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Nutritional Regrets and Knowledge in National Collegiate Athletic Association

Division I Athletes: Establishing a Foundation for Educational Interventions

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The aim of this study was to describe the nutritional regrets and sport nutrition knowledge of Division I NCAA athletes and determine if higher knowledge would be related to fewer regrets. Additionally, we explored whether differences would emerge on nutrition knowledge or nutritional regrets based on gender or year in school. This was a cross-sectional, questionnaire-based study conducted during the spring and summer of 2015. A total of 196 Division I NCAA student-athletes (145 male and 51 female) from a single university completed a questionnaire at the end of their competitive season. Comparisons on nutrition-related regrets and sport nutrition knowledge were conducted using Mann-Whitney U and Kruskal-Wallis tests. A Spearman's rho correlation was used to examine the relationship between nutrition-related regrets and sports nutrition knowledge. Most student-athletes possessed regrets related to their eating habits, with few regretting weight management practices. Total nutritional regrets were higher in females than males, but did not differ significantly by school level. There was no significant association between nutritional knowledge and regrets. Interventions that incorporate education, strategies that increase dietary choice self-efficacy, and goal-setting may prove to be more efficacious in minimizing regrets in nutrition-related decision-making.

Keywords: nutrition, sport, health

Over the past half century, the proliferation of scientific knowledge related to nutrition and its effects on athletic performance has been dramatic. A simple PubMed search using sport nutrition terminology illustrates the prolific increase in publications. For example, annual articles published on *sport carbohydrate* and *sport protein* increased from 20 to 477 and 26 to 1426, respectively, from 1969 to 2014. This expanding body of research has contributed, in part, to an increased focus on nutrition as a means to augment athletic performance (Rodriguez, Di Marco, & Langley, 2009).

Despite the growth of scientific knowledge, athletes' diets often do not meet recommendations from researchers and sporting organizations (Mujika & Burke, 2010). While intercollegiate student-athletes may be aware of the benefits of maintaining proper nutrition (e.g., consuming proper amounts of carbohydrates to optimize training), their actions often prove otherwise (Kreider et al., 2010; Mujika & Burke, 2010; Shriver, Betts, & Wollenberg, 2013). Both males and females appear susceptible to misconceptions about the role of nutrition in athletic performance (Rosenbloom, Jonnalagadda, & Skinner, 2002). Of additional concern, intercollegiate student-athletes may overestimate their level of understanding of nutrition and rely on parents and coaches as primary sources for nutrition information instead of practitioners with special nutritional educational training (Shifflett, Timm, & Kahanov, 2002). The juxtaposition between scientific knowledge and day-to-day practice is unfortunate because intercollegiate student-athletes, in particular, need to maximize their nutrition in order to meet the demands not only of training and recovery, but also for optimal physical maturation and academic success.

Discrepancies can exist between an individual's nutrition knowledge and actual nutrition choices. Intercollegiate student-athletes are one group that may be vulnerable to this phenomenon, but unfortunately, there is little research on this topic in student-athletes. One area that may help address this gap involves the decision-making processes around nutritional choices and their associated regrets. When decisions are made that result in an outcome that could have been different had an alternate decision been selected, regret is likely to be experienced (Zeelenberg, 1999). Regret can be defined as a negative affective state connected to a counterfactual thought (Connolly & Zeelenberg, 2002). For example, an athlete returning to their sport after summer may regret not eating better over the break. Importantly, the type and amount of regret that an athlete experiences may influence their decision-making process in the future.

A greater understanding of intercollegiate student-athletes' nutritional regrets and perceptions of unhealthy eating should serve as a foundation for enhanced coaching practices and educational curricula. While "eating unhealthy" has been identified by intercollegiate student-athletes as a leading cause of regret, the underlying scope of this regret has yet to be fully elucidated (Robbins et al., 2015). Clearly, factors such as taste preferences, cultural norms, food availability, convenience, and economic constraints play a role in athletes' nutritional choices. However, managing regrets and increasing sport nutrition knowledge represent relatively inexpensive methods of positively influencing the nutritional intake of athletes (Valliant, Pittman, Emplaincourt, Kieckhafer Wenzel, & Garner, 2012). The aim of this study was to examine sport nutrition knowledge of collegiate athletes and their reported nutritional regrets.

Literature Review

Many athletic departments within colleges/universities offer resources to student-athletes to help them excel both in and out of their sport. These resources may include career and life skills development, career planning and placement, academic advising, eligibility monitoring, and academic support services (Satterfield, Croft, & Godfrey, 2010). Additionally, several performance team members are available to student-athletes, which can include sports medicine physicians, athletic trainers, strength and conditioning coaches, academic counselors, sport psychologists, and sport dietitians (Quatromoni, 2008). While these team members may be available at some universities, not every institution provides its student-athletes with access to these resources.

In terms of prevalence of sport dietitians, a survey involving student-athletes from eight NCAA Division I universities found that half of the universities (49.6%) had a registered dietitian on staff, and about half (47.5%) provided access to individual counseling (Burns, Schiller, Merrick & Wolf, 2004). Of these student-athletes that had access to nutrition-based resources, only 30% attended group classes and 18% received individual counseling (Burns et al., 2004). Consequently, although access to nutrition providers may be limited, those that do have access may not be fully utilizing these resources. Further, there is a need to find alternative methods of extending nutrition knowledge for intercollegiate student-athletes.

One method to optimize delivery of nutrition services may be providing a nutrition-based course for student-athletes or implementing a nutrition intervention. Student-athletes who completed a nutrition course had higher nutrition knowledge scores than those who had no prior nutrition course history (Weeden, Olsen, Batacan, & Peterson, 2014). Thus, including a nutrition course as part of a Life Skills plan for incoming freshman may be one way to increase nutrition knowledge early on in a student-athlete's career. Karpinski (2012) proposed an academic course specifically designed to instruct college student-athletes on nutrition education. Course objectives would include describing strategies for promoting health and performance, developing personal meal plans, and discussing appropriate use of dietary supplements and principles of proper weight control. Although the proposed course outlined by Karpinski (2012) included many important aspects of acquiring and applying nutrition knowledge, there have been no follow-up investigations testing this approach in collegiate athletes.

In a recent review of nutrition interventions in college/university settings, Kelly, Mazzeo, and Bean (2013) found only 14 studies evaluated the effectiveness of nutrition interventions for improving college students' eating habits. A variety of approaches facilitated changes in students' dietary intake; however, including self-regulation strategies such as self-monitoring and goal-setting seemed to maximize positive outcomes (Kelly et al., 2013). Being mindful about nutritional choices (i.e., incorporating behavioral checklist or using dietary logs) is a way of promoting self-regulation (Heckler, Gardner, & Robinson, 2010; Poddar, Hosig, Anderson, Nichols-Richardson, & Duncan, 2010).

Beyond content-driven nutrition courses, another approach to help student-athletes improve aspects of nutrition knowledge and behaviors has been through cooking interventions. Levy and Auld (2004) found those that either witnessed a 1-hour cooking demonstration or partook in a cooking intervention showed improvement in attitudes and cooking-related knowledge and behaviors. Despite these short-term improvements in knowledge and behavior, it is less clear whether long-term eating patterns are altered by these types of interventions. Murray et al. (2015), for example, interviewed college students who lived off campus and thus were

responsible for their own meal planning and production. These students indicated being knowledgeable about eating a balanced diet, but this did not translate into actual food choices and cooking practices.

Student-athletes may be at an advantage relative to other college students because of the availability of sports dietitians and training tables that provide a variety of healthy food options. However, education and available resources still may not translate to actual behaviors because of the aforementioned barriers and problems. Thus, the gap between nutrition knowledge and eating behavior that exists in college students (including student-athletes) is an area that deserves additional evaluation and research.

Regret

As eluded to previously, managing regret may be an important means of influencing an athlete's nutrition choices. Regrets can range from actions (e.g., "I regret that I ate too much junk food) to inactions (e.g., "I regret that I did not run over break"), as well as from experienced to anticipated regrets, which involve deliberations over possible regrets before any losses actually occur (Janis & Mann, 1977). Experienced regrets are deemed to be negative because they are connected to lower levels of psychological and physical well-being (Dijkstra & Barelds, 2008). However, anticipated regrets can be helpful in allowing people to learn from past experiences and alter future decision-making processes (Zeelenberg, 1999). Regrets can be a positive experience if they can be used to modify future behaviors. On the other hand, fixating on regrets and repetitive thoughts over situations can lead to feelings of distress (Roese et al., 2009). In essence, optimizing anticipated regrets while minimizing experienced regrets may be one way to positively alter student-athletes' future decision-making processes related to nutrition.

In support of this concept, research in non-athletic populations has found anticipated regret can influence health choices. The Theory of Planned Behavior is a framework that has been used to link anticipated regret to health behaviors (Kock, 2014). According to the Theory of Planned Behavior, intentions are the most salient predictor of behavior (Ajzen, 1991). Similarly, anticipated regrets for not eating healthfully have been found to predict strong intentions to consume healthy food (Kock, 2014). Employees who had higher anticipated regret for not choosing a healthy snack at their workplace cafeteria reported greater intentions to choose a healthy snack and ultimately chose a healthy snack compared to those with lower anticipated regret (Weijzen, de Graaf, & Dijksterhuis, 2009).

A major area of research on anticipated regret involves risky health behaviors (e.g., unsafe sexual practices, substance use), which may provide insights into strategies practitioners and educators might use to reduce maladaptive behaviors (Kock, 2014). Caffray and Schnieder (2010) examined adolescents' motivations to participate in various risky behaviors, including drinking alcohol, using drugs, having sex, smoking cigarettes, and skipping school. They found that adolescents with less experience in these domains were more likely to report anticipated regret. These results suggest anticipated regret could deter inexperienced adolescents from engaging in maladaptive behaviors. Although benefits may be gained from using anticipated regrets to modify future health behaviors and decisions, research on regrets in athletics has been limited.

One of the first studies to examine regret in a collegiate athletic population identified six areas of regret: team, communication, role, priorities, confidence and transition (Robbins & Stanley, 2013). In this study, former female NCAA Division I level collegiate field hockey

players reported regrets related to a lack of team cohesion, not accepting a role, insufficient confidence, and having difficulties transitioning between high school and collegiate sport. To expand these findings to a more diverse group of athletes, Robbins, Madrigal, and Stanley (2015) collected regrets from 172 athletes from team and individual sports. A total of 1,236 regrets were reported by the athletes, with the top regrets involving eating and sleeping behaviors (Robbins et al., 2015). Understanding regrets experienced by collegiate athletes represented foundational research necessary to the development of regret-based interventions. Using this foundational work, Robbins and Stanley (2012) examined how stimulating anticipated regret would influence thoughts and behaviors in Division I athletes. These athletes were asked to read and discuss regrets of former student-athletes as a way to stimulate their own anticipated regret. Notably, student-athletes that read and discussed the regrets of others expressed fewer regrets compared to a control group that did not have access to regrets of former athletes (Robbins & Stanley, 2012). Additionally, reading others' regrets during the season led to changing personal thoughts and behaviors in-season (Robbins & Stanley, 2012).

The mechanisms behind this phenomenon are not entirely clear. When observing the negative outcome of another's choices, individuals react as if they were personally involved in that situation (Giroto, Ferrante, Pighin, & Gonzalez, 2007). Experiencing regret can lead to positive changes by teaching individuals to act on future opportunities or avoid repeating similar mistakes (Landman & Manis, 1992; Zeelenberg & Pieters, 2004). Regrets, either personally or vicariously experienced, may be one way to minimize future regrets for college athletes.

It is probable that a combination of educational strategies—that include stimulating anticipated regret—may help collegiate athletes alter eating behaviors more effectively than by targeting nutritional knowledge alone. Prior to developing regret-based interventions, however, additional research is needed to evaluate the specific nutritional regrets of athletes and the factors that influence these regrets. The purpose of the study was to (1) describe the nutritional regrets and sport nutrition knowledge of a cohort of Division I NCAA athletes, (2) determine if there were differences on nutrition knowledge scores or nutritional regrets based on level in school or gender, and (3) determine if those more knowledgeable about sport nutrition were likely to have fewer nutritional regrets.

Method

Participants and Design

This was a cross-sectional questionnaire-based study conducted during the spring and summer of 2015. Convenience sampling was utilized given the pilot nature of the work (Bernard, 2013). A total of 196 Division I NCAA athletes (145 male and 51 female) from a Midwestern university with a mean age of 20.1 ($SD = 1.2$) were analyzed as a part of this study; 19.4% were freshmen, 29.1% were redshirt freshmen, 28.1% were sophomores, 14.8% were juniors, and 8.7% were seniors. The racial/ethnic distribution of the sample was 68.4% white, 22.4% African American, 4.6% multi-ethnic, 3.1% Hispanic, 1.0% Asian-Pacific Islander, and 0.5% American Indian. Female athletes from the following sports participated: basketball ($n = 4$), bowling ($n = 3$), gymnastics ($n = 11$), rifle ($n = 7$), soccer ($n = 7$), swimming/diving ($n = 8$), track/field ($n = 5$), and volleyball ($n = 6$). Male athletes from football ($n = 104$), golf ($n = 1$), gymnastics ($n = 14$), track/field ($n = 5$), and wrestling ($n = 21$) participated.

Measures

Nutrition regrets. Previous research found the majority of collegiate athletes regretted “eating unhealthy” (Robbins et al., 2015). Eating unhealthy can mean a variety of things from eating too much junk food to not enough food rich in nutrients such as vitamins, minerals, and phytochemicals. To understand this major regret further, nine items were created to assess regrets related to nutrition, which were related to actions or inactions of eating habits and weight management. Participants were given a definition of regret (i.e., regret is defined as a negative emotion- or range of emotions- associated with feelings that an action or series of actions could have been carried out more suitably, often followed by comments like “If only I had...” or “If only I hadn’t...”) and then asked to rate on a 5-point Likert scale the degree to which they agreed with the regret (1= not at all; 5= very much). Thus, experiencing little regret would be indicated by a 1, while having a stronger feeling of regret would be indicated by anything ranging from 2-5. The nine items were summed to create a total score (ranging from 9-45) for nutrition regrets, with a higher number indicating more regrets. Cronbach’s reliability for this scale was 0.85 ($M=18.7$, $SD=7.0$). Refer to Table 1 for a list of nutrition regrets.

Sport nutrition knowledge. An adapted version of a validated questionnaire was utilized to assess sport nutrition knowledge (Zinn, Schofield & Wall, 2005). This questionnaire demonstrated good test-retest reliability, with Pearson’s correlations of $r = 0.74$ to 0.93 and up to 81% of questions being duplicated with repeated administrations (Zinn et al., 2005). The original questionnaire was comprised of 88 questions covering five domains: general nutrition, hydration, weight control, recovery, and supplements. This questionnaire was reduced from 88 to 61 questions for the present study in order to reduce the burden of participation. Furthermore, some questions were altered or eliminated because scientific knowledge in that particular area evolved since the questionnaire was originally developed (e.g., chocolate milk versus carbohydrate drink as an optimal recovery beverage). In addition, minor changes were made to some questions and answers to make them more applicable to American college students (changing units of measurement and examples of foods). Finally, several novel questions were included in order to address issues that were important to practitioners at the university where the research was conducted.

Question format varied between allowing for selection between two foods, allowing participants to indicate *agree*, *disagree*, or *unsure* for a statement (e.g., there is more protein in a glass of whole milk than in a glass of non-fat milk), and asking participants to select all relevant answers. Participants were instructed to indicate *unsure* for questions they did not genuinely know the correct answer to. For the analysis, questions that participants responded *unsure* to were considered incorrect. Possible correct answer totals for each domain were as follows: general nutrition = 35, hydration = 6, weight control = 8, recovery = 3, and supplements = 9. Scores from the five domains were summed for a total correct answer score ranging from 0 to 61.

Procedure

Following Institutional Review Board approval, 19 coaches from different teams were contacted around the end of the competitive season and asked whether they would be willing to allow a researcher to attend a meeting or practice to recruit athletes. Fourteen coaches agreed for a researcher to meet with their teams. At a time arranged with the coach, a researcher met with

the athletes to explain the study and obtain informed consent. To be included in the study, participants had to be current student-athletes that recently finished their competitive season. We excluded 48 cases due to missing information (39 males, 9 females). Those who agreed to participate either completed a survey in a group setting ($n=166$) or were sent an electronic survey ($n=30$). Group settings were in a team locker room or at a closed practice facility. The survey took approximately 20 minutes to complete.

Results

Table 1 shows the categorization of those that experienced various nutritional regrets (i.e., Yes) versus those that did not (i.e., No). Most athletes presented some level of regret related to their eating habits. In contrast, the majority of athletes did not have weight management regrets (i.e., gaining weight, not losing weight, losing too much weight). Because of non-normally distributed data, nonparametric statistics were used, such that nutritional regrets were compared between genders and by level in school using the Mann-Whitney U and Kruskal-Wallis tests. Five cases were removed from this analysis due to missing data. Total nutritional regrets were higher in females (Mean Rank = 112.2) than males (Mean Rank = 90.3; Mann-Whitney U = 2717, $z = -2.4$, $p = 0.02$), but did not differ significantly by school level (Kruskal-Wallis chi-square = 1.3, $df = 4$, $p = 0.86$).

Total and domain scores from the sport nutrition knowledge questionnaire are displayed in Table 2. Out of a possible 61 correct answers, male and female participants had similar medians of 29 (48%) and 30 (49%; Mann-Whitney U = 2512, $z = -0.61$, $p = 0.54$). Scores did not differ significantly by school level (Kruskal-Wallis chi-square = 3.9, $df = 4$, $p = 0.42$). Regarding the knowledge domains, the proportion of correct answers was below 50% for all except general nutrition knowledge (60% for both males and females), and the lowest scores were on the supplement domain (<25% for both males and females).

A Spearman's rho correlation was run to examine whether there was any association between sport nutrition knowledge and nutritional regrets at the end of the season. Among participants with complete responses on all scales ($n = 161$), there was no significant association between total sport nutrition knowledge and nutritional regrets ($\rho = .00$, $p = 0.99$).

Discussion

The purpose of our exploratory study was to describe the nutritional regrets and sport nutrition knowledge of Division I NCAA student-athletes and determine if higher knowledge would be related to fewer regrets. We also sought to explore whether differences would emerge on nutrition knowledge and nutritional regrets based on gender or year in school. There is scant previous research available to describe the nutritional regrets of athletes at all levels. In previous qualitative work from Robbins et al. (2015), 55% of Division I and II NCAA student-athletes regretted their eating habits during the previous season. However, their study did not delve into specific eating behaviors that student-athletes regretted, which limits inferences that can be made regarding the specific habits that should be targeted for intervention. In the present study, the most common nutritional regret was "eating unhealthy," followed by "eating foods with little nutritional value" and "not fueling enough." On the other hand, the least common regrets were related to weight management, although a substantial proportion of athletes (25-43%) reported some level of regret with weight management. Moreover, the median level of regret for "not

losing weight” was three for females, indicating a moderate level of regret. It is important to note that our sample was disproportionate in that we had more male athletes, specifically from football and wrestling that may have biased the reported regrets. Collegiate football players, in particular, often attempt to gain weight and muscle mass as means to positively augment performance (Anzell, Potteiger, Kraemer, & Otieno, 2013), which may have contributed to a low prevalence of weight loss related regrets among males.

Considering future regrets before making a decision served as one way intercollegiate student-athletes can make better decisions during their competitive season. By anticipating the regret, student-athletes become focused on “what can be” (i.e., hope for the future) instead of “what might have been” (i.e., regret over the past; Boninger, Gleicher, & Strathman, 1994). When an individual perceives they have an ability to control and change an action or behavior, they are more likely to engage in the corrective behavior (Roesse & Summerville, 2005). From a coach’s, sport nutritionist’s, or a sport psychologist’s perspective, it may be useful to address regret-related emotions and behaviors early in season (or collegiate career) when student-athletes have ample opportunity to take responsibility and identify skills and resources they possess to change future behaviors (Bauer, Wrosch, & Jobin, 2008).

While the authors are not aware of any interventions targeting nutritional regrets, previous research supports the notion that experienced regrets, in general, can be reduced through intervention. The aforementioned investigation from Robbins and Stanley (2012) used vicarious learning through written modeling of former athletes’ regrets to reduce experienced regrets in college student-athletes. Specifically, athletes who read about regrets of former athletes reported fewer regrets than controls. Despite not experiencing those regrets themselves, student-athletes were able to learn from others’ choices and modify their behavior to avoid experienced regret. These findings, while indirect, provide foundational support for interventions to increase anticipated regrets as a means of reducing experienced nutritional regrets in collegiate athletes.

Another aim of this investigation was to describe the sport nutrition knowledge of Division I NCAA student-athletes. A number of studies evaluated nutrition knowledge in athletes, but many of these either had small sample sizes, only focused on one team/sport, or failed to evaluate sport-specific nutrition knowledge (Heaney, O’Connor, Michael, Gifford, & Naughton, 2011). We utilized a modified version of a validated sport nutrition knowledge questionnaire, and compared to other samples of college students taking this questionnaire, our participants scored similarly or slightly better (Jessri, Jessri, RashidKhani, & Zinn, 2010; Zinn et al., 2005). With that said, the median number of correct answers was still below 50% for both males and females, indicating a substantial lack of nutritional knowledge. While all domains could be targeted, knowledge of weight control, recovery, and supplements stand to improve the most from education.

An additional finding of this investigation was the lack of association between nutritional regrets and sport nutrition knowledge. Ultimately, other factors such as motivation and self-efficacy may be more important determinants of regret than knowledge, which would explain the apparent lack of association. Increasing intrinsic motivation is a well-known method of eliciting behavior change compared to strictly giving advice (Rubak, Sandbaek, Lauritzen, & Christensen, 2005). Motivation is a key piece to applying knowledge of proper nutrition to eating decisions directed at improving health and sports performance. Equally important, athletes must feel confident in their ability to make the right decisions when choosing what to eat. For example, an 8-week intervention with collegiate female athletes emphasized dietary choice self-efficacy in addition to instructing athletes on proper nutrition (Abood, Black, & Birnbaum, 2004). Within,

those who received the education not only experienced a significant increase in nutrition knowledge but reported more confidence in their ability to make healthy food choices (Abood, et al., 2004). In the end, simply educating student-athletes about nutrition may not go far enough; interventions should begin combining education, motivation, and goal-alignment behaviors to optimize the messages being sent. Furthermore, stimulating anticipated regret should be examined as a means of reducing experienced regret and improving actual nutrition behavior.

This was the first study to provide an in-depth analysis of nutritionally-related regrets in collegiate athletes. As part of understanding regrets in this unique population, we explored whether differences would emerge on nutrition knowledge or nutritional regrets based on gender or year in school. Gender was the only variable to show differences on nutritional regrets. Although research on regrets in sport is limited, previous work found that sport-related regrets do not vary according to gender or sport type (Robbins et al., 2015). In regards to nutritional regrets, previous research reported males on team sports (e.g., baseball, basketball) and females on individual sports (e.g., cross-country, track and field) were more likely to report regret than their female-team and male-individual counterparts (Robbins et al., 2015). In comparison, the present study discovered that female student-athletes reported more regrets than male student-athletes; however, these regrets were more focused on weight management regrets (e.g., gaining weight, not losing weight).

In the general population, women report greater desires to lose weight and are more likely to engage in weight loss behaviors (Yaemsiri, Slining, & Agarwal, 2011). In sport, research has shown that some female athletes are motivated for a leaner body due to how others (e.g., teammates, coaches, spectators) perceive their weight (Reel, Soohoo, Petrie, Greenleaf, & Carter, 2010), while other athletes associate improved performance with low body weight and body fat (Thorton, 1990). It is desirable for many athletes to have a high lean body mass and relatively low fat mass to achieve a high power-to weight ratio (O'Connor, Lewis, & Kirchner, 1995). While performance in some sports is more dependent on an ideal body type (e.g., cross country, gymnastics), sociocultural factors may have been contributing to these weight-related regrets in females (Drinkwater, Loucks, Sherman, Sudgot-Borgen, & Thompson, 2005). Consequently, it is important that interventions aimed at anticipated regret and nutritional knowledge also address healthy weight management practices so that athletes can select the proper fuel to train while minimizing the risk of over- or under-eating.

The current study did have limitations that should be noted. All participants came from a single university with substantially more male than female participants. Additionally, football, wrestling, and gymnastics had greater representation than other sports. This convenience sampling impacts the generalizability of the findings, and additional work will be needed in other populations to examine whether regrets vary considerably with athlete level (e.g., Division I vs. III) or the nutritional and psychological resources offered at an institution. Although this study captured nutrition and weight management regrets athletes experienced over their season, we did not examine why. For instance, a wrestler may regret eating high calorie foods because he was trying to make weight while a gymnast may have that same regret but instead associate it with poor performance. We did not know what the student-athletes were attempting to achieve that resulted in them experiencing regret. Future studies could address this issue by having athletes report why they experienced regret or assessing regret multiple times throughout the season in an attempt to modify or reduce regrets experienced. An additional limitation is that the majority of the data were collected via survey in team settings. The setting and the influence or presence of the coach may have impacted the way in which student-athletes responded to items. In

anticipation of these effects, coaches were reminded that they would not receive their team's score, and players were reminded of the confidentiality of responses. Finally, the sport nutrition knowledge questionnaire was shortened to reduce the burden of participation and some questions were altered to reflect changes in the latest scientific research. Thus, comparisons to other samples—even those using the same questionnaire—must be done tentatively.

Research in this area can be advanced by testing various interventions aimed at reducing experienced nutritional regrets. Research in other areas of regret provides justification for this approach and offers insight into possible strategies. Oswalt, Cameron, and Koob (2005) examined sexual regret and reasons for regret in college students. The inconsistency between their morals and sexual decision making was the most cited reason for students regretting their behavior. If interventions can be implemented with athletes outlining their goals and values for the upcoming season as well as how nutrition can play a role in facilitating those goals, then athletes may be more inclined to make nutritional decisions that are consistent with those values and goals. Seta, Seta, McElroy, and Hatz (2008) found that decisions consistent with goals led to fewer regrets than decisions counter to one's goals. Future research developing such interventions that utilize goals and values may help athletes minimize experienced regrets related to nutrition and weight management decisions.

Implications for Research and Practice

This study used a novel approach to examine nutritional regrets and sport nutrition knowledge in a sample of Division I NCAA student-athletes. Consistent with the literature, collegiate student-athletes understanding of nutrition knowledge is average and reported a high prevalence of experienced regret related to eating behavior during their season. Although the reported nutritional knowledge was comparable for college student-athletes, this is still an area that needs vast improvement. College student-athletes may have support from coaches, athletic trainers, or other performance staff members on nutritional information; however, the athletes themselves must learn proper nutrition for sport so they can make the decision that would be most suitable for their needs. The results herein provide the groundwork necessary to develop nutrition-based interventions aimed at reducing experienced nutritional regret, improving sport nutrition knowledge, and altering eating patterns. Such interventions should incorporate education, use strategies that increase dietary choice self-efficacy, and apply goal-setting approaches to assist athletes in minimizing regrets in nutrition-related decision-making. Moreover, stimulating anticipated regret related to nutrition behaviors should be evaluated as a means to augment eating behaviors in collegiate athletes.

Lastly, we provide an example of a strategy that can be implemented by practitioners or researchers to reduce experienced regret and improve nutrition behavior. Steps of such a strategy would include (a) identifying current behaviors, (b) creating a list of possible actions or inactions, (c) writing down all possible regrets that could accompany each action or inaction, and (d) identifying the athlete's main goal related to that action or inaction. For example, at mid-season, an athlete could consider her current habits (e.g., skipping breakfast before training, eating fast food as opposed to cooking meals), possible actions (e.g., eating a supplement shake before training, cooking a healthy meal at least twice a week), regrets that could be attached to each action (e.g., waking up earlier to make the supplement shake, having to do more dishes and grocery shopping), and their purpose related to that action (e.g., desire to make the starting lineup). This mental exercise could stimulate one or more changes and lead to better decision

making over the second half of the season. Perhaps using the objectives outlined by Karpinski (2012), in addition to discussing anticipated regrets, may be a useful method in both educating student-athletes on nutrition knowledge and also applying the information during one's collegiate career and beyond.

References

- Abood, D. A., Black, D. R., & Birnbaum, R. D. (2004). Nutrition education intervention for college female athletes. *Journal of Nutrition Education Behavior, 36*, 135-139.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.
- Anzell, A. R., Potteiger, J. A., Kraemer, W. J., & Otieno, S. (2013). Changes in height, body weight, and body composition in American football players from 1942 to 2011. *Journal of Strength and Conditioning Research, 27*, 277-284.
- Bauer, I., Wrosch, C., & Jobin, J. (2008). I'm better off than most other people: The role of social comparisons for coping with regret in young adulthood and old age. *Psychology and Aging, 23*, 800-811.
- Bernard, H. R. (2013). *Social research methods: Qualitative and quantitative approaches*. Thousand Oaks, CA: Sage Publications.
- Boninger, D. S., Gleicher, F., & Strathman, A. (1994). Counterfactual thinking: From what might have been to what may be. *Journal of Personality and Social Psychology, 67*, 297-307.
- Burns, R. D., Schiller, M. R., Merrick, M. A., & Wolf, K. N. (2004). Intercollegiate student athlete use of nutritional supplements and the role of athletic trainers and dietitians in nutrition counseling. *Journal of American Dietetic Association, 104*, 246-249.
- Caffray, C. M., & Schneider, S. L. (2010). Why do they do it? Affective motivators in adolescents' decisions to participate in risk behaviors. *Cognition and Emotion, 14*, 543-576.
- Connolly, T. & Zeelenberg, M. (2002). Regret in decision making. *Current Directions in Psychological Science, 11*, 212-216.
- Dijkstra, P., & Barelds, D. (2008). What Dutch women of different ages regret most. *Journal of Research in Personality, 42*, 1663-1667.
- Drinkwater, B., Loucks, A., Sherman, R., Sundgot-Borgen, J., & Thompon, R. (2005). *International Olympic Committee Medical Commission Working Group Women in Sport. Position Stand on the Female Athlete Triad*.
- Giroto, V., Ferrante, D., Pighin, S., Gonzalez, M. (2007). Postdecisional counterfactual thinking by actors and readers. *Psychological Science, 18*, 510-515.
- Heaney, S., O'Connor, H., Michael, S., Gifford, J., & Naughton, G. (2011). Nutrition knowledge in athletes: a systematic review. *International Journal of Sport Nutrition and Exercise Metabolism, 21*, 248-261.
- Heckler, E. B., Gardner, C. D., & Robinson, T. N. (2010). Effects of a college course about food and society on students' eating behaviors. *American Journal of Preventative Medicine, 38*, 213-214.
- Janis, I. L., & Mann, L. (1977). *Decision making*. New York, New York: The Free Press.
- Jessri, M., Jessri, M., RashidKhani, B., & Zinn, C. (2010). Evaluation of Iranian college athletes' sport nutrition knowledge. *International Journal of Sport Nutrition and Exercise Metabolism, 20*, 257-263.
- Karpinski, C. (2012). Exploring the feasibility of an academic course that provides nutrition education to collegiate student-athletes. *Journal of Nutrition Education and Behavior, 44*, 267-270.

- Kelly, N. R., Mazzeo, S. E., & Bean, M. K. (2013). Systematic review of dietary interventions with college students: Directions for future research and practice. *Journal of Nutrition Education and Behavior, 45*, 304-313.
- Kock, E. J. (2014). How does anticipated regret influence health and safety decisions? A literature review. *Basic and Applied Social Psychology, 36*, 397-412.
- Kreider, R. B., Wilborn, C. D., Taylor, L., Campbell, B., Almada, A. L., Collins, R.,.....Antonia, J. (2010). ISSN exercise and sport nutrition review: Research and recommendations. *Journal of the International Society of Sports Nutrition, 7*, 1-43.
- Landman, J., & Manis, J. D. (1992). What might have been: Counterfactual thought concerning personal decisions. *British Journal of Psychology, 83*, 473-477.
- Levy, J., & Auld, G. (2004). Cooking classes outperform cooking demonstrations for college sophomore. *Journal of Nutrition Education Behavior, 36*, 197-203.
- Mujika, I., & Burke, L. M. (2010). Nutrition in team sports. *Annals of Nutrition and Metabolism, 57*, 26-35.
- Murray, D. W., Mahadevan, M., Gatto, K., O'Connor, K., Fissinger, A., Bailey, D., & Cassara, E. (2015). Culinary efficacy: An exploratory study of skills, confidence, and healthy cooking competencies among university students. *Perspectives in Public Health*, Advance online publication doi:10.1177/1757913915600195
- O'Connor, P. J., Lewis, R. J., Kirchner, E. M. (1995). Eating disorder symptoms in female college gymnasts. *Medicine in Science, Sports, and Exercise, 27*, 550-555.
- Oswalt, S. B., Cameron, K. A., & Koob, J. J. (2005). Sexual regret in college students. *Archives of Sexual Behavior, 34*, 663-669.
- Poddar, K. H., Hosig, K. W., Anderson, E. S., Nichols-Richardson, S. M., & Duncan, S. E. (2010). Web-based nutrition education intervention improves self-efficacy and self-regulation related to increase dairy intake in college students. *Journal of American Dietetic Association, 110*, 1723-1727.
- Quatromoni, P. A. (2008). Clinical observations from nutrition services in college athletics. *Journal of American Dietetic Association, 108*, 689-694.
- Reel, J., Soohoo, S., Petrie, T. A., Greenleaf, C., & Carter, J. E. (2010). Slimming down for sport: Developing a weight pressures in sport measure for female athletes. *Journal of Clinical Sport Psychology, 4*, 99-111.
- Robbins, J. E., Madrigal, L., & Stanley, C. T. (2015). Retrospective remorse: College athletes' reported regrets from a single season. *Journal of Sport Behavior, 38*, 212-222.
- Robbins, J. E., & Stanley, C. T. (2013). Exploring regret in former athletes: Emotional ramifications of sport-specific decisions. *Applied Research in Coaching and Athletics Annual, 28*, 1-33.
- Robbins, J. E., & Stanley, C. T. (2012). Minimizing regrets in college athletes: An intervention approach. *International Journal of Sport & Exercise Psychology, 10*, 186-197.
- Rodriguez, N. R., Di Marco, N. M., & Langley, S. (2009). American Dietetic Association; Dietitians of Canada; American College of Sports Medicine. American College of Sports Medicine position stand. Nutrition and athletic performance. *Medicine and Science in Sports and Exercise, 41*, 709-731.
- Roese, N., Epstude, K., Fessel, F., Morrison, M., Smallman, R., Summerville, A. Galinsky, A., & Segerskom, S. (2009). Repetitive regret, depression, and anxiety: Findings from a nationally representative survey. *Journal of Social and Clinical Psychology, 28*, 671-688.

- Roese, N. & Summerville, A. (2005). What we regret most...and why. *Personality and Social Psychology Bulletin*, 31, 1273-1285.
- Rosenbloom, C., Jonnalagadda, S. S., & Skinner, R. (2002). Nutrition knowledge of collegiate athletes in a Division I national collegiate athletic association institution. *Journal of the American Dietetic Association*, 102, 418-420.
- Rubak, S., Sandbæk, A., Lauritzen, T., & Christensen, B. (2005). Motivational interviewing: a systematic review and meta-analysis. *British Journal of General Practice*, 55, 305-312.
- Satterfield, J. W., Croft, C., & Godfrey, M. (2010). Whose responsibility is it anyway: The student-athlete? *Academic Leadership Journal*, 8
- Seta, C. E., Seta, J. J., McElroy, G. T., & Hatz, J. (2008). Regret: The role of consistency-fit and counterfactual salience. *Social Cognition*, 26, 700-719.
- Shifflett, B., Timm, C., & Kahanov, L. (2002). Understanding of athletes' nutritional needs among athletes, coaches, and athletic trainers. *Research Quarterly for Exercise and Sport*, 73, 357-362.
- Shriver, L., Betts, N., & Wollenberg, G. (2013). Dietary intakes and eating habits of college athletes: Are female college athletes following the current sports nutrition standards? *Journal of American College Health*, 61, 10-16.
- Thorton, J. S. (1990). Feast or famine: Eating disorders in athletes. *The Physician and Sportsmedicine*, 18, 116-122.
- Valliant, M. W., Pittman Emplaincourt, H., Kieckhafer Wenzel, R., & Garner, B. H. (2012). Nutrition education by a registered dietitian improves dietary intake and nutrition knowledge of a NCAA female volleyball team. *Nutrients*, 4, 506-516.
- Weeden, A. M., Olsen, J., Batacan, J. M., & Peterson, T. (2014). Differences in collegiate athlete nutrition knowledge as determined by athlete characteristics. *The Sport Journal*, 55, 1-13
- Weijzen, P. L., de Graaf, C., & Dijksterhuis, G. B. (2009). Predictors of the consistency between healthy snack choice intentions and actual behavior. *Food Quality and Preference*, 20, 110-119.
- Yaemsiri, S., Slining, M. M., Agarwal, S. K. (2011). Perceived weight status, overweight diagnosis, and weight control among US adults: the NHANES 2003-2008 Study. *International Journal of Obesity*, 35, 1063-1070.
- Zeelenberg, M. (1999). Anticipated regret, expected feedback and behavioral decision-making. *Journal of Behavioral Decision Making*, 12, 93-106
- Zeelenberg, M., & Pieters, R. (2004). Consequences of regret aversion in real life: The case of the Dutch postcode lottery. *Organizational Behavior and Human Decision Processes*, 93, 15-168.
- Zinn, C., Schofield, G., & Wall, C. (2005). Development of a psychometrically valid and reliable sports nutrition knowledge questionnaire. *Journal of Science and Medicine in Sport*, 8, 346-351.

Table 1

Descriptive Information on Nutrition Regrets

	Yes	No
Eating unhealthy	154 (78.6%)	42 (21.4%)
Foods with little nutritional value	136 (69.4%)	60 (30.6%)
Not fueling enough (food or fluid) for practice and competition	125 (64.4%)	69 (35.6%)
Not eating enough fruits and veggies	119 (61.0%)	76 (39.0%)
High calorie foods	118 (60.2%)	78 (39.8%)
Eating out too much	114 (58.2%)	82 (41.8%)
Gaining weight	84 (42.9%)	112 (57.1%)
Not losing weight	83 (42.9%)	111 (57.2%)
Losing too much weight this season	49 (25.3%)	145 (74%)

Note. Regrets were reported on a 1 to 5 scale (1 = not at all, 5 = very much). ‘Yes’ indicates a participant reported any value > 1. Some participants were missing an answer for one or two questions on the regrets scale, accounting for the slight variations in sample sizes for each item.

Table 2

Descriptive Information on Sport Nutrition Knowledge

	Males		Females	
	Median	IQR	Median	IQR
Total (n = 119 & 45)	29	22-35	30	23-36
General nutrition (n = 131 & 47)	21	16-23	21	18-24
Hydration (n = 141 & 51)	3	2-4	3	2-4
Weight control (n = 137 & 51)	2	1-4	2	1-4
Recovery (n = 135 & 51)	1	0-2	1	1-2
Supplements (n = 140 & 49)	2	0-3	1	0-3

Note. Sample sizes are slightly different for each domain because some participants did not have complete responses for every domain. n = represents sample sizes for males and females, respectively. Possible number of correct answers: total = 61, general = 35, hydration = 6, weight control = 8, recovery = 3, supplements = 9.