAC students (see Perry et al., 2014).

6. Discussion

Competitive student athletes entering university can face unique and demanding pressures that impinge upon their academic learning, motivation, and performance (De Knop et al., 1999; MacNamara & Collins, 2010; Simons et al., 1999). These competitive athletes are required to keep up in their respective sport and accommodate demanding academic schedules while navigating the challenging school-to-university transition. Not surprisingly, these individuals are more prone to attain poorer grades and quit college (Bengtsson & Johnson, 2012). Since students' perceived control beliefs over their academic performance can affect their educational development (Perry et al., 2005, 2014; Perry & Hamm, 2016), our study focused on whether an Attributional Retraining (AR) treatment intervention could benefit competitive student athletes who have limited PAC.

Our study revealed AR (vs. no-AR) improved low PAC competitive athletes' performance on an in-class course test (Test 2) and on final course grades. Low PAC competitive athletes who received the AR treatment in Semester 1 outperformed their no-AR counterparts by nearly 12% on a subsequent psychology test that occurred two weeks post-treatment. Furthermore, this same treatment group achieved 6% higher final grades overall than their no-treatment peers in the online, two-semester course. Notably, the final grade difference represents approximately a letter grade increase in their course grading system at a Canadian university.

These results also highlight the long-term treatment effects of AR and align with research by Rascle et al. (2015) that found enduring effects of expectations for success and task persistence in a sport setting. Other AR research shows that students academically at risk (i.e., low incoming high school grades) who received AR in their first year of college had higher course completion rates and were two times more likely to graduate five-years later (Perry et al., 2014). Adopting a different persistence measure (i.e., withdrawing from a course) and a unique student sample, our study supports these findings by showing that academically at-risk students (competitive athletes with low PAC) who received AR had lower course withdrawal rates compared to their no-AR peers (12% vs. 27%).

These findings have important implications when considering the type of student who is at-risk in terms of performance and persistence in a college setting. Competitive student athletes with low PAC who are arguably most in need of interventions that facilitate academic success seem to be most receptive to an attribution-based treatment (e.g., compared to high PAC athletes or non-athletes). Thus, our findings contribute to the AR literature by

[6] Results for low PAC athletes remained significant when controlling for English as a first language, gender, and high school grade which have been shown to influence academic success for student-athletes (Comeaux & Harrison, 2011).

featuring competitive athletes who have not systematically been examined apart from the larger postsecondary student population. Further, these findings potentially have strategic utility for athletic programs, directors, and coaches who value the retention of athletes struggling with the transition to novel university and athletic programs.

An additional finding of import arose for the competitive athletes when examining perceived success. Low PAC athletes in the no-AR group indicated noticeably lower levels of perceived course success compared to their AR counterparts ($M = 4.28$ and 4.87, respectively) and compared to both experimental groups with high PAC ($M = 6.68$ and 6.50, respectively). Furthermore, AR did not appear to impact non-athletes' perceived course success. Assuming that competitive athletes experience frequent success and failure experiences when competing in their selected sport, it may be that these athletes have a heightened sensitivity to the concept of "success", even when used in an academic context. Thus, the AR treatment may have assisted the low PAC athletes to recognize the factors (causes) that contribute to success outcomes in their academic endeavours, whereas the no-AR, low PAC athletes did not. Future research could look at examining attributional thinking for these high-risk athletes pre- and post-treatment, or whether such reasoning moderates AR's effects for these specific individuals.

For non-athletes, AR produced expected effects on post-treatment test performance and year-end perceived general control. Non-athletes with low PAC who received AR outperformed their no-AR peers by 6% in their course tests two weeks after the treatment which may be attributed to AR's immediate impact of boosting perceived controllability in course achievement. This is supported in past research where attributing poor performance to controllable factors enhanced perceptions of control (Hall, Hladkyj, Perry, & Ruthig, 2004; Hamm et al., 2014).

In the supplementary analyses, AR's effects were consistent with past studies when non-athletes, competitive athletes, and less competitive athletes were examined collectively. Specifically, AR (vs. no-AR) promoted higher perceived general control, achievement performance (Test 2 scores, final grades) and resulted in fewer course withdrawals (VW rates) for low PAC students. Although these treatment effects are not as prominent for the combined sample as for the competitive athletes separately (e.g., Test 2 scores: 12% versus 6%), they are consistent with past AR study findings (see Perry et al., 2014).

6.1. Limitations and future directions

Although our study extends AR research by examining treatment effects for a novel, high-risk group of college students that have previously been ignored, it has some limitations that require the findings be treated with caution. First, the two participant groups under investigation (i.e., competitive athletes and non-athletes) were self-identified. These self-defined groups may vary according to the students' perception of what constitutes a "competitive athlete." However, in defining competitive athletes as those who participate in their sport more than four times per week, we attempted to limit the subjective variability by identifying individuals who were highly committed to their sport.

Second, our study did not stipulate the precise number of times the athletes participated in their sport each week. For example, some athletes may practice or play their sport two times a day each week (e.g., 14 times per week), whereas others may only play and practice five times each week. This is worth considering since physical demands, time pressures, and other stressors will differ depending on the frequency of participation, and may impact the degree of challenge experienced by the athletes. In addition, some athletes may have coaches who mandate their participation, whereas others may choose to freely engage as a result of intrinsic motivation or passion for their sport. Participating in practice due to obligation would presumably create a more low-control environment compared to settings where athletes' participation is voluntary. Understanding these differences may help to further illuminate the types of athletes who require motivational assistance.

Another limitation involves the lack of information and control we had concerning the coaches' instructions being delivered to the athletes. It is possible some athletes were receiving additional training that would support, or possible hinder, the AR treatment in our study. In this regard, if the athletes received coaching instruction that comprised attributional content, this would be one potential confound affecting our results that could be considered in future analyses. Finally, another limitation to our study was the online implementation of the treatment conditions. There was limited experimental control since the students could receive the treatment at any place or time that was convenient for them. This made possible delivering the AR treatment to a large number of introductory psychology students involved in the study, but controlled laboratory conditions would contribute to an optimal research design.

In summary, our eight-month, quasi-experimental randomized treatment study highlights the benefits of administering Attributional Retraining to high-risk student athletes who are juggling both academic and athletic schedules and who have low PAC. Our study suggests the utility of AR for improving competitive athletes' academic performance and persistence. AR may prove useful for athletic and university programs striving to keep their athletes off academic probation and successful in their university development.

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