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Abstract

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Keywords

physical activity, COVID-19, college athletes, Reasoned Action Approach, behavior intentions

Acknowledgements/Disclaimers/Disclosures

All participants provided informed consent and the study was approved by the Miami University institutional review board. All methods were carried out in accordance with relevant guidelines and regulations. Individual responses/data are not publicly available due to privacy and ethical restrictions. Requests for aggregate and group summaries not presented in this manuscript can be directed to the corresponding author: Dr. Paul Branscum, branscpw@miamioh.edu, Miami University, 420 Oak Street, Phillips Hall 204B, (513) 529-3022. The authors have no conflicts of interest to report, financial or otherwise.

Reasoned Action Approach to Analyze Differences in Athletes' Physical Activity During COVID-19

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Abstract

The purpose of this study was to examine the reasoned action approach (RAA) in relation to the impact of COVID-19 on college athletes' physical activity (PA). Participants were college athletes (ages 18-22 years) who were involved in university, club, and/or intramural sport. The RAA constructs were measured for the three different types of PA behaviors. Statistical analyses included ANOVA and multiple regression analyses to evaluate the RAA determinants of PA intentions. Results partially supported theoretical expectations. All RAA constructs had an impact on perceived norms indicating a dominant influence. Remote social interaction/training during isolation periods are suggested to promote sustained conditioning among college athletes.

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Introduction

The COVID-19 pandemic has largely impacted society since early 2020 (Xiong et al., 2020). This pandemic was first reported in Wuhan, China in December of 2019, then spread to other countries, eventually making its way to the United States. COVID-19 is highly contagious and causes breathing problems, body aches, extreme fatigue, and many other serious health issues (CDC, 2020). The pandemic has made a significant impact on millions of lives worldwide, leading to closures of businesses, reductions in workforce members, and the suspension of sports. Mandatory lockdowns were used early in the pandemic to contain the spread of COVID-19. This forced individuals to remain in their homes for any reason other than essential activities. For the Spring semester in the 2019-2020 school year collegiate athletes abruptly stopped at all levels, and athletes were unable to continue traditional training and competition. This

largely continued into the Fall semester of the 2020-2021 school year.

As college campuses closed and transitioned to remote learning, student athletes' routines drastically shifted. While online and distance models in the past have been adopted for physical exercise and training, the unprecedented COVID-19 lockdown left athletes to continue training and remain physically active on their own (Sá Filho et al., 2020). Past research has identified various factors that influence physical activity (PA) behaviors, such as time commitment and social barriers (Downs et al., 2014). Furthermore, college students involved in club or intramural sports were more likely to meet the recommended amount of moderate to vigorous PA, compared to those not participating in these sport activities (Dinger et al., 2014). There is a wealth of research on PA behaviors among college students' pre-pandemic; however, research is needed to understand how the pandemic altered PA behaviors, especially for collegiate athletes.

Gaining greater insight into how the pandemic influenced PA behaviors among college athletes is beneficial for the promotion of their PA during COVID-19 and related or similar future challenges.

There are multiple forms of PA that have been identified by the U. S. Office of Disease Prevention and Health Promotion (ODPHP). Currently, adults are recommended to engage in at least 150 minutes of moderate-intensity aerobic exercise, or 75 minutes of vigorous-intensity aerobic exercise, or a combination of both intensities each week (Office of Disease Prevention and Health Promotion, 2016). Muscle-strengthening PA is another form of recommended exercise for adults. Adults should engage in this form of exercise at least twice a week, working all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms) (CDC, 2020). Along with the potential benefits of aerobic and muscle-strengthening exercises, sport-specific conditioning exercises for athletes can increase sport performance. The University of Rochester's Medical Center (2021) suggests athletes work out their major muscle groups, specifically targeting muscles highly associated with peak performance. However, not much is known about how to maintain athletes' motivation for PA behaviors during isolation due to illnesses such as COVID-19.

This study used the reasoned action approach (RAA). This approach addresses determinants of behavior by using the following constructs: intentions, attitudes, perceived norms, and perceived behavior control (PBC) (Fishbein, 2008). The RAA is useful in predicting and understanding health behaviors. In a meta-analysis, McEachan et al. (2016) showed that implementing the RAA in prospective tests on health behaviors was moderately to highly correlated with the constructs. Conner et al. (2017) also found the constructs to be strong predictors of engagement in health behaviors.

To expand on previous research, the purpose of this study was to examine potential differences in RAA constructs between the three types of PA among college athletes during the beginning stages of the COVID-19 pandemic when training and competition were shut down.

Methods

Study Design & Participants

This study used a cross-sectional research design. All research related activities were approved by the sponsoring university's Institutional Review Board, and data were collected in October and November 2020 when COVID-19 safety protocols were still in place and athletics were still in question of returning. The sample included college athletes between the ages of 18 and 22 years attending a large Midwestern university. This included those involved in university, club, and intramural sports. Participants were recruited via email, direct and group messaging, and social media. Approximately 1,200 athletes were asked to participate. All participants provided informed consent. As an incentive, participants were entered into a random drawing for a \$25 gift card.

Instrumentation

Variables were measured through an online, self-report survey. Questions focused on the RAA constructs for three different types of PA behaviors: aerobic PA, muscle strengthening PA, and conditioning PA. Before each set of questions, participants were given the definitions of the recommended amounts of PA for aerobic and muscle strengthening PA. For conditioning PA, they were asked to think about the activities coaches would expect to maintain their conditioning.

Attitudes towards the behavior.

Attitudes were measured using four items for each of the three PA behaviors. Relative to aerobic and muscle strengthening PA behaviors, items were phrased as, “Getting the recommended amount of PA behavior every week is...”. Conditioning exercise items were phrased as, “Engaging in conditioning exercises every week is...”. Responses included both instrumental (e.g., not at all important to me/extremely important to me) and experiential attitudes (e.g., extremely frustrating to me/extremely enjoyable to me). Items were evaluated using a 7-point Likert scale. Instrumental attitudes were determined with a scale of 1 (e.g., not at all important to me) to 7 (e.g., extremely important to me). Experiential attitudes were determined with a scale of 1 (e.g., extremely frustrating to me) to 7 (e.g., extremely enjoyable to me). The Cronbach’s alpha scores for each scale were appropriate (Tavakol & Dennick, 2011). The Cronbach’s alpha scores for attitudes for behavior were aerobic PA = 0.84, muscle-strengthening PA = 0.92, and conditioning PA = 0.90.

Perceived norms about the behavior.

Each PA behavior in relation to perceived norms was measured by four items, using both injunctive normative items (e.g., most people who are important to me want me to engage in PA behavior every week) and descriptive normative items (e.g., most people similar to me get the recommended amount of PA every week). Responses were given on a 7-point Likert scale, determining how strongly participants agreed or disagreed with the statement (1 = strongly disagree to 7 = strongly agree). The Cronbach’s alpha scores for each scale were appropriate (Tavakol & Dennick, 2011). For aerobic PA the alpha = 0.70, muscle-strengthening PA = 0.79, and conditioning PA = 0.84.

Perceived behavior control over the behavior (PBC).

PBC was measured using four items per PA behavior. Items included both elements of capacity/self-efficacy (e.g., I believe I have the ability to get the recommended amount of PA behavior every week) and autonomy (e.g., getting the recommended amount of PA behavior is out of my control). Each response was recorded on the 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). The Cronbach’s alpha scores for each scale were adequate (Tavakol & Dennick, 2011). For aerobic PA the alpha = 0.70, muscle-strengthening PA = 0.89, and conditioning PA = 0.77.

Intentions towards the behavior.

Intentions for all three PA behaviors were measured using three items (e.g., I plan to get the recommended amount of PA behavior every week). Each response was recorded on the 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). The Cronbach’s alpha score for each scale were adequate. For aerobic PA the alpha = 0.90, muscle-strengthening PA = 0.94, and conditioning PA = 0.94.

Statistical Analysis

All analyses were conducted using SPSS version 25 (IBM Corp., Armonk, N.Y., USA). Means and standard deviations of the RAA constructs for each PA behavior were reported to describe the sample. The RAA constructs were compared between PA behaviors using a repeated measures ANOVA. If the test was significant ($p < 0.05$), post-hoc analyses were used to determine specific differences, that is, to find which pair differences were significant. Multiple regression analyses were also used to evaluate the RAA determinants of intentions to perform each type of PA behavior.

Results

One-hundred fifty-two participants initiated the survey and 108 completed the survey ($n = 71\%$). Only complete data were included in the analyses and no duplicate data were possible. The sample was mostly female ($n = 74$; 69%), Caucasian ($n = 98$; 91%), and split by current undergraduate class level. Specifically, freshman ($n = 28$; 26%); sophomore ($n = 27$; 25%); junior ($n = 23$; 21%); senior ($n = 25$; 23%); with one graduate student responding (4 students did not disclose their class standing). In addition, the average age of participants was 19.8 years \pm 1.3. Most students also participated in club or intramural sports ($n = 80$; 74%), compared to university sponsored sports ($n = 23$; 21%).

Differences in Reasoned Action Approach (RAA) Constructs Based on Physical Activity (PA) Type

Table 1 demonstrates the results for the RAA constructs in relation to aerobic, muscle strengthening, and conditioning PA. All

differences were significant ($p < 0.00$). PBC had the highest mean scores for all three PA behaviors and perceived norms had the lowest mean scores. When observing the differences between the types of PA, muscle strengthening PA had the lowest scores for all RAA constructs.

Theory-based Correlates of Aerobic, Muscle Strengthening, and Conditioning Physical Activity (PA)

Multiple linear regression analyses were conducted to evaluate the prediction of intentions for aerobic, muscle strengthening, and conditioning PA (Table 2). Results showed that perceived norms were the strongest predictor of intentions for aerobic ($\beta = 0.37$) and conditioning PA ($\beta = 0.37$). For muscle strengthening PA, attitudes were the strongest predictor ($\beta = 0.37$). Perceived norms and attitudes for all three types of PA were statistically significant, whereas PBC was the only significant predictor of conditioning PA ($\beta = 0.21$).

Table 1

Reasoned Action Approach Constructs/Differences Between Groups (n = 108)

	Cardio PA Mean (SD)	Muscle Conditioning PA Mean (SD)	Conditioning PA Mean (SD)	F	p-value
Behavioral Intentions	1.34 (1.40) ¹	0.76 (1.60) ^{1,2}	1.25 (1.60) ²	8.93	< 0.01
Attitudes	1.38 (1.30) ¹	0.94 (1.50) ^{1,2}	1.51 (1.40) ²	15.18	< 0.01
Perceived Norms	1.16 (1.00) ¹	0.44 (1.20) ^{1,2}	1.01 (1.20) ²	20.78	< 0.01
Perceived Behavioral Control	2.33 (0.80) ^{1,2}	2.01 (0.10) ¹	1.93 (1.10) ²	8.26	< 0.01

PA = physical activity; SD = standard deviation.

¹Intentions: Cardio/Muscle [$p = 0.001$; $d = 0.37$]; ²Conditioning/Muscle [$p = 0.01$; $d = 0.31$].

¹Attitudes: Cardio/Muscle [$p = 0.001$; $d = 0.30$]; ²Conditioning/Muscle [$p = 0.001$; $d = 0.39$].

¹Perceived Norms: Cardio/Muscle [$p = 0.001$; $d = 0.65$]; ²Conditioning/Muscle [$p = 0.001$; $d = 0.48$].

¹PBC: Cardio/Muscle [$p = 0.004$; $d = 0.71$]; ²Cardio/Conditioning [$p = 0.001$; $d = 0.42$].

Table 2

Parameter Estimates and Model Prediction to Intentions for Physical Activity Behaviors

3-Component Models	Adjusted R^2	Standardized Coefficient (β)	t	p
Cardio PA Intentions	0.29			
Perceived norms		0.37	4.18	0.00
Attitudes		0.25	2.69	0.01
Perceived behavioral control		0.11	1.33	0.19
Muscle Strengthening PA Intentions	0.44			
Perceived norms		0.37		0.00
Attitudes		0.33		0.00
Perceived behavioral control		0.14		0.08
Conditioning PA Intentions	0.35			
Perceived norms		0.37	4.02	0.00
Attitudes		0.23	2.88	0.01
Perceived behavioral control		0.21	2.23	0.03

Note. PA = physical activity

Discussion

Results supported the theoretical expectations that RAA constructs impacted college athletes' PA behaviors during the COVID-19 pandemic. ANOVA results showed significant differences in all RAA constructs based on types of PA. Muscle strengthening PA was viewed as less important than aerobic and conditioning PA, which may be due to limited availability of exercise equipment and/or facilities at home. PBC had the highest mean scores for all PA behaviors and perceived norms had the lowest mean score, supporting previous research (McEachan et al., 2016).

Results from multiple regression analyses partially supported preceding research. Similar to previous research, RAA predicted PA behaviors (Conner et al., 2017; McEachan, 2016). The strongest predictor of all PA behaviors was perceived norms,

suggesting the significant influence of social relations and influences. PBC had the lowest influence, contradicting previous research that has labeled PBC as the highest-regarded determinant of intentions (Yzer, 2012).

Study limitations included the use of a self-reported survey and lack of observational data, and the representation of multiple types of sports and training methods that complicated specific data interpretation. It is also noteworthy that most participants were female (69%) and Caucasian (91%), requiring a more diverse sample in similar future research. The term "athlete" is generally described as an individual who is either eligible for or currently engaging in intercollegiate sport (Cornell Law School, 2004). Based on current results, future research is recommended to differentiate among athletes at multiple levels of competition.

Implications for Health Behavior Theory

The RAA approach demonstrated differences based on PA, which should be considered in future theoretical applications. Also, RAA predicted PA behavior, with perceived norms having the strongest impact. Additional research is needed on how the RAA constructs can be applied to support athletes' PA. Based on current results, certain health promotion strategies can be suggested. First, barriers to muscle strengthening exercises can be combated with outdoor gyms or alternative exercises that are planned and provided by coaches and team leaders. The significant dependence on social norms requires social interaction. During times of isolation, resources that remotely connect athletes with teammates and/or coaches will likely improve RAA constructs and overall conditioning and performance.

This research also adds to how researchers can approach evaluating PA behaviors. Traditionally, PA is evaluated as meeting some type of guideline, and categorized as aerobic PA and muscle strengthening PA. Both types of PA are 'behavioral categories' because many types of activities fall under these umbrella terms: running, biking, and swimming are traditional aerobic activities that are distinct, yet can be performed to meet recommendations. Lifting weights, using resistance bands, and plyometrics are in turn common muscle-strengthening activities that again are distinct, yet can be performed to meet recommendations. Within this study we attempted to operationalize a new type of PA, sport-specific conditioning PA, and treated it as a behavioral category like aerobic and muscle strengthening PA, so the behavior would be relevant no matter what sport the athlete participated (i.e., water polo, baseball, hockey, etc). We acknowledge however that this type of conditioning PA could be difficult to study, if the athlete does not have

sufficient knowledge for what types of activities would be appropriate. Therefore, more work may be needed to understand how to better operationalize this specific form of PA.

Discussion Question

The current findings supported the theoretical expectations that the reasoned action approach constructs impacted college athletes' PA behaviors during the COVID-19 pandemic. How can coaches support their athletes' PA and training during COVID-19 or similar times of isolation?

Acknowledgments

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